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Page 30

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Official Journal of
ARRL The national association for AMATEUR RADIO™

NOVEMBER 2010 QST Vol 94 No 11

digital HFDSP

Icom's pioneering work in Digital Signal Processing lets today's ham isolate weak signals without needing to buy expensive optional filters

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200 Watt Output (50W AM),
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RX: 0.030–60.000MHz*

Four 32 Bit IF-DSPs + 24 Bit
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2 Completely Independent Receivers

+40dBm 3rd Order Intercept Point

3 Roofing Filters

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- Dualwatch Receive
- 4-hour Digital Recorder

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- AM, FM, WFM
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- 100 Ch/Second High Speed Scan
- Computer Controllable[1]

IC-RX7 TRACK READY

- RX: 0.150–1300.0MHz*
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hy-gain ROTATORS

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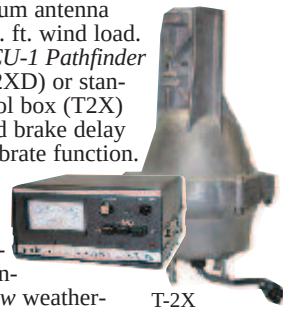
HAM-IV

HAM-IV
$649.95

The most popular rotator in the world! For medium communications arrays up to 15 square feet wind load area. *New* 5-second brake delay! *New* Test/Calibrate function. *New* low temperature grease permits normal operation down to -30 degrees F. *New* alloy ring gear gives extra strength up to 100,000 PSI for maximum reliability. *New* indicator potentiometer. *New* ferrite beads reduce RF susceptibility. *New* Cinch plug plus 8-pin plug at control box. Dual 98 ball bearing race for load bearing strength and electric locking steel wedge brake prevents wind induced antenna movement. North or South center of rotation scale on meter, low voltage control, max mast size of $2^{1}/_{16}$ inches.

HAM IV and HAM V Rotator Specifications	
Wind Load capacity (inside tower)	15 square feet
Wind Load (w/mast adapter)	**7.5 square feet**
Turning Power	800 in.-lbs.
Brake Power	**5000 in.-lbs.**
Brake Construction	Electric Wedge
Bearing Assembly	**dual race/96 ball bearings**
Mounting Hardware	Clamp plate/steel U-bolts
Control Cable Conductors	**8**
Shipping Weight	26 lbs.
Effective Moment (in tower)	**2800 ft.-lbs.**

TAILTWISTER SERIES II



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

T-2X
$799.95

T-2XD
$1229.95
with DCU-1

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

CD-45II

CD-45II
$449.95

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

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

HAM-V

HAM-V
$1099.95
with DCU-1

For medium antenna arrays up to 15 square feet wind load area. Similar to the HAM IV, but includes *DCU-1 Pathfinder* digital control unit with gas plasma display. Provides automatic operation of brake and rotor, compatible with many logging/contest programs, 6 presets for beam headings, 1 degree accuracy, auto 8-second brake delay, 360 degree choice for center location, *more!*

AR-40

AR-40
$349.95

For compact antenna arrays and large FM/TV up to 3.0 square feet wind load area. Dual 12 ball bearing race. Automatic position sensor never needs resetting. Fully automatic control -- just dial and touch for any desired location. Solid state, low voltage control, safe and silent operation. $2^{1}/_{16}$ inch maximum mast size. MSLD light duty lower mast support included.

AR-40 Rotator Specifications	
Wind load capacity (inside tower)	3.0 square feet
Wind Load (w/ mast adapter)	**1.5 square feet**
Turning Power	350 in.-lbs.
Brake Power	**450 in.-lbs.**
Brake Construction	Disc Brake
Bearing Assembly	**Dual race/12 ball bearings**
Mounting Hardware	Clamp plate/steel bolts
Control Cable Conductors	**5**
Shipping Weight	14 lbs.
Effective Moment (in tower)	**300 ft.-lbs.**

HDR-300A

HDR-300A
$1499.95

King-sized antenna arrays up to 25 sq.ft. wind load area. Control cable connector, *new* hardened stainless steel output shaft, *new* North or South centered calibration, *new* ferrite beads on potentiometer wires reduce RF susceptibility, *new* longer output shaft keyway adds reliability. Heavy-duty self-centering steel clamp and hardware. Display accurate to 1°. Machined steel output.

HDR-300A Rotator Specifications	
Wind load capacity (inside tower)	25 square feet
Wind Load (w/ mast adapter)	**not applicable**
Turning Power	5000 in.-lbs.
Brake Power	**7500 in.-lbs.**
Brake Construction	solenoid operated locking
Bearing Assembly	**bronze sleeve w/rollers**
Mounting Hardware	stainless steel bolts
Control Cable Conductors	**7**
Shipping Weight	61 lbs.
Effective Moment (in tower)	**5000 ft.-lbs.**

ROTATOR OPTIONS

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

Digital Automatic Controller

DCU-1
$749.95

Automatically controls T2X, HAM-IV, V rotators. 6 presets for favorite headings, 1° accuracy, 8-sec. brake delay, choice for center of rotation, crisp *plasma* display. Computer controlled with many logging/contest programs.

AR-35 Rotator/Controller

AR-35
$89.95

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

RBD-5
$29.95

NEW! Automatic Rotator Brake Delay

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

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Maldol **EM-5M** SO-239 / PL-259
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Max Antenna: 40"

For Medium Size Antennas

MODEL / ANT CONN / COAX CONN

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

For Tall or Multi-band HF Antennas

MODEL / ANT CONN / COAX CONN

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

COMET and Maldol Mobile

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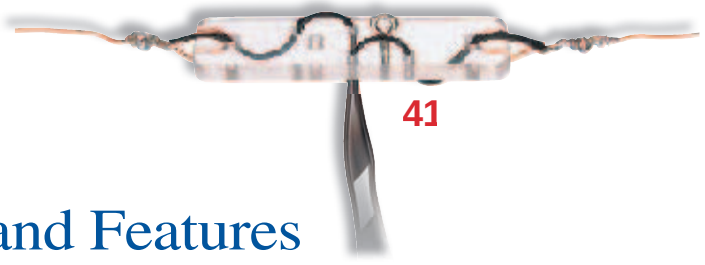
Technical



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News and Features

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Our Cover
Shout it from the rooftops! With Joe Taylor's, K1JT, new program *WSPR* — Weak Signal Propagation Reporter — and an SSB transceiver, you can participate in a worldwide network of low power stations exchanging beacon-like transmissions to probe potential propagation paths. Check out the article by Taylor and Bruce Walker, W1BW, beginning on page 30. Speaking of beacons and propagation, turn to page 75 to discover how you can use beacons to find out when the bands are open.

Departments

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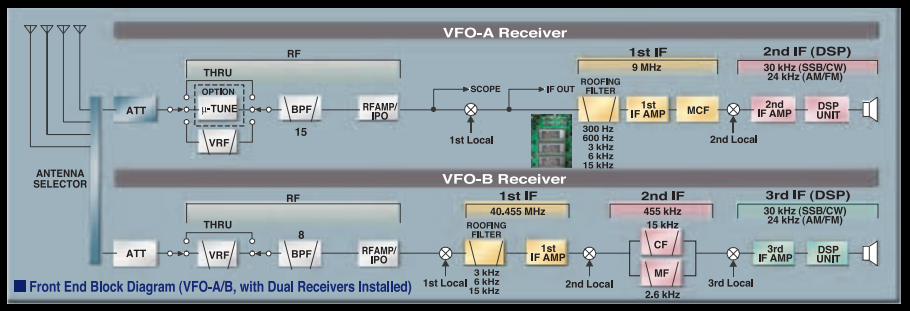
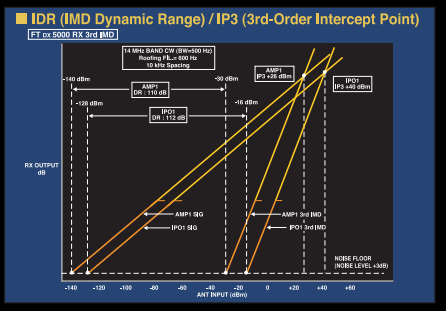


■ Front End Block Diagram (VFO-A/B, with Dual Receivers Installed)



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HF/50 MHz Transceiver

FT DX 9000MP

400 W Special Order Version

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

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HF/50 MHz Transceiver

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

HF/50 MHz Transceiver

FT DX 9000 Contest 200 W Custom-Configurable Version

Two Pairs of Meters, plus LCD Window, VRF Input Preselector Filter,Three Key Jacks, and Dual Headphone Jacks, 50 V/12 A Internal Switching Regulator Power Supply

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

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* 222 MHz/1.5 W (USA version)

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Actual Size

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All-in-one Prestigious Tri-band Transceiver
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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
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"It Seems to Us"

WRTC

"Remember the boycotts of the 1980 Olympics in Moscow and the 1984 Olympics in Los Angeles? They may have been unfortunate political intrusions into the world of sports, but indirectly they led to an Amateur Radio activity that is entering its third decade: the World Radiosport Team Championship (WRTC)."

The Olympic boycotts inspired cable television pioneer Ted Turner to organize the Goodwill Games, the first of which was held in Moscow in 1986. When the location of the 1990 event was announced as Seattle, a group that included ARRL Northwestern Division Director Rush Drake, W7RM (now a Silent Key) decided to approach the Goodwill Games organizers with a proposal to stage an Amateur Radio competition as a Goodwill Exchange program activity.

The ARRL Board of Directors endorsed and supported the WRTC effort in principle. Some financial support was provided from an ARRL fund to promote international goodwill that had been established by Joe Mullan, W3RLR (now also a Silent Key). The ARRL also helped persuade the FCC to grant operating permission to the competitors who were coming from countries with which the United States did not yet have reciprocal operating agreements. Otherwise the burden of organizing the event fell on the shoulders of a small group of dedicated Seattle-area amateurs. Ultimately 22 two-man teams from 15 countries, including four teams from the Soviet Union, competed using similarly equipped stations in a 10-hour HF contest on July 20-21, 1990.

Like the Olympics, much of the value of WRTC — as well as of other on-site competitive activities in Amateur Radio such as Amateur Radio Direction Finding (ARDF) and High Speed Telegraphy (HST) — arises from the opportunity to meet and get to know people from other countries. Social, cultural, political, and religious differences are set aside as we share our common passion.

The original concept called for another WRTC to be held four years later in the Soviet Union, but with the breakup of that country this did not come to pass. WRTC might have faded into history as a one-time event but for the efforts of a group of amateurs in the San Francisco Bay area who took on the task of organizing and raising funds for an even larger event in conjunction with the 1996 IARU HF World Championship. That year, 52 competitive teams and two exhibition teams were hosted by Bay-area amateurs and a pattern for future events was established.

WRTC became truly international in 2000 when for the first time it was held outside the United States. The stunningly beautiful lakes, mountains, countryside and coastline of the newly independent Republic of Slovenia provided the setting for an event that will always be remembered by those of us who were fortunate enough to participate (I was honored to be asked to serve as chief judge and have been on the judging committee of each subsequent WRTC). Hosts in Finland were anxious to hold one while there were still sunspots, so the fourth WRTC was held just two years later. The quadrennial pattern was re-established in 2006 in Florianopolis, Brazil.

In 2010 the vision of its founders was realized with the holding of the sixth event in Domodedovo, Russia, just south of Moscow.

WRTC is a contest within a contest, with the IARU HF World Championship on the second weekend of July providing the opportunity for the WRTC teams to make lots of contacts. There is keen competition to qualify for possible selection as a team member. There is competition even to be a referee — that is, for the privilege of watching and listening to a team for the entire 24-hour period to make sure they obey the rules.

The WRTC rules have evolved over time, with each organizing committee putting its own mark on their event. While the emphasis is on operating skill, technology has become increasingly important as the rules have been adjusted to permit the two operators to share the antennas and transmitting time more intensively.

From the beginning, providing a level playing field has been an ideal of WRTC. Since 2000 identical antennas have been provided to each team. However, the Russian hosts were the first to provide station locations that were essentially identical with no significant differences in terrain. In Domodedovo 48 Field Day-style stations were set up at least 500 meters apart. About 200 volunteers came from all over Russia to set up the antennas, tents, generators, and other essentials. They camped alongside, looked after the competitors' needs, and dismantled everything once the contest was over, all for the benefit of competitors and referees from more than 30 countries — people they had never met and with whom they probably didn't share a common language, except the language of Amateur Radio. It was the finest illustration of "ham spirit" I've ever experienced.

In 2014 WRTC will come full circle. It is returning to the United States, this time to New England. As it happens, 2014 is also the 100th Anniversary of the ARRL. We are looking forward to welcoming old friends and making new ones during our Centennial Year.

Matching the success of previous WRTCs is an enormous challenge for the organizing committee led by Doug Grant, K1DG and Randy Thompson, K5ZD. They will need a lot of support from the Amateur Radio community in New England and beyond. To learn more about how you can help, visit **www.wrtc2014.org**.

David Sumner, K1ZZ
ARRL Chief Executive Officer

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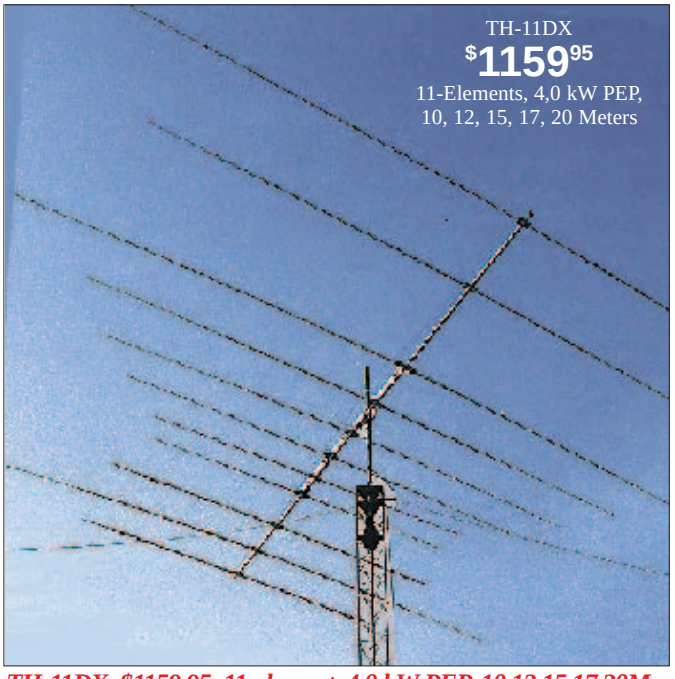

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The broadband *five element* TH5-MK2 gives you outstanding gain.

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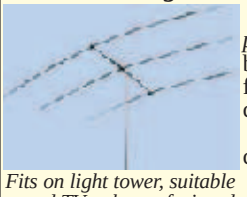

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TH-11DX	11	*For Gain and F/B ratio--See…* • www.hy-gain.com • Hy-Gain catalog • Call toll-free 800-973-6572		4000	10,12,15,17,20	12.5	100	24	37	22	88	1.9-2.5	T2X	$1159.95
TH-7DX	7			**1500**	**10, 15, 20**	**9.4**	**100**	**24**	**31**	**20**	**75**	**1.5-2.5**	**HAM-IV**	**$869.95**
TH-5MK2	5			1500	10, 15, 20	7.4	100	19	31.5	18.42	57	1.5-2.5	HAM-IV	$759.95
TH-3MK4	**3**			**1500**	**10, 15, 20**	**4.6**	**95**	**14**	**27.42**	**15.33**	**35**	**1.9-2.5**	**CD-45II**	**$469.95**
TH-3JRS	3			600	10, 15, 20	3.35	80	12	27.25	14.75	21	1.25-2.0	CD-45II	$359.95
TH-2MK3	**2**			**1500**	**10, 15, 20**	**3.25**	**80**	**6**	**27.3**	**14.25**	**20**	**1.9-2.5**	**CD-45II**	**$369.95**
EXP-14	4			1500	10,15,20 opt. 30/40	7.5	100	14	31.5	17.25	45	1.9-2.5	HAM IV	$599.95

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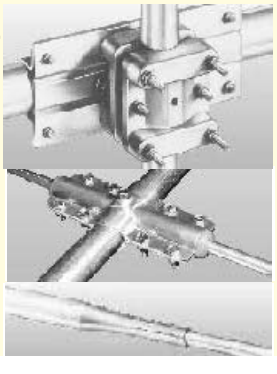

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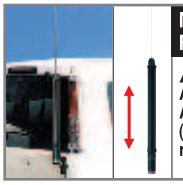

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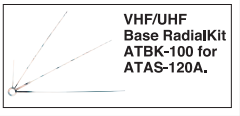

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This Just In

Joel P. Kleinman, N1BKE
jkleinman@arrl.org

In Brief

- Thanks to a well-written state law prohibiting cell phone use while driving, a New York state judge dismissed a traffic charge against a ham who was ticketed for transmitting mobile on his 2 meter rig.
- Five incumbent ARRL Directors and Vice Directors who did not face opposition have been declared elected to new three year terms. Ballots for the contested positions will be counted November 19. See this month's Happenings for more information.
- The ARRL has filed a *Petition for Clarification or Partial Reconsideration* to "clarify, or partially reconsider a single aspect" of its *Report and Order* in WT Docket No 07-293, involving the 2.3 GHz band. See Happenings, this issue, for details.
- The ARRL has filed a *Reply* in response to the latest ReconRobotics filing in opposition to a previous ARRL request that the FCC deny dozens of pending license applications for a device that operates in the 430-448 MHz band.
- The 2014 World Radiosport Team Championship will be held in the USA.
- Boulder County (Colorado) ARES® members provided communications support during the response to the Fourmile Canyon Fire, which eventually destroyed 169 structures and charred 6200 acres.
- Groups in North Carolina, Massachusetts and Maine prepared for Hurricane Earl, which brushed the US East Coast.
- ARRL is once again a coalition member of the DHS-sponsored National Preparedness Month, held each September.
- The ARRL has filed comments on aspects of an FCC proceeding (dealing with the Citizens Band Radio Service and other Personal Radio Services) that relate to the Amateur Radio Service.
- The 2010 Global Amateur Radio Emergency Communications Conference is scheduled for October 11-12 in Curaçao, Netherlands Antilles.
- ARRL Honorary Vice President Hugh Turnbull, W3ABC, became a Silent Key September 14.
- TSgt Jason E. Sandifer has been named interim chief of the Air Force Military Auxiliary Radio System (AFMARS).

Media Hits

Allen Pitts, W1AGP
Media & Public Relations Manager

- "Ham radio to remain helpful during hurricane season" was the headline in *The Observer* (Houston, TX) back in July. "And during this new hurricane season, it will be there again."

How right they were!

As Hurricane Earl threatened, the North Carolina *News-Times* was happy to print "Ham radios to the rescue; shelters ready" and highlight people like Jerome Olack, KI4FFN, and other hams manning the shelters just in case. Even the business blog at CTOEdge.com picked up on hams with "Planning for Disaster in the Face of Earl." "You can't use this in the furtherance of your business in any way, but if you need an ambulance or to be rescued, ham radio will work when nothing else will." It was obvious the memories of Katrina were still fresh in many people. *Huntsville Item's* (AL) story "Katrina: Five Years Later" reminded people how the county "enlisted the help of local amateur HAM radio operators, who patrolled throughout the county, communicating with officials." Thankfully, Hurricane Earl missed.

But it does not take a hurricane for hams to make news. On the other far side of the country, the Colusa County (CA) *Sun Herald* printed "Hamming it up" and highlighted several ARES people including Eleanor Knox, KI6CSO. "The Yuba City woman has found herself on the front lines of ham radio communication during a number of emergency events — the most recent being the fires..." In the middle of the country, FortBendNow.com (TX) published "During the severe storms that battered Fort Bend County Monday night, the county's Emergency Management Radio Operators Group provided "vital information to the National Weather Service and the Fort Bend County Sheriff's Office," in their story "Fort Bend County "Well Served" By Ham Radio Operators During Storm." To the north in Idaho, TMC.net published "Amateur radio offers technical assistance during disasters" and told how "That's when Geoff Billin (KC7QCS) — and other hams, or amateur radio operators, like him — come in to save the day," highlighting the service of the Palouse Hill Amateur Radio Club.

- As we know, hams have been doing this since the development of radio itself — it's not really news to us. But radio amateurs also provide thousands of hours of community service for other events and these were noted in stories such as "Keeping the Hotter'n Hell Hundred connected" in the Wichita Falls, TX *Times Record News*. David Gaines, N5DHG, oversees more than 50 radio operators who control that route.
- Youth activities were in the media this month with "Young hams stay connected through amateur radio" in the *Marquette Monthly* (MI). "Although community service is important," 12 year old Adam Smith, KD8IAX, said, "he sometimes uses his radio just because ham radio operators are really good people to talk to."
- Getting our special interest was "Program for Astronomy Education and Research Builds Radio-Telescopes" reported by TMC.net — "It all began with an article in the amateur radio magazine *QST*. Larry D. Barr, Tarleton's Planetarium Manager, showed the article to Dr Shaukat Goderya, Director of the Program for Astronomy Education and Research. …thus began the latest research program in Radio Astronomy for the Tarleton Observatory." Our magazine's description of the construction of a radio-telescope using a cast-off satellite TV antenna and a commercially available satellite signal monitor really started something. Ham Radio? We Do That!
- **Finally, history also made the media with "WW II Battleships Reunite" from *Star News* (Wilmington, NC)** that the Azalea Coast Amateur Radio Club aboard the Battleship *North Carolina* contacted the USS *Missouri* moored in Pearl Harbor. The ARRL headquarters itself also made historical news with "Amateur radio has a history in West Hartford" by Tracey Wilson in *West Hartford LIFE* (CT). It gave a good history of the ARRL's past headquarters in West Hartford.

WB2MGP Promotes Ham Radio in Schools at AWA Convention

Retired teacher Carole Perry, WB2MGP, of Staten Island, New York, was keynote speaker at the Antique Wireless Association Annual Convention in Rochester, New York in August. She spoke as a Director of the Radio Club of America and leader of its educational efforts to bring radio/technology programs into high schools and middle schools across the country.

ROY WILDERMUTH, W3RLW

At the AWA Annual Convention, Carole Perry, WB2MGP, extended an invitation to AWA members to join the effort to bring radio/technology programs into schools. From the left: Radio Club of America President Stan Reubenstein, W6RNU; Keynote Speaker WB2MGP, and Bill Endres, a recipient of the RCA Houck Award for preservation of the RCA archives.

Energetic Instructors Produce Crop of New Licensees

Two Kansans, Matt May, KC4WCG, and Brian Short, KCØCBS, have helped nearly 600 area residents become licensed since October 2006, and they show no signs of slowing down. "Matt and I now turn our attention to our next 500 students, as well as helping other groups across the country leverage our format in their locales," writes Brian. Their Web site is at **hamclass.org**.

BRIAN SHORT, KCØCBS

Matt May, KC4WCG, teaches a licensing class in Benton, Missouri.

Inside HQ

How We Support Hamfests and Conventions

Did you find out about your local hamfest here in *QST* or on our Web site? Odds are you did, as we sanction about 350 hamfests and 70 conventions annually. Here's a look at how the process works.

There can be conventions for any of the ARRL's 15 Divisions, 71 Sections or 50 States. States with multiple Sections can have both State and Section conventions. We also sanction a dozen or so Operating Specialty Conventions each year. These deal with such Amateur Radio topics as VHF/UHF, DX and Emergency Communications. To determine if your event is eligible to be sanctioned as an Operating Specialty Convention, check with your Director — contact information is on page 15 of each issue.

We publish the Hamfest and Convention listings monthly in *QST* (beginning on page 95 this month). We have recently expanded the Coming ARRL Conventions box to include all conventions that occur during the previous, current and next upcoming month. We also now highlight upcoming ARRL Division Conventions in the rotating carousel display at the top of our home page, **www.arrl.org**. A Hamfest and Convention Calendar, along with a database that can be used to look up events, are located at **www.arrl.org/hamfests-and-conventions-calendar**. Involved with planning a convention or hamfest? You'll find useful information in The ARRL Convention and Hamfest Planner at **www.arrl.org/files/file/convhf_final.pdf**.

Our recommended method of filing a hamfest or convention application is to use the online application form at **www.arrl.org/hamfest-convention-application**. This form goes to both our Hamfest Coordinator, Gail Iannone (**giannone@arrl.org**) and to the appropriate ARRL Division Director. The Director will then sanction the event if it meets the criteria in the *Official Rules and Regulations Concerning ARRL Hamfests and Conventions.* This document is posted in the Hamfest section of our Web site. If the Director approves the event, Gail notifies the organizers and the event is listed on the ARRL Web site and published in *QST*. Division conventions, generally larger events, need to be approved by both the Division Director and the Executive Committee of the ARRL Board. Because of the sometimes-lengthy approval process, Gail strongly suggests that event applicants get their information to her at least 4 months in advance for hamfests and 6 months for conventions.

What advantages do ARRL-sanctioned events receive? Along with the listings in *QST* and online, we mail event organizers a hamfest kit 4-6 weeks before the event. (Additional hamfest materials can be obtained online at **www.arrl.org/shop/Forms-and-Media-Warehouse/**.) To help with promotion, we also provide mailing labels of all amateurs and/or Amateur Radio clubs in the event's geographic area. In addition, we offer conventions the opportunity to have a member of the HQ staff serve as a speaker. About 50 speakers annually present such topics as EmComm, DXing and contesting. If you want a particular speaker, please make the request as far in advance as possible. Speakers are requested and scheduled through Gail at the hamfest and convention area of the Membership and Volunteer Programs Department.

That's how the hamfest and convention process works on your behalf here inside HQ.

73,

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

Guide to ARRL Member Services

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

Tel: 860-594-0200, Mon-Fri 8 AM to 5 PM ET (except holidays)
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The American Radio Relay League, Inc.

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

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

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

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

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

Officers, Division Directors and Staff

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

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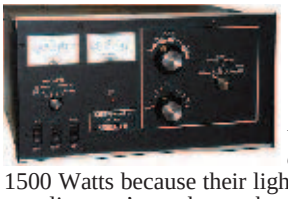

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Suitcase Antenna Mast

Dean Wathen, KF9DL

My portable mast system not only fits into a suitcase but uses the suitcase as its support base. An improvement over my original design shown previously in *QST*, this one is more easily transported.[1] This mast extends about 14 feet. The whole mast including the ⅛ inch diameter clothesline guys can be carried inside the 24 ×19 inch Samsonite suitcase. It hasn't really been tested in high winds, though — maybe 10 to 15 mi/h.

There are four sections of 1½ inch Thin Wall SDR-21 PVC pipe with a 1¼ inch Schedule 40 PVC pipe inserted into it. The mast is extended and locked with dowel rods. The sections then rest on top of another dowel rod at the top of each section. The clothesline guys *do not have to be untied* — they are just rolled up inside. When the mast is assembled you just move the pipe to a proper position for the dowel rods to go into the pipe.

The barbells placed in each corner are 10 pounds each and need to be carried separately. If the ground is not level they might need to be moved around to keep the top of mast from leaning.

The antenna is a Cushcraft Ringo AR 2, weighing 1.5 pounds. There is also a bare ground wire 5 feet long attached to the Ringo base going down the pipe for a signal ground, since there are no radials on the antenna itself. The antenna's driven element is 3.9 feet.

[1]D. Wathen, KF9DL, "Up Front in *QST*," *QST*, Feb 2007, p 20.

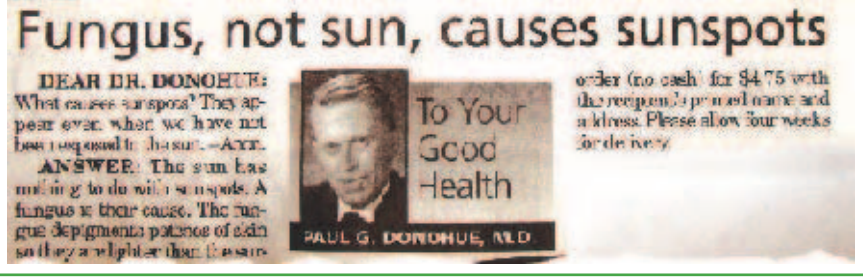
DEAN WATHEN, KF9DL

All 14 feet of the suitcase mast stowed and ready to travel.

DEAN WATHEN, KF9DL

The author and his 14 foot tall suitcase antenna topped with a Cushcraft Ringo AR 2.

FROM THE CURRY COASTAL PILOT, BROOKINGS, OREGON



Fungus, not sun, causes sunspots

DEAR DR. DONOHUE: What causes sunspots? They appear every when we have not been exposed to the sun. —Ann.

ANSWER: The sun has nothing to do with sunspots. A fungus is their cause. The fungus depigments patches of skin so they are lighter than [illegible]

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PAUL G. DONOHUE, M.D.

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Who knew! **I thought this was shocking news for DXers until I realized it was medical, not astronomical advice. —*Bob Wilkinson, W7VN***

Pumpkin Patrol Lights Up the Night

In cooperation with the NY State Police, the Mount Beacon Amateur Radio Club in the Hudson Valley sponsors the annual Pumpkin Patrol. The patrol is coordinated by Andrew Schmidt, W2BOS, and monitored by State Trooper Brian Kieckhafer. Andrew has coordinated this public service event for the past 18 years.

Our service consists of watching the seven overpass bridges that cross I-84 in Dutchess County during Halloween eve and Halloween night. We park the cars as close to the overpass as we can, on the shoulder or in the breakdown lane. This year I decided to be a little more conspicuous and added a distinctive light to the top of my vehicle. It serves to warn passing traffic of a parked car, it may inform local residents that we are doing a service, and, most important, it shows a potential prankster that we are watching.

Last year, 23 individuals assisted (20 hams, 2 spouses, 1 daughter). Since its inception, 128 individuals — hams, family members and friends — have taken part. — *Finn Poulsen, WB2UWU*

FINN POULSEN, WB2UWU

On patrol: **This is my 94 cent plastic pumpkin basket with a "stick-up" battery light and a cookie tin cover that I will be using on future Pumpkin Patrols. My wife Lilli keeps me company during the two 2 hour shifts.**

DAVE CARTER, KA1HDG

Antenna perch: **A hummingbird rests on the vertical antenna coils at KA1HDG, Cedar Lake, Michigan.**

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CW CONUNDRUM

♦ Something really struck me as I looked over the list of Special Event stations published in the September issue of *QST*. All 27 of them listed SSB frequencies and several gave some digital frequencies, but only one special event included CW frequencies. I then went back to the August issue where only one out of 39 listings included CW frequencies. I operate 100 percent CW and although I was never one of those who got all upset over the code/no-code licensing issue from a few years ago, I find these results disturbing. Special Event stations can be fun to work and I feel left out!

As I continued to think about it, three possible reasons for this situation came to mind. First, it is possible that the clubs sponsoring these special events believe that CW is a dying mode. A quick tune across the bands or a look at the statistics from any major contest should lay this false impression to rest. As a matter of fact, I have heard several anecdotal reports that interest in CW has possibly increased since the no-code licensing was instituted.

The second possibility is the idea that a demonstration of CW would not be of interest to the general public. Special Event stations are often set up as part of community celebrations and are used to promote our hobby and the activities of the local club. In my experience, it is actually quite the opposite. On the surface, phone and digital modes look a lot like cell phones and e-mails to the general public. They really don't produce that "wow factor" that grabs people's attention. CW, on the other hand, is very different from what most people have experienced and frequently results in "that's really cool" kinds of comments.

The third possibility is that local clubs are having trouble finding qualified CW operators to staff the Special Event stations. This raises a number of questions: What is the club doing to train and encourage CW operators? What is the club doing — or not doing — that causes CW operators to be a rare commodity on the membership lists?

PAUL HUFF, N8XMS
Livonia, Michigan

THE WONDER OF W1AW

♦ I got my Novice license many years ago and for a long time I read about the ARRL and W1AW, the Hiram Percy Maxim Memorial Station in publications and license manuals, but I never had an opportunity to communicate directly with W1AW. Only in recent years have I even heard W1AW on the air, much less worked them. I have had several contacts with W1AW and I have to say, each time that I have the thrill of having a QSO with W1AW, it's like being in the presence of greatness. Not only is W1AW a monument to the founder of the ARRL, it represents what the ARRL is about: courtesy, professionalism and just plain fun. Thank you for this opportunity to share and be a part of the American Radio Relay League.

TED DRELL, W5HEU
Pineville, Louisiana

D-STAR DILEMMA

♦ Larry Moxon, K1KRC ["Discovering D-STAR," Sep 2010, page 72] makes the statement that he was "concerned about what seemed to be a closed, proprietary system" and that "D-STAR is an open digital protocol developed by the Japan Amateur Radio League (JARL) — it is not an ICOM product." While that is technically true, the fact remains that D-STAR, as currently implemented, uses the AMBE voice encoding scheme — a completely secret, proprietary protocol and not open at all. As a result, it is currently impossible to make a completely free implementation of D-STAR. Being able to use a chip with the voice encoder still does not make it open.

There is an effort at to replace the AMBE voice encoding scheme with ones that are completely open and that can be implemented by anyone; however, it has not had much success. Unless more people start discussing this and demanding completely free and open protocols, this problem will remain.

Historically, hams have valued the freedom to modify or build our own radios. As more and more radio functions move into software, I, as a software engineer, have looked forward to being able to modify my "rig" at will. While, as was said, D-STAR itself is an "open digital protocol," as long as the codec it uses is secret and proprietary, we might as well simply be using unmodifiable commercial equipment.

TANNER LOVELACE, KB4TYE
Durham, North Carolina

E-MAIL ETIQUETTE

♦ As part of our enjoyment of Amateur Radio we end up doing a lot of e-mail. There are e-mail reflectors for every interest within ham radio. QRP enthusiasts, DXers, contesters, VHF/UHF/weak signal interests and especially public service and humanitarian aid groups. In the case of the last item, e-mail enables us to acquire timely information that could help save a life.

It strikes me that we give too little thought to our e-mail etiquette. Just as it is considered out of line to discuss politics, tell bawdy jokes and discuss religion in casual contacts or on nets, it's also out of line to post this material to such lists. If, for example, you're e-mailing to the membership of your Amateur Radio club, it's especially rude. Though your club members may share your interests in ham radio, they may not share your political views or lifestyle choices. Keep it to your friends. If you wouldn't send it to your boss, or a coworker you don't know very well, don't send it to the reflectors or entire lists of ham radio associates.

We must also remember that there are a wide variety of ways to access one's e-mail, including packet radio and other low-bandwidth pipelines. Sending large file attachments to people you don't know can personally handle and process them, or to reflectors where such isn't the norm, is also bad behavior and quite rude.

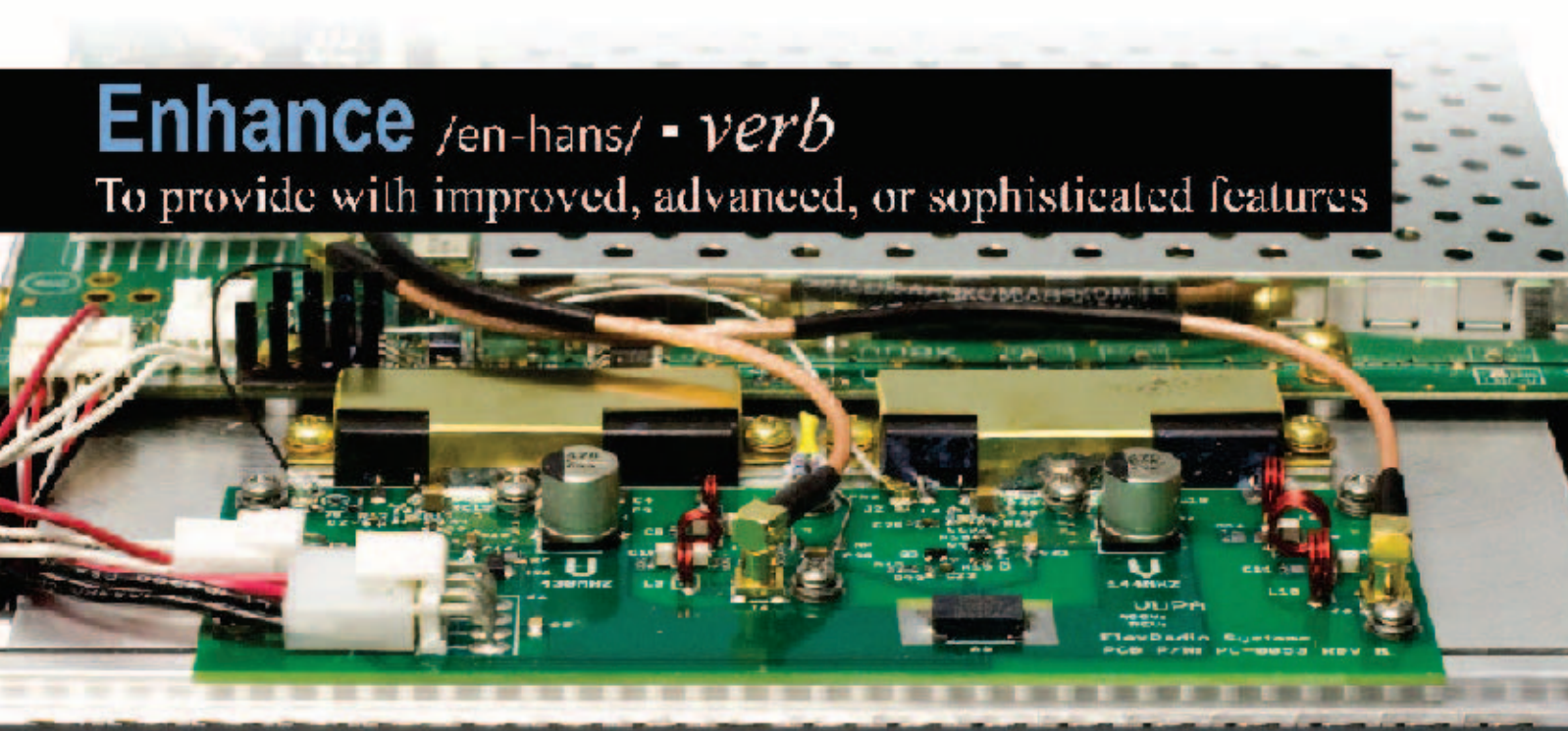
It's come to the point where I am almost reluctant to give an e-mail address to Amateur Radio groups because of the bad e-mail behavior I have seen exhibited by my fellow hams. I don't want to hear about your politics or your religion, and I don't welcome the large multi-megabyte video file as an attachment on a dial-up connection. If you think I must hear the audio or see the video, send me a link or be polite — ask first if I'm interested before you send it. Your fellow radio amateurs will appreciate your courtesy.

RICHARD WEBB, NF5B
Eads, Tennessee

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

Enhance /en-hans/ • *verb*

To provide with improved, advanced, or sophisticated features



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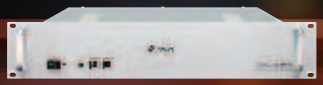

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WSPRing Around the World

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Joe Taylor, K1JT, and Bruce Walker, W1BW

Amateur Radio would be much less interesting if our communication channels were always predictable and reliable. In fact, we often don't know where in the world our signals may be copied. If vagaries of the ionosphere and MF and HF propagation fascinate you, you'll surely enjoy using WSPR and its associated Web site, **WSPRnet.org**.

WSPR (pronounced "whisper") is an acronym for "Weak Signal Propagation Reporter." With a computer program of this name and a standard SSB transceiver, you can participate in a worldwide network of low power stations exchanging beacon-like transmissions to probe potential propagation paths. Most participating stations transmit as well as receive, although short wave listener (SWL) activity is also common. In principle, and with the propagation gods willing, everyone can copy and be copied by everyone else who is currently active with WSPR on the same band.

When a global picture of all these connections becomes available, things get especially interesting — and that's the purpose of WSPRnet. Most stations using WSPR are configured to automatically upload their reception reports to a central database at **WSPRnet.org**, in real time. By pointing your browser to WSPRnet you can get nearly instantaneous reports of where and at what signal strength you're being received, and view the results plotted on a world map.

In today's ham jargon, WSPR is another *sound card mode.* Its setup requirements are similar to those o2f, say, PSK31. WSPR transmits and receives, but it does not support normal types of on-the-air conversation. Instead, it sends and receives specially coded, beacon-like transmissions aimed at establishing whether particular propagation paths are open. Transmissions convey a call sign, station location, and power level using a compressed data format with strong forward error correction (FEC) and narrow-band, four-tone frequency-shift-keying (FSK). The FEC greatly improves chances of copy and reduces errors to an extremely low rate. The signal bandwidth is only 6 Hz, which together with randomized time-sharing assures that dozens of WSPR signals can fit into a tiny 200 Hz segment of each amateur band. The WSPR protocol is effective at signal-to-noise ratios as low as –28 dB in a 2500 Hz bandwidth, some 10 to 15 dB below the threshold of audibility. On most bands, typical WSPR power levels are 5 W or less — sometimes a *lot* less. You will be amazed to discover that these very low power signals can be copied in distant corners of the world.

WSPR Operation

WSPR software can be freely downloaded from **www.physics.princeton.edu/pulsar/K1JT/**. Packaged installation files are available for *Windows* and *Linux*; the program can also be compiled for *Macintosh*, *FreeBSD* and other operating systems. *WSPR* is "open source" software, and its source code is maintained in a public repository at **developer.berlios.de/projects/wsjt/**.

As with all sound card modes, WSPR requires audio connections between your computer and radio transceiver. Briefly stated, sound card audio out goes to the transceiver's audio in, and the radio's audio out goes to sound card in. You can use VOX control for TR switching; if you prefer hard-keyed switching you'll need a serial port or USB-to-serial adapter. A serial connection can also provide handy CAT control of most modern transceivers. If you use other data modes such as PSK31, you probably have the necessary connections already in place. If not, you'll find sound card interfaces available from a number of *QST* advertisers. Your SSB transceiver should be set to use upper sideband.

Even though FCC rules require you to be present at your station to operate WSPR, the operation itself is largely automated. Time-synchronized transmissions last for slightly less than two minutes, nominally starting one second into an even UTC minute. Reception and transmission intervals alternate in a pseudo-random fashion such that on average, a specified percentage (typically 20 to 25%)

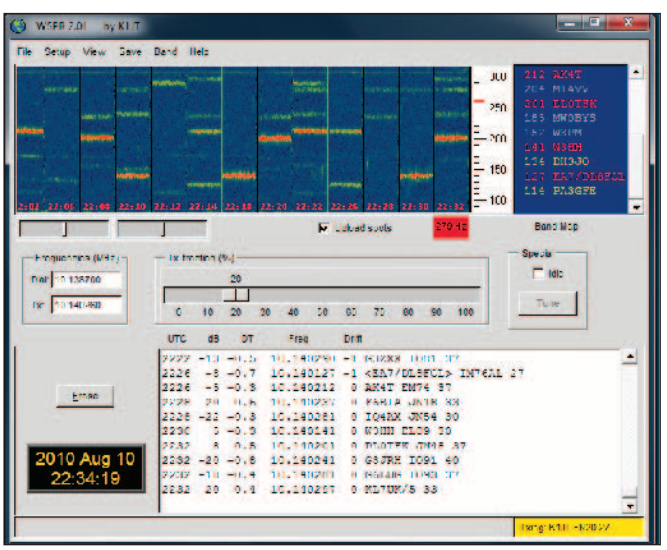


Figure 1 — Typical appearance of the main screen during WSPR operation.

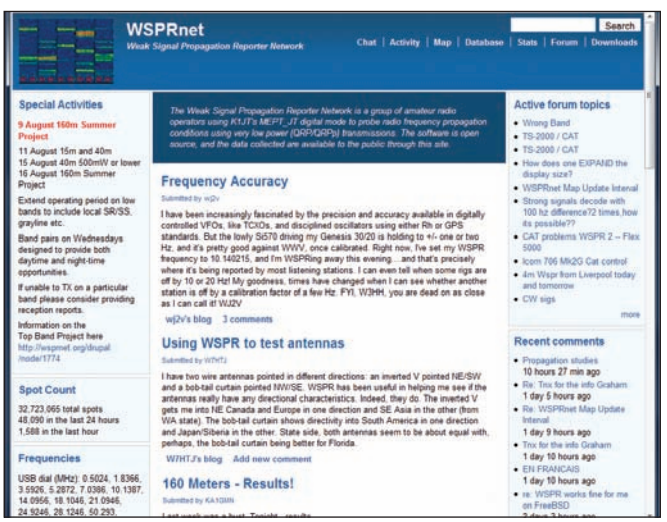


Figure 2 — The WSPRnet home page.

of the two minute intervals are used for transmitting. It's important for your computer's clock to be accurate to within a second or so. Conventional operating frequencies for WSPR are summarized in Table 1. Many additional details of WSPR operation, including step-by-step startup instructions, are given in the *WSPR 2.0 User's Guide*, which — thanks to a number of bilingual users — is now available in English, French, German, Italian, Japanese, Polish, Portuguese and Russian at **www.physics.princeton.edu/pulsar/K1JT/wspr.html**.

In normal operation the main *WSPR* screen looks something like Figure 1. At the end of each two minute reception interval the software decoder looks for all detectable *WSPR* signals in a 200 Hz passband and displays the results in a waterfall spectrogram, a scrolling text window, and a scrolling Band Map. The spectrogram covers a frequency range of about 220 Hz; the last three digits of the received frequency, in Hz, are displayed on the vertical scale at right. Time runs from left to right in the spectrogram, the full width spanning about half an hour. On a typical computer screen each two-minute interval corresponds to a strip about 1 cm wide in the spectrogram. The times of your own transmissions are denoted by thin green vertical lines. For example, at the time Figure 1 was made, transmissions had been made at 2204, 2216 and 2224 UTC.

Each decoded WSPR signal produces text showing the UTC, signal-to-noise ratio in dB (in a 2500 Hz reference bandwidth), time offset DT in seconds, frequency in MHz, drift rate in Hz/minute, and the decoded message. Time offsets greater than about ±2 seconds indicate a significant clock error at transmitter or receiver, or possibly both. Apparent frequency drifts greater than ±1 Hz per minute can usually be traced to the transmitter, and should be corrected if possible. (Of course, receiver drift can also contribute to measured drifts, but this condition is easily recognized because nearly all signals will appear to drift by the same amount.) Good frequency stability is essential to WSPR's remarkable sensitivity, because the software filters used for decoding are only about 1.5 Hz wide.

WSPRnet

The **WSPRnet.org** Web site is written and maintained by Bruce, W1BW. It provides a central repository for WSPR reception reports ("spots") and offers a simple user interface for querying the database, a mapping facility, and many other handy features. By default, the worldwide map shows all WSPR stations reporting or decoded over the past hour, and illustrates the open propagation paths between them. The map can be zoomed and panned, and you can set various criteria to determine exactly which spots are included. The WSPRnet site also offers band-by-band counts of stations reporting in the past hour, a chat facility for brief communications between operators, an interface to the historical database back to March 2008, and a number of statistical summaries of the data. An example of the *WSPRnet* home page is shown in Figure 2. This particular screen capture, taken in August 2010, mentions that the WSPR database contains more than 32 million spots. Recently an average of 300 to 500 stations, scattered around the world, have been submitting roughly 50,000 to 100,000 WSPR reports each day.

Figure 3 is a typical example of the WSPRnet world map, in this case for the 30 meter band. You can specify selection criteria that limit the map to a particular band, a longer or shorter time interval, or spots involving a particular call sign. You can click on a call sign to see what other stations are hearing and being heard by that station. Red labels on the map indicate stations (or SWLs) operating in receive-only mode.

WSPR Protocol and Software

The WSPR protocol was originally named MEPT_JT, which stood for "Manned Experimental Propagation Tests, by K1JT." The "Manned" part of the name was a reminder that under FCC rules a transmitting station (with a few very specific exceptions) must always be attended. In current practice, everybody just calls the mode WSPR.

The WSPR protocol is designed to do just one thing, and do it very well. Messages normally consist of a standard call sign, a four character grid locator and the power level in dBm (decibels relative to 1 milliwatt). This information is compressed into 50 binary digits and then encoded using a convolutional code with constraint length $K = 32$ and rate

Figure 3 — The WSPRnet global map of spots posted on 30 meters over a typical one-hour period.

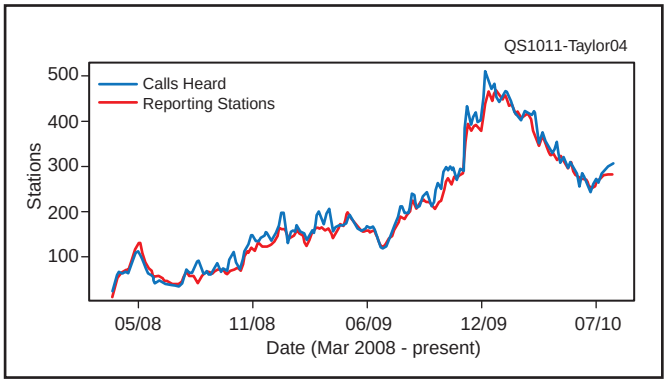


Figure 4 — Seven-day moving average of the number of stations participating, per day, from early 2008 through mid-2010.

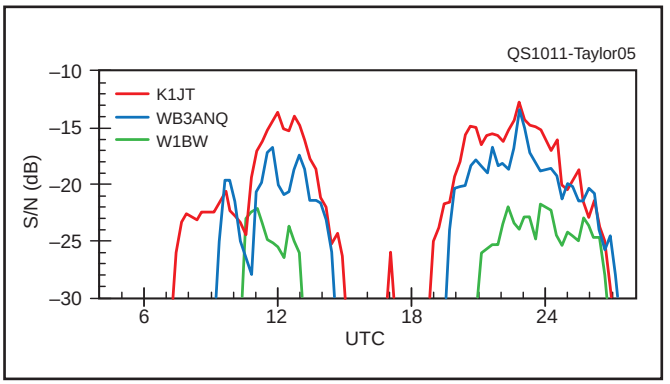


Figure 5 — Average S/N reported by VK6DI (Western Australia) for K1JT, WB3ANQ and W1BW (all in northeast USA) during March and April 2009 on the 30 meter band, plotted vs time of day.

Table 1

Conventional Frequencies for WSPR Activity

Band (meters)	*Dial Frequency (MHz)*	*Actual Transmitting Frequency (MHz)*
160	1.836.600	1.838.000 – 1.838.200
80	3.592.600	3.594.000 – 3.594.200
40	7.038.600	7.040 000 – 7.040 200
30	10.138.700	10.140.100 – 10.140.300
20	14.095.600	14.097.000 – 14.097.200
17	18.104.600	18.106.000 – 18.106.200
15	21.094.600	21.096.000 – 21.926.200
12	24.924.600	24.926.000 – 24.926.200
10	28.124.600	28.126.000 – 28.126.200
6	50.293.000	50.294.400 – 50.294.600

r = ½. Each of the resulting 162 bits is used as the most significant bit of a 2 bit "channel symbol" to be transmitted using 4 tone frequency shift keying at 1.46 baud. The least significant bit is defined by a pseudo-random sequence known to the software at both transmitter and receiver and used to establish accurate synchronization of time and frequency.

Convolutional codes with long constraint lengths have the important advantage that undetected decoding errors are rare. These codes are too complex to be decoded with the well-known and highly efficient Viterbi algorithm, so the WSPR decoder uses the so-called "sequential" algorithm, instead. Full details of the WSPR protocol and its implementation in the WSPR program will be published elsewhere. WSPR is licensed under the GNU General Public License and its source code is freely available to anyone.

Propagation Studies

The WSPRnet database represents a rich source of experimental data for propagation studies. To provide a simple example, we queried the database to give us all spots of K1JT, WB3ANQ, and W1BW posted by VK6DI on the 30 meter band. It happens that all four of these stations were running WSPR more or less around the clock between March 20 and April 12, 2009. VK6DI was a receive-only station; K1JT mostly ran 5 W, WB3ANQ 1 W and W1BW 100 mW. All stations used simple dipole antennas. Figure 5 shows the signal-to-noise ratios reported by VK6DI for each US station, sorted by time of day (in 15 minute intervals) and then averaged over the three week period. As expected, the 5 W signals from K1JT typically start a little sooner and are somewhat stronger than the lower power signals from WB3ANQ and W1BW, but otherwise the data for all three stations are remarkably consistent. At this low point of the sunspot cycle, each station enjoyed both short-path and long-path propagation on 30 meters from northeast US to Western Australia, on most days — even at the 100 mW power level. In fact, WSPR signals from both WB3ANQ and W1BW of less than 10 mW were also decoded by VK6DI, nearly halfway around the world. You can surely think of many other fascinating ways to explore propagation phenomena by using the WSPRnet database.

Conclusion

Radio Amateurs keep finding new ways to challenge the frontiers of wireless communication, exploring the wonders of the electromagnetic spectrum and the extraordinarily wide range of interactions between electromagnetic waves and the terrestrial environment. Conceived with just-for-fun, hobbyist motivations, WSPR has helped to bring some recent technical advances from the professional and scientific world into Amateur Radio, thereby providing educational benefits to the nation and the world as well as many hours of enjoyment for technically minded experimenters. We hope you'll enjoy playing with WSPR as much as we have, and at the same time will add to your knowledge and understanding of radio propagation and modern communication techniques.

Many people have contributed to the development of WSPR and WSPRnet — indeed, too many to list here — but we especially wish to thank VA3DB and G4KLA, who have worked tirelessly to help ensure portability of *WSPR* to the *GNU/Linux*, *FreeBSD*, and *OS X* operating systems, and G4ZOD and OZ1PIF, who have spent countless hours helping us to identify and eliminate bugs in the software.

Joe Taylor is an ARRL member first licensed as KN2ITP in 1954, and has since held call signs K2ITP, WA1LXQ, W1HFV, VK2BJX and K1JT. He was Professor of Astronomy at the University of Massachusetts from 1969 to 1981 and since then has been Professor of Physics at Princeton University. He was awarded the Nobel Prize in Physics in 1993 for discovery of the first orbiting pulsar. He chases DX from 160 meters through the microwave bands. Joe can be reached at 272 Hartley Ave, Princeton, NJ 08540, or **k1jt@arrl.net**.

Bruce Walker is an ARRL member licensed since 1991 and has held the call signs N1IKV, WT1M and W1BW. He holds a degree in physics from MIT, and has spent most of his career involved in high performance scientific computing, currently with the Broad Institute in Cambridge, Massachusetts. His primary radio interests are currently very low power (QRPp) operation on HF and software-defined radios (SDRs). You can reach Bruce at 667 Belknap Rd, Framingham, MA 01701-2843, or **bruce@w1bw.org**. QST

The Tape Measure Vertical

A temporary vertical ground plane antenna that is easy to deploy, resonates well and can be quickly tuned between bands.

David L. Poole, AD9DP

KIM HAGAR

Figure 1 — View of antenna base mounted on stepladder.

As with many Amateur Radio antenna projects, this one got its start at an ARRL Field Day. We had limited air space and few trees to hang additional horizontal dipoles, so I wondered how I might build an economical vertical antenna for 20 meters. Knowing of the SteppIR verticals that use an extendible metal strip for a radiator, and of tape measures having been used for ground radials, I wondered if I could use a tape measure supported within a PVC pipe for the vertical element as well.

But Will it Work?

Opinion on PVC in print and on the Web was mixed. Some recommended white schedule 40, if anything; others warned of chalk or other additives used by some manufacturers that can degrade RF properties. As for structural strength, some hams reported using PVC for temporary masts up to 20 feet. This seemed reasonable for portable use, considering the availability of other hams to assist with erecting and guying it. PVC pipe and tape measures are as close as the nearest hardware store and available at reasonable cost, so I decided to take a further look.

A Web search yielded only US patent No. 5,865,390, which expired in 2003.[1] The patent proved the idea was feasible, or at least had been considered by others.

An Idea Comes Together

I was concerned about making electrical contact with the blade, so I decided to try that as a first step. Finding no suitable pulley sheaves at the hardware store, I made my own from three fender washers stacked on a machine screw as a mandrel, trued up, soldered into a unit and then finished with a file. Details of the feed roller assembly, along with other detailed fabrication drawings are provided on the QST-In-Depth Web site.[2] I set the spacing between sheaves to compress the blade between them and make contact at both edges. A check of dc resistance suggested good electrical contact, particularly after a little run-in around the contact point.

I ran some *4NEC2* models to see how effective spring steel would be as radiator and radials. Figuring the RF performance would be no better than the dc resistance would predict, I measured the blade resistance at 0.0245 Ω/ft, or 5.94×10^7 S/m conductivity for use in the models.

Conventional wisdom says that elevating the radials of a ground plane antenna minimizes the ground losses and sloping them

[1]Notes appear on page 35.

Figure 3 — Staked radial detail. Note ⅜ inch cable clamp and larger housing screw. The end of the radial does not electrically connect to the stake.

Figure 2 — The complete kit ready for setup at the park.

toward ground raises the radiation resistance.[3] My *4NEC2* models confirmed the desirability of elevated, sloped radials and provided rough physical dimensions for 20 meters and up with a bare vertical element. *NEC2* has no provisions for modeling a PVC pipe, but tuning would require trial and error anyway.

Putting it Together

I chose a 4 foot aluminum stepladder as a stand for the base and also the inner support for the elevated radials. This could as well have been PVC pipe, but a ladder has the advantage of providing a few seconds of self standing ability under calm conditions to allow one person to erect the antenna. Mine has fallen over a few times while I rushed around to guy it, but it fell gracefully and without damage each time.

The rest of the structure was made of PVC pipe and fittings as shown in Figure 1. The feed roller fits inside a 1½ inch PVC cross T. A 1½ inch hole cut into the side of the T aids in assembly and allows reading the vertical element length for tuning. One side leg holds a PVC threaded plug with an SO-239 coax socket wired to the feed rollers. The top leg mounts the first mast section of 1 inch PVC through a threaded bushing. A 1 inch tape measure blade fits within a 1 inch PVC mast by replacing its end hook with a nut and bolt to prevent retraction into the housing. The tape measure housing is held by friction in a slotted pipe in the bottom leg of the T. The remaining side leg can be left open, capped or used for an alternate feed point as discussed below.

I made a base to attach radials out of ½ inch recycled PETE sheet from a local home store. That material has been discontinued, but a polyethylene (PE) or polypropylene (PP) cutting board would provide an alternate source of raw material. I cut an octagonal piece with a center hole sized for an interference fit and solvent welded it onto the lower leg of the cross T. Four bulldog clips hold the blade ends of the ground radials and connect them to the flange of the SO-239 socket. The assembly mounts to the stepladder with two carriage bolts. I made three 5 foot mast sections of 1 inch PVC pipe with male and female couplers solvent welded at each end. A guy ring was fitted over the male threads between the upper two sections. The construction details are shown on the QST-In-Depth Web site.

Putting it to Work

The first outing was to a local park where local hams meet on Saturdays for coffee, technical talk and to teach occasional license classes. Figure 2 shows the complete kit of ladder, feed T, mast sections, tape measures, guy ring, wires, tent stakes and feed line ready to go up.

We assembled two 5 foot mast sections with the guy ring in between and attached polyester guys. Three hams provided tension on the guys while I coupled the upper two sections to a third then lifted and secured the completed mast into the top of the feed T on the ladder.

After a few nervous moments in one of the morning's 16 mi/h gusts, we staked the fourth guy. Although the patent disclosed an insulated cord to pull the vertical into its column, it was easy to thread the vertical blade between the feed rollers and into the mast from the bottom. The vertical tape measure was stowed and the radial rules stretched out to length, braked and staked to ground (Figure 3). Tape measures with good brakes are helpful for tensioning the radials to minimize droop.

Tuning (Figure 4) took but a few tries to find 1.1:1 VSWR at band center. We were good to go on 20 meters in about 15 minutes from kit to first QSO. The VSWR was indistinguishably flat across the band. Several hams made contacts, including a number with an Oregon QSO Party, but we had nothing to compare the tape measure vertical with and I had a license class to teach. At the end of the morning, the tape measure vertical came down just as quickly as it had gone up and it was back in the car. It had gone up so quickly and worked well enough that other hams were suggesting I write it up and submit an article to *QST*.

Adding 40 Meter Capability

The tape measure vertical was used on our 20 meter *get on the air* station on Field Day. At many times of the day, 40 meters is more useable than 20, so we wanted to move lower in frequency. Given the mast loading, a 33 foot tape measure could be used on that band as a quarter wave, but it would require more guy wires, more amateurs and a larger clear ground radius to set up. The unused leg of the cross T, however, had "loading coil" written all over it, so I decided to try the 20 meter arrangement as a base loaded vertical on 40 meters.

Based on cookbook calculations, I made a loading coil by hand on an 8 inch length of 1¼ inch schedule 40 white PVC pipe using one end to become the form and the other as a handle for holding during the wind. I used a length of 1 inch pipe clamped into a vise as a mandrel. Better approaches to build-

Table 1

Vertical and Radial Dimensions (inches) for 10 through 20 Meters

Band (Meters)	*Freq (MHz)*	*Vertical*	*Radials*	*SWR*	*2:1 SWR Bandwidth (MHz)*
10	29.4	85	100	1.3	7
12	25.5	98	105	1.3	5.3
15	21.7	121	125	1.2	4
17	18.1	144	155	1.3	3.4
20	14.2	187	190	1.2	1.5
40	7.22	172	200	1.1	0.43

*Loading coil required for 40 meters. See text.

Figure 4 — The author making one of the initial tuning adjustments to 20 meter band center.

ing such coils can be found in *QST*, but this was quickest for me. I began with a 5⁄64 inch hole and wire loop to anchor the start of the winding 3⁄8 inch from the form end. I wound 20 turns of #14 AWG bare copper at 10 turns per inch, then secured the far end into another 5⁄64 inch hole with a wire loop.

I drilled additional 5⁄64 inch holes around the starting end of the form to anchor trial taps at quarter turn intervals, added a trial tap and headed into the field. With some tweaking, I obtained a match on 40 meters using 16 turns of the coil and tapping the feed two turns up from the ground end. I later removed the excess turns, secured the winding end and trimmed the form. An alligator clip connects the 16 turn end to the feed rollers for ease of disassembly. A construction drawing of the loading coil is provided on the QST-In-Depth Web site. The coil can be left in place on higher bands by disconnecting it from the radials. [If space is available, 40 meter performance might improve if at least one pair of radials is extended to 33 feet. — *Ed.*]

Performance Measurements

Tests across bands were made with the assistance of Don Backys, K9UQN, and Bill Rowe, AB9SV, using Don's AEA CIA-HF Complex Impedance Analyzer. We alternately tuned the vertical and radials for the lowest VSWR at band center on 10, 12, 15, 17 and 20 meters and on 40 meters with the loading coil. By logging the tape positions on each band, we are able to quickly return to the correct position without test gear.

The 40 meter performance on a few contacts was reported as comparable reports to an inverted V at 50 feet. The loading coil remained cool at 790 W CW. The optimum dimensions, measured results, and bandwidths to 2:1 VSWR are shown in Table 1.

It might be said that no amateur antenna project is ever finished, and this one is no exception. The tape measure vertical is a great experimental vehicle. In his *QEX* and *QST* articles, Rudy Severns, N6LF, observed that four ground level radials perform significantly better when shortened from quarter wave to as little as 0.15 wavelength if the vertical element is lengthened to resonance.[4,5] While my *NEC2* models suggest there is less of an improvement for shortening 4 foot sloped radials, shorter radials may be useful if you have a limited area for deployment. Rudy's work also suggests that radial elevations as small as 1 foot might provide acceptable performance even at 40 meters. This suggests a stepstool in lieu of a stepladder or even a short section of PVC pipe to elevate the radials, if you will always have help setting up.

Other *QST* articles suggest additional variations, such as placing the vertical rule on or within a fiberglass mast, such as the Spiderpole or the Fiberpole.[6,7] The permutations and combinations are endless — after all, that's the joy of Amateur Radio.

Acknowledgments

I would like to thank Don Backys, K9UQN, and Bill Rowe, AB9SV, for their assistance with tuning and the VSWR measurements, and the hams in Palatine ARES®/RACES for their encouragement to write this article.

Notes

[1]The cover page is shown at **www.arrl.org/qst-in-depth.**

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

[3]R. D. Straw, Editor, *The ARRL Antenna Book,* 21st Edition, pp 6-18, 19. Available from your ARRL dealer or the ARRL Bookstore, ARRL order no. 9876. Telephone 860-594-0355, or toll-free in the US 888-277-5289; **www.arrl.org/shop**; **pubsales@arrl.org**.

[4]R. Severns, N6LF, "Experimental Determination of Ground System Performance — *Part 1,*" *QEX*, Jan/Feb 2009, pp 21-25; Part 2, Jan/Feb 2009, pp 48-52; Part 3, Mar/Apr 2009, pp 29-32; Part 4, May/June 2009, pp 38-42; Part 5, Jul/Aug 2009, pp 15-17; Part 6, Nov/Dec 2009, pp 19-24, and Part 7, Jan/Feb 2010, pp 18-19.

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

[6]J. Hallas, W1ZR, "Product Review — Spiderpole Telescoping Antenna Mast," *QST*, Feb 2010, pp 54-55.

[7]D, Reynolds, KE7QF, "The Fiberpole — Evolution of an Antenna Mast," *QST*, Jan 2010, pp 42-43.

Photos by the author.

Dave Poole, AD9DP, is an ARRL member and former Assistant Emergency Coordinator for the Palatine, Illinois ARES®/RACES Club. He has since relocated to Indianapolis to be near his first grandchild. Dave was first licensed in the '70s as a Novice, a call he has long since forgotten, then relicensed as KB9RZG in 1998 in Libertyville, Illinois. He now holds an Amateur Extra class license.

Dave retired in 2007 from a 30 year career in product development. He holds a BSEE degree from Rose-Hulman Institute of Technology and an MBA from the University of Chicago and is a Registered Patent Agent. Dave can be reached at 9721 Oakhaven Ct, Indianapolis, IN 46256 or at **ad9dp@arrl.net**.

Infrared Radio Control for Your HF Transceiver

Avoid RFI issues on wires and cables by using infrared remote radio control.

Gary Sargent, KE8WO

This article describes how an infrared TV remote control can be used to provide a numeric keypad to allow more rapid entry of frequency and mode to an HF transceiver. While the details relate directly to a Yaesu FT-817, a popular amateur HF, VHF and UHF low power portable transceiver, the concept could likely be adapted to other radios with remote control provisions.

With the TV remote based interface you can directly enter the FT-817's frequency, mode, band and other basic functions. For example, you can control the '817 from across the room to change frequency and mode from 14,230 kHz USB to 145.19 MHz FM by just pressing the appropriate buttons on the TV remote.

What it Takes

The interface is based on a single computer chip and uses the Sony TV infrared (IR) remote control protocol. The interface connects to the FT-817's ACCESSORY port and optionally draws the small amount of power needed from the radio to power the interface circuit, so no batteries or external power sources are required.

The interface was constructed on a small RadioShack project board and housed in a plastic enclosure. All components are readily available, including a program-med version of the computer IC. Con-struction techniques are not critical, and the result is a very useful addition to the FT-817.

Interface Circuit Description

Figure 1 is a block diagram of the IR control interface with the circuit diagram is shown in Figure 2. The heart of the interface is a PICAXE computer IC that controls all operations. A three pin IR receiver IC detects the output of the standard TV remote control and presents a digital signal to the PICAXE. The PICAXE decodes the IR remote commands (or buttons pushed) and formats them into command signals sent to the FT-817. A 5 V dc regulator converts the FT-817 supplied dc voltage down to power the interface circuitry. A dual color LED indicates interface operation status as commands are entered. An optional few resistors and a connector allow connection to your PC's serial port for programming or reprogramming the PICAXE, or for debugging purposes.

The FT-817 ACCESSORY port provides a TTL level serial input and output capability to monitor and control the radio. The FT-817 supports three baud rates, but this project uses 4800 baud. Note that this interface only sends commands to the radio — no data is read from the radio. This port also provides limited dc power for external devices. The voltage is essentially whatever voltage is powering the radio. Hence it could be the internal radio battery voltage (a nominal 9.6 V), or the external power supply voltage of up to 16 V. Note that the interface will draw its small amount of power as long as it's plugged into the radio, even if the radio is turned off.

TV remote controls all use an infrared emitting LED to transmit a digital pulse stream to the TV (or other device) to control that device. Sony TVs and IR remotes use a standard protocol that is available in all universal TV remote controls. That is the reason I chose the Sony remote control standard.

The PICAXE 18X single chip computer is the heart of the actual interface. It is a true single IC solution. No external memory, I/O, crystals or other bits are required. It is programmed in a simplified version of the *BASIC* programming language. The chips are low cost and program development tools are free.

The IR receiver chip converts the 38 kHz IR pulses into a TTL pulse stream that the PICAXE decodes and can respond to.

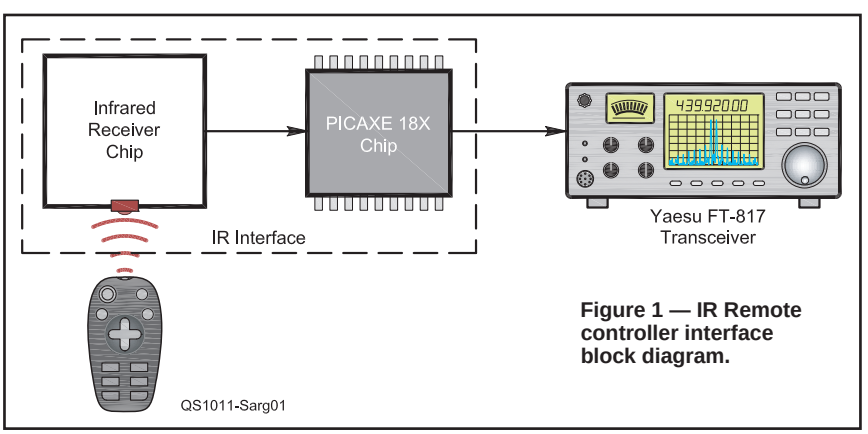


Figure 1 — IR Remote controller interface block diagram.

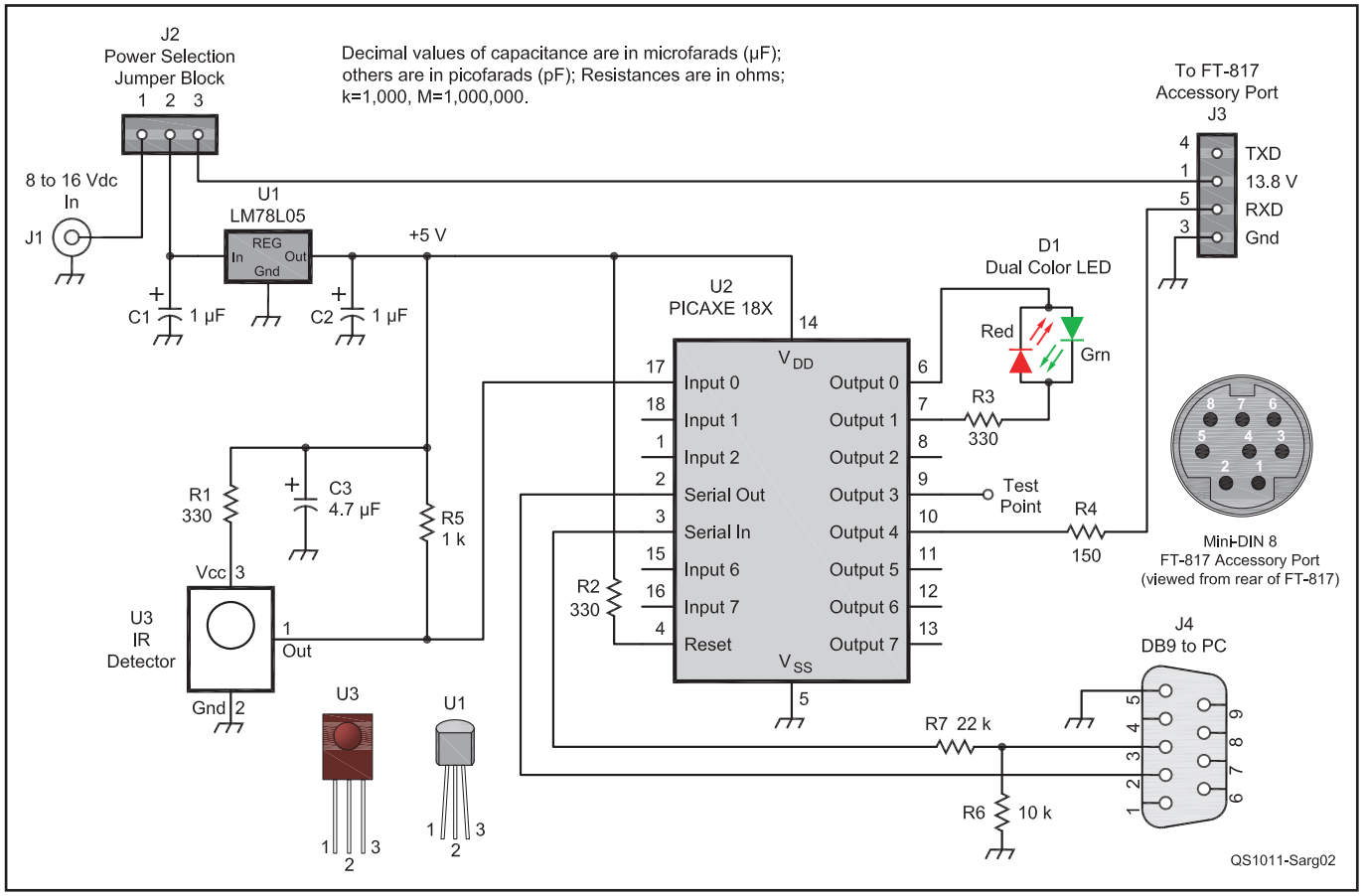


Figure 2 — Schematic diagram and parts list of the IR Remote controller interface. Connect D1 so that the anode for the green side is connected to pin 6, while the red side to pin 7. Use short leads for the LED connections.

C1, C2 — 1 µF, 25 V electrolytic capacitor.
C3 — 4.7 µF, 25 V electrolytic capacitor.
D1 — Dual color (red, green) LED (RadioShack 276-012).
J1 — Coaxial dc power socket to suit your power source.
J2 — Three pin 0.1 inch power selection block.
J3 — Mini DIN-8 connector to fit FT-817.
J4 — DB9 male connector.
R1, R2, R3 — 330 Ω, ⅛ W resistor.
R4 — 150 Ω, ⅛ W resistor.
R5 — 1 kΩ, ⅛ W resistor.
R6 — 10 kΩ, ⅛ W resistor.
R7 — 22 kΩ, ⅛ W resistor.
U1 — LM78L05 voltage regulator IC.
U2 — PICAXE 18X (see sidebar for sources).
U3 — IR detector (RadioShack 276-640).

Program

The PICAXE control program is programmed in a *BASIC* computer programming language variant, as supported by the PICAXE vendor. The PICAXE devices and the *BASIC* language used are intended for educational settings and are tailored for simple sensor and control uses, such as this interface application. The program occupies about 1000 lines of code and comments that use about 80% of the nominal 600 lines of program space available. The program file is available on the QST-in-Depth Web site, or a preprogrammed PICAXE is available at nominal cost from the author.[1]

Program operation is ultra simple:

- On power up, operation is initialized. The LED blinks to indicate normal operation. The radio frequency is set to the 20 meter band.
- The program then loops to receive IR command keys that are read as the user presses keys on the IR remote control.
- Valid commands are identified — the LED blinks red if errors are detected, green otherwise.
- Commands are sent to the FT-817.

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

Construction

Figure 2 is the detailed circuit diagram and Figure 3 is a photo of the completed prototype. Notice that only a handful of components are required. Construction techniques are not critical. I used the RadioShack 276-150 project board, which has room for a couple of ICs and additional discrete parts. Point-to-point wiring was used. The resulting board was mounted in a RadioShack 270-1801 enclosure. The circuit board does require a little trimming at the corners to allow it to actually fit down within the enclosure.

There are a couple of points to keep in mind about the final package. First, the IR detector needs to be mounted in the enclosure such that the IR remote beam can actually reach it. I chose to mount my detector in the front on the enclosure. IR remote control beams do bounce off walls and ceilings, so a top mounted detector may be appropriate for you. The second point is the cable you choose to use from the enclosure to the mini DIN-8 connector to the back of the radio. I used four conductor stranded phone wire. This provided a very flexible connection to allow me to position the enclosure without cable stiffness being a problem. About an 18 inch cable length allows the interface to be placed on top of, beside or behind the radio.

You should take care in constructing the mini DIN-8 connector (J3) that will connect to the radio. The pins on this connector are small and closely spaced. Further, the FT-817's power (pin 1) and ground (pin 3) are adjacent and a short here can damage the radio by opening a resistor in the radio that is in series with the power on pin 1. For

this reason, and the option of using this basic design with my Kenwood TS-440, I have chosen to power my prototype from an external 12 V dc source. Jumper J2 allows selecting the circuit's power source.

The IR detector looks just like a three lead LED, but with a metal shroud. The usual process is to mount this component on a circuit board and behind a window covered by a film that passes IR signals and blocks other light wavelengths. I have chosen to remove the IR detector device from its metal shroud and then mount it such that the actual detector sticks through a hole in the enclosure. In my prototype other ambient light hitting the IR detector has not been a problem.

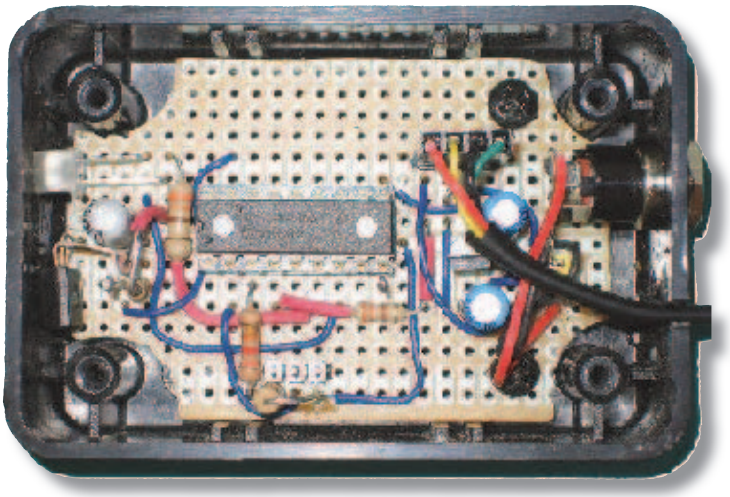


Figure 3 — Photo of completed circuit board. The LED and IR detector are both located on the left side of the circuit board.

Finally, I installed the connections to the remote PC serial port on a three pin header. I then use a mating three pin connector and short three wire cable to a DB9 male connector (J4 on the circuit diagram) to attach to my PC. This three pin header is directly below U2 in the photo of the circuit board and is not shown on the schematic diagram. This approach makes it simpler to have a serial port cable attached only during the programming of U2. I also used this approach with a four pin header connector for the lines to J2 (see the black four wire cable in Figure 3).

Components

The required parts are listed in the caption of Figure 2. A few of the components are somewhat special, but all are readily available.

An unprogrammed PCAXE 18X is available from the sources shown, or a preprogrammed unit is available from me. Programming the chip from your PC is very simple, using the free PICAXE editor/debugger from the Internet source listed. I recommend the latter as a learning experience.

The IR detector IC I used is a RadioShack #276-640 unit. These detectors are generic. Any device that supports a 38 kHz IR carrier should work, if you cannot find the RadioShack device.

Finally the LED is a dual color (red/green) model, RadioShack #276-012 is suitable, but any dual color LED should work fine. You could also choose to connect two different color LEDs in parallel, but with reversed polarity — that's essentially what a dual color LED is.

Choosing an IR Remote Control

The TV remote control you choose must support the popular Sony IR standards. I suspect that all universal replacement remotes may be configured to this standard. I have restricted the remote's keys required to just the numeric digits, channel and volume up and down to allow the widest possible range of remotes to be usable. I have used three different remotes and they all worked properly with my prototype unit. Consult your particular remote's documentation to determine how to configure it for Sony operation.

Initial Testing

Before connecting the circuit to the FT-817, double check your constructed circuit card and wiring to the connector to the radio. It's easy to get confused — I did more than once — by the FT-817 accessory connector pin designations. It's also easy to have a solder bridge on the mini DIN-8 connector that goes to the radio. Also use the FT-817 command menu item 14 (CAT RATE) to set the radio's CAT mode baud rate to 4800 — the only baud rate that this interface supports. Either jumper pins 1 and 2 or 2 and 3 of J2 to select the circuit's power source.

Plug the unit into the radio and observe the LED. Proper operation will start off with a series of quick blinks of green and red (in that order). The FT-817 will then be tuned to 14.275 MHz in USB mode. If you don't observe this then consider the following points to check:

- Check for proper voltage at the input (must be >7 V dc) and output (5 V dc) of the 78L05 regulator.
- Check for 5 V dc on pin 14 on the PICAXE.
- Ensure the LED is connected to pins 6 and 7 on the PICAXE.
- The PICAXE will continuously be generating a 5 kHz square wave signal on pin 9 whenever it is powered up. This signal being present means the chip is operating.

To check for remote control operation, first ensure the remote control is set up to use the Sony protocol. Then point it to the IR detector and key in 1, 2, 3, 4, 5, 6 and then CHANNEL + (or CHANNEL UP on some remotes). The LED should blink green with each key press. Erroneous keys will blink red. If the command is completed successfully, the radio will tune to 123.456 MHz and a green (or red if the command is invalid) LED will blink. Congratulations!

On the Other Hand

If you don't experience the above but the unit powers up okay, then check:

- The IR detector's output pin 1 is connected to pin 17 of the PICAXE. The output pin is a TTL digital signal that you should see an indication of change when monitored with any voltmeter (analog or digital). If you don't observe some indication of a pulse stream with each button press on the remote, then suspect either the remote or the IR receiver chip.
- If the IR detector is working properly, next look for signs of the output commands being sent from the interface to the radio. Monitor PICAXE pin 10 for signs of this digital signal (much like the IR detector's output). This will be seen only when a valid command to the radio is completed, not on every key press of the remote.
- A counter, oscilloscope or logic probe would be more helpful for these checks, should you have one of these devices and the need arises.

Using the Controller

Operation is simple. Plug the interface into the radio and turn it on. This powers up the interface. Then point the remote in the general direction of the interface and key in the desired commands. A listing of the supported commands and syntax are on the QST-In-Depth Web page.

Options

Components J4, R5 and R6 are required only if you are programming your own PICAXE chip or wish to modify the program. This capability is so simple and useful that I

PICAXE Overview

A PICAXE is a single chip microcontroller that typically requires just one or very few support components to make it a working system. The PICAXE is a standard Microchip PICmicro microcontroller that has been preprogrammed with the PICAXE bootstrap code and a *BASIC* computer language interpreter. The bootstrap code enables the PICAXE to be reprogrammed directly via a simple serial connection to a PC. No other chip programmer is required.

The software used for programming the PICAXE is called the *Programming Editor* and includes the very capable *BASIC* language. This software is free to download from **www.picaxe.co.uk** along with a wealth of supporting user documentation. They also can provide the PICAXE chips. This Web site is highly recommended. Many of your questions will also be addressed at the Web site **www.hippy.freeserve.co.uk/picaxe.htm**. Also highly recommended.

The PICAXE system can be used with four sizes of PICAXE chip (8, 18, 28 and 40 pin) with the additional pins primarily inputs and outputs. The larger units also have additional program capacity. The same *BASIC* language is common to all size chips. Prices for the chips range from as little as $3 each to about $10, depending on the size selected.

The PICAXE 18X used here provides up to 14 inputs or outputs including:

- General TTL digital in and out,
- Interrupts,
- Infrared receive,
- PC keyboard input,
- I2C interface for linking to external EEPROMs and other devices,
- 8 or 10 bit analog input option,
- 12 bit temperature read option,
- PWM output for motor control or similar functions,
- Input pulse counting,
- Serial I/O to PCs or other devices,
- Program memory for about 600 lines of code.

The power of the PICAXE system is its simplicity. No programmer, eraser or complicated electronic system is required. The microcontroller is programmed via a three wire connection to the computer's serial port (as shown by components J4, R6 and R7 on the circuit diagram).

Sources of PICAXE Chips

SparkFun Electronics offers a very nice selection of PICAXE products from individual chips to various circuit assemblies at **www.sparkfun.com/commerce/categories.php?c=124**.

www.phanderson.com/picaxe/picaxe.html lists selected PICAXE based products. Also includes a very fine collection of sample programs and other design related topics.

HVW Technologies at **hvwtech.com** offers a good variety of PICAXE chips and other interesting products.

The inventors and manufacturers of the PICAXE can be found at **www.picaxe.co.uk**. They sell individual chips at a reasonable price, though the shipping from England ups the cost significantly. Download the *Programming Editor* and a wealth of other information at no cost.

The ARRL has recently released a popular introductory book on PIC programming that readers might find helpful.†

The author can provide preprogrammed 18X chips loaded with the FT-817 IR control program described here for $19, postpaid to the US. Please send an e-mail to **garysargent@woh.rr.com** for more information.

†M. Spencer, WA8SME, *ARRL's PIC Programming for Beginners*. Available from your ARRL dealer or the ARRL Bookstore, ARRL order no. 0892. Telephone 860-594-0355, or toll-free in the US 888-277-5289; **www.arrl.org/shop**; **pubsales@arrl.org**.

recommend implementing this capability. Doing so means you can alter the PICAXE program to operate however you choose. For example, you may wish to change the bands that I have predefined. Or you may wish to add whole new types of commands, say a command that tunes to specific frequency/modes on a time schedule.

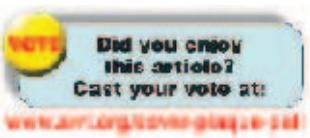
The program is well commented and would be easily modified to support other transceivers, especially the Yaesu FT-897 and FT-857, since they are so similar to the FT-817. The FT-817, FT-857 and FT-897 all have identical CAT/ACCESSORY or CAT/TUNER ports and feature the identical CAT commands for remote control of the radios. While I have not tested this circuit with the FT-857 or FT-897, I would expect it to work with little or no modification.

The program is straightforward, lending itself to tweaks. The *BASIC* programming language used by the PICAXE is simple and a good way to learn a bit of programming if you are new to this sort of thing.

If you power the unit only from the FT-817, then components J1 and J2 may be omitted. Simply connect pin 1 on plug J3 to pin 1 (the input) of the 78L05 voltage regulator.

Conclusion

The interface provides the remote control keypad capability for the Yaesu FT-817 transceiver that I had wished for. Operation is possible at home or in the field. A low cost evening or weekend project, it will enhance your enjoyment of this fine radio. If you tire of using the FT-817, just point the TV remote to the TV and catch your favorite program!



ARRL member Gary Sargent, KE8WO, was first licensed in 1969, while pursuing an electrical engineering degree. He currently holds an Advanced class license. Gary enjoys the digital modes and tinkering with computers and radios. He is an engineer at a computer services company. You can reach him at 4227 Willow Run Dr, Dayton, OH 45430 or at **garysargent@woh.rr.com**.

Antenna Gain Specs — What Do They Really Mean?

There are a number of ways to specify antenna performance — no wonder it can be confusing!

Joel R. Hallas, W1ZR

The first thing to keep in mind about antenna gain is that it is not quite the same as, for example, amplifier gain. An amplifier with 8 dB gain designed for 1 W input will deliver 6.3 W output at that level. It uses perhaps 10 to 12 W of dc power to increase the signal strength at the output.

A passive antenna, on the other hand, will never put out more total power than is put into it. An antenna with "gain" rather focuses the power in a particular direction at the cost of reduced power in other directions. Think of a flashlight, or auto headlight, with a reflector.

The Usual Yardsticks

Traditionally, there are two references that are used for antenna gain specifications. These are defined as follows:

- *Isotropic Radiator* — This is a mythical antenna that radiates equally in all directions, both horizontally and vertically. Think of an isolated bare light bulb in a room with dark surfaces so there are no reflections. I say mythical because, while this is easy to imagine, it is quite difficult to actually produce.
- *Half Wave Dipole* — This is an antenna with which we are all familiar. It is a real antenna, and thus gain comparisons can be more meaningful. Because the dipole has energy shifted from the nulls at each end to the broadside direction, a dipole in free space has a gain in its favored direction of about 2.1 dB. Thus, if free space gain figures are given in decibels with reference to a dipole (dBd), subtracting 2.1 dB will provide the corresponding free space gain with respect to an isotropic radiator (dBi), and vice versa. The comparison of azimuth patterns of the two are shown in Figure 1. The patterns of dipoles near the earth will be significantly affected by ground reflections, as are all terrestrial antennas.

Down to Earth

While free space antennas are easy to imagine, most of us find them hard to construct. The addition and subtraction of reflected RF signals from those coming directly from an antenna have a major impact on the resulting radiation pattern. In some directions they will add, in some directions they will subtract, depending on the relative phase.

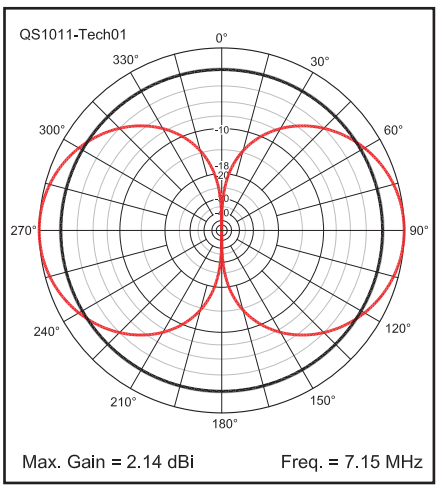


Figure 1 — Comparison of azimuth patterns of a lossless 40 meter dipole (red) to that of an isotropic source (black), both in free space. Note that in free space, since there are no ground reflections, the pattern will be the same at any elevation angle.

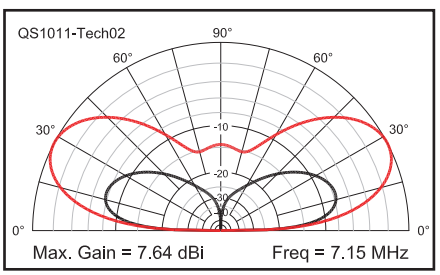


Figure 2 — Elevation pattern of our lossless 40 meter horizontal dipole (red) in its favored direction at ½ wavelength (68.8 feet) above typical soil. Elevation pattern of the same antenna moved to vertical orientation over the earth (black).

Horizontal Antennas Above Ground

The ground reflection of a horizontally polarized wave is out of phase from that of the antenna, resulting in a cancellation at the horizon, or 0° elevation. The good news is that at those elevation angle(s) at which the path from the reflected wave and the antenna's direct wave are different by a distance of a half wavelength (180°), the wave will be in phase and add to the signal from the antenna. This also occurs for high antennas for a distance that is an odd multiple of half wavelengths. At intermediate angles, the results are in between, as we might expect.

Figure 2 is the pattern of our 40 meter dipole of Figure 1 at a height of ½ wave above typical soil. Note that while there is no radiation towards the horizon, the radiation at 28° elevation is at a level 7.64 dB above that of an isotropic radiator. If the antenna were raised, the elevation angle of maximum signal would decrease, the gain would increase and other lobes would appear at higher angles, corresponding to the odd multiples of half waves discussed earlier.

Vertical Antennas Above Ground

A vertical antenna in free space acts just like a horizontal one — after all, which way is up in outer space? Bring it near ground and the differences appear. The ground reflection from a vertical antenna is in phase with the radiation from the antenna itself. This means that it would tend to add at the horizon or at 0° elevation. This would happen over a perfectly conducting earth, or a similar one such as sea water, with the result that intensity of the low angle radiation would be close to that of the horizontal antenna's at 28°.

Unfortunately, for most of us who live inland, the losses along the ground eliminate much of the low angle radiation from a vertical HF antenna. The resulting main lobe, Figure 2 (black), shows the story.

What's It All Mean?

For many years, it was common to quote the free space gains of antennas, compared to either an isotropic radiator or a dipole. There is nothing wrong with that, as long as you are aware that any comparisons of horizontal and vertical antennas will miss the big difference that ground reflections make.

If comparisons are made between antennas over ground, it is important that the same height and ground conditions are employed in each, and that they are stated.[1] I make an effort to do so in *QST* antenna articles. Note that while the gain of an array, such as a Yagi, over a dipole at the same height should be similar whether in free space or above ground, the gain of that horizontal Yagi over ground in its favored direction compared to an isotropic radiator can be 5-6 dB higher, potentially confusing comparisons.[2]

Joel R. Hallas, W1ZR, is Technical Editor of QST. *He can be reached at* **w1zr@arrl.org**.

[1]The default ground parameters used in *EZNEC* modeling software and in *QST* antenna articles are conductivity 5 mS/m, dielectric constant 13.

[2]An isotropic radiator is one that transmits (receives) energy equally to (from) all directions. If such a radiator were placed near the earth, it would no longer act in that way. Thus, I believe it only makes sense in a free space environment.

An Improved Center Insulator for Wire Antennas Fed with Window Line

Richard J. Peacock, W2GFF (SK)

An antenna fed with window or open wire transmission line works better, both electrically and mechanically, if the transmission line is perpendicular to the antenna wire. This arrangement will result in minimum distortion of the antenna pattern due to coupling. In addition, the transmission line conductors will be evenly stressed and localized flexing of the leads will be minimized. The desired configuration is shown in Figure 1.

The Problem Appears

It is often impossible to meet this condition. If the transmission line leaves the antenna at an angle other than 90°, as in Figure 2, one lead will be supporting the weight of the transmission line and the other will have a slack loop. The line is free to twist around the tight lead as the wind moves the transmission line. Both wires will flex or twist locally near the attachment points. This constant flexing and twisting will eventually result in a mechanical failure of the wire connections.

Easy Solution

A solution to this problem is to use a center insulator that has the transmission line attachment points oriented 90° to the antenna wire axis. This basic principle for any open wire balanced line is illustrated in Figure 3.

This configuration automatically equalizes the strain on the two wires of the transmission line because the antenna wire will twist and the whole insulator will rotate around the axis of the antenna wire regardless of the angle at which the line leaves the antenna. With both conductors of the transmission line sharing the load equally there is negligible flexing of these leads. The jumpers between the transmission line and the antenna wire can be made with direct connections that will not see any flexing. This type of center insulator can be used with wide spaced open lines or with window line by choosing appropriate dimensions to match the line spacing.

Insulators for 450 Ω Window Line

I elected to make my insulators from polycarbonate, a very tough plastic with good resistance to UV exposure.[1] Polycarbonate can be machined easily and the cut surfaces can be readily sanded and polished with hand

Make your own antenna center insulator that is even better than what you can buy.

Figure 4 — View of the actual insulator as designed.

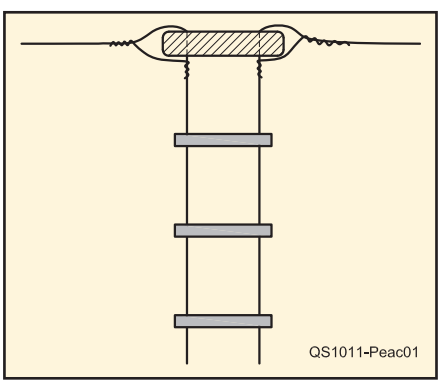


Figure 1 — The usual desired configuration of open wire or window line on the typical insulator. Note that in this position both line conductors are equally stressed.

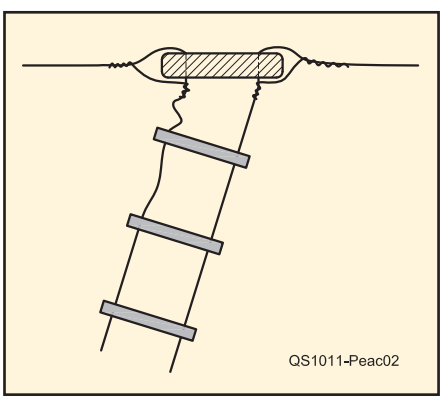


Figure 2 — What really happens as the antenna and line move in the wind. The conductors are subject to unbalanced stress and flexing.

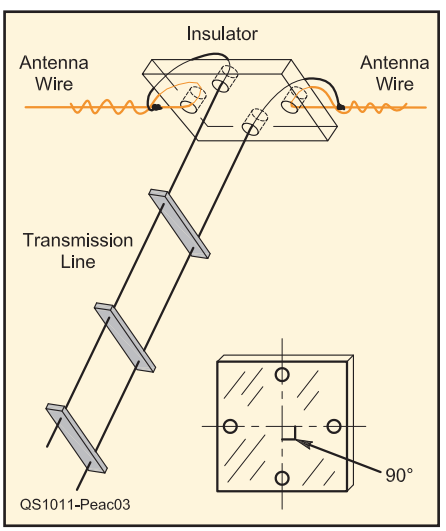


Figure 3 — Making the line attachment perpendicular to the wire access tends to equalize the stress.

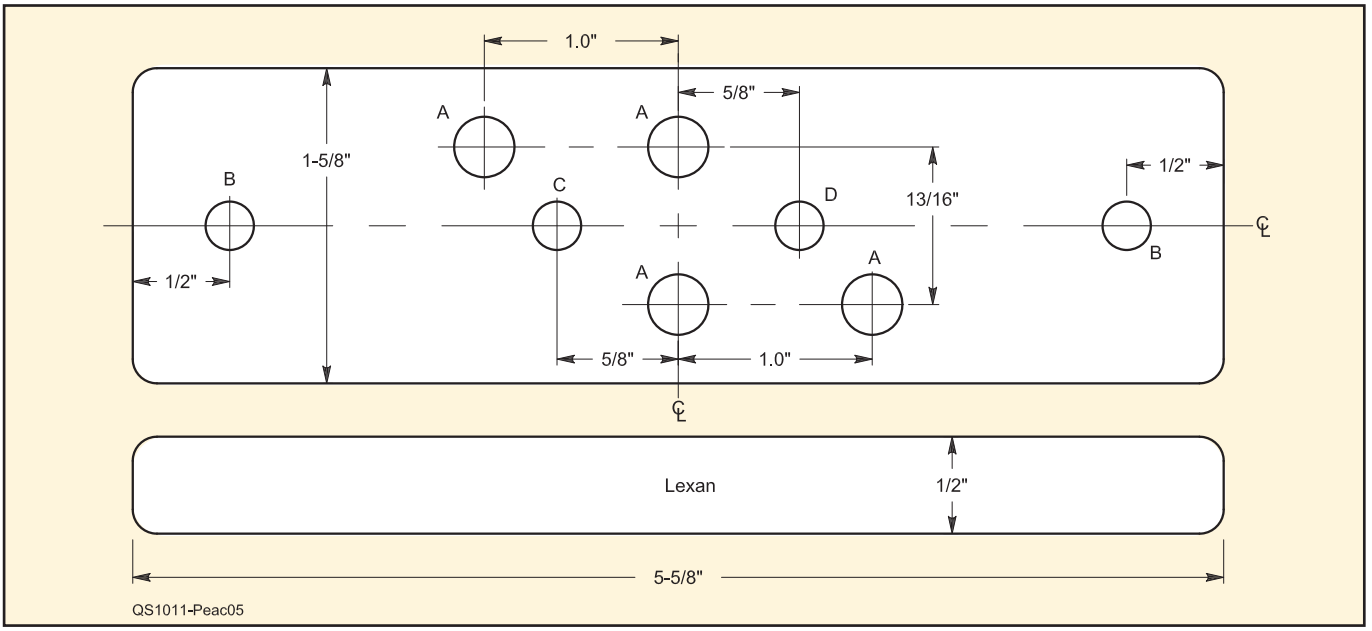


Figure 5 — Fabrication drawing of insulator shown in Figure 4. Your hole diameters may be different, depending on the diameter of the antenna and transmission line wire. My dimensions were: A, 5/32 inch; B, ¼ inch; C and D, as required for eye bolt or rope line.

tools. It also does not shatter when dropped on a hard surface.

I have had excellent results by making insulators out of ½ inch thick polycarbonate and drilling the holes for the window line wires as snug fits. By pulling the window line cross piece tight against the insulator and looping the wires back through a second hole, there is negligible motion or flexing of the window line. The leads continue to the antenna loops where they can be soldered. Window line attachments of this type have survived several years of exposure to the weather without any indication of mechanical wear. See Figure 4 for an example of the complete assembly with this type of insulator.

Preparing the Line

Carefully plan the termination of the window line conductors. Determine how many of the window line cross pieces will need to be removed to provide sufficient separated lead lengths to solder to the antenna after looping through the holes in the insulator. Try to maintain the same insulation dimension the entire lead length. I found that this was quite readily accomplished using a band saw. Evenly trimmed insulation will be easier to install in the insulator holes. Snug fit in the holes will ensure that the transmission line will not pull away from the insulator during normal use.

Fabricating the Insulator

Detailed dimensions of my insulators are shown in Figure 5. You may wish to make some changes in hole sizes for different gauge or insulation of your antenna wire and transmission line. A drilling template is suggested for drilling small pilot holes, such as 5/64 inch, in the Lexan blanks. You may later enlarge these pilot holes to suit your own preferences. A suggested template is shown in Figure 6. The total length of the insulator and the spacing of the antenna wire holes is not critical, but the overall center line between the antenna holes should be used to center the other holes. Centering the antenna wire holes about 5/8 inches from the end appears to provide sufficient material strength for tension loads. The antenna wire holes are chamfered slightly with a countersink to eliminate any sharp edges being presented to the antenna wire loops. The only critical dimension is the spacing of the two A holes that must match the spacing of the transmission line. For my 450 Ω window line this spacing is 13/16 inch, and 5/32 diameter was a good snug fit to the insulated conductors.

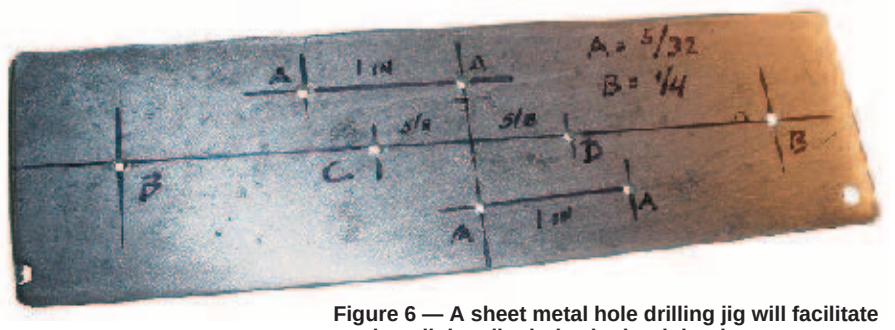


Figure 6 — A sheet metal hole drilling jig will facilitate getting all the pilot holes in the right place.

If sagging of the antenna requires attachment of a support rope, use a stainless steel eye bolt. The hole for the eye bolt can be easily tapped for the required thread. With a full thread the eye bolt will be secure and no locking nut will be required. The eye bolt should be centered with respect to the transmission line. With the eye bolt about 5/8 inch from the transmission line attachment points there is no indication of any RF problem with about 1200 W to my antenna. If you do not want to use an eye bolt you can simply drill a hole in the same area to pass a rope line, and then tie a secure knot in the rope under the insulator.

[1]J. Wonoski, N1KHB, "An Ideal Plastic for Amateur Radio Projects," *QST*, Oct 2009, pp 42-44.

Amateur Extra class licensee Richard J. Peacock, W2GFF, became a silent key on February 6, 2010 at the age of 90. A longtime resident of Setauket, New York, he was living in Fairhope, Alabama at the time of his death. Richard retired in 1989 from AIL on Long Island, New York after 30 years of service. He was a lifelong Amateur Radio operator, an active member of the South Baldwin Amateur Radio Club, a member of the ARRL and on the DXCC Honor Roll. QST

An Expanded Scale Voltmeter for 120 or 240 V ac — With a Bonus

Stop squinting at those tiny meter markings — spread them out for easy reading.

Steve Gilbert, K1SG

Tubes are generally rated for a specified filament voltage — ±5%. If the filament voltage is too low, the tube loses emission and the power output drops. If the filament voltage is too high, the filament burns out. Eimac states that if a type 8877 high power triode is run at 10% over the rated filament voltage, the life expectancy will drop by 50%. Given the cost of power tubes, it's surprising that more ham amplifier manufacturers don't allow you to measure and compensate for filament voltage variations, either directly or indirectly by measuring the ac line voltage.

While designing a new 6 meter amplifier, I decided that I wanted to monitor ac line voltage. Being aware of the ac powerline variations allows me to adjust both filament and high voltages to ensure long life for tube filaments and HV capacitor banks. My amplifier is designed to run on a nominal 234 V line, and will have separate Variac adjustable autotransformers for both filament and high voltage supplies. By knowing if the line voltage is high or low that day I'm able to adjust each transformer to keep the amp running happily and legally for a long time.

Measuring the Line Voltage

I had a 125 V ac meter in the junk box, but did not have a 250 V ac meter. But the voltage (when on) was always going to be between 230 and 240 V, so a scale of 200 to 250 V was really all the range I needed. By expanding the scale, I could read the voltage much more easily, especially with the amp in its permanent home on the other side of the room. Similarly, if I wanted to read 117 V as the primary voltage, an expanded scale would be helpful as well. This circuit was devised for the first application, but with minor parts changes can be used at the lower voltage as well.

First, I needed to step the overall voltage down to a more user-friendly level. T1 in Figure 1, the meter schematic, steps the voltage down from a nominal 240 to 24 V ac. The 24 V ac is rectified and adjusted so that 240 V ac produced 24 V dc at the wiper of R2.

Then I needed an accurate 0 to 5 V dc meter. I used a 100 µA movement meter with R4 and R5 forming a multiplier to make a 0-5 V meter and recalibrated the

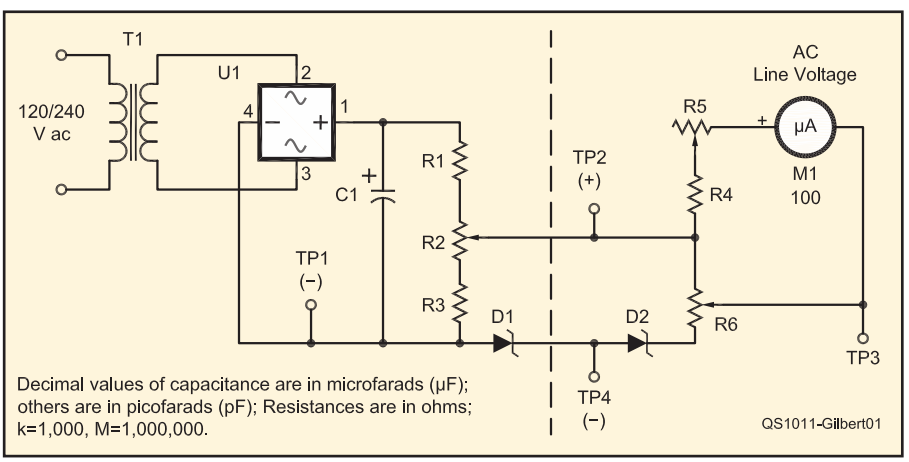


Figure 1 — Schematic diagram of the expanded voltmeter. Parts list for the three versions are shown in Table 1. Printed circuit boards are available from FAR Circuits at www.faircircuits.com.

Table 1

Parts List for the Three Versions of the Expanded Scale Voltmeter Shown in Figure 1

200-250 V ac Version	*100-125 V ac Version*	*12 V dc Version*
C1 — 100 µF, 50 V electrolytic capacitor.	100 µF, 50 V electrolytic capacitor.	NA
D1 — 1N4739A, 9.1V Zener diode.	Jumper – see text.	Jumper — see text.
D2 — 1N4739A, 9.1 V Zener diode.	1N4739A, 9.1 V Zener diode.	1N4739A, 9.1 V Zener diode.
M1 — 100 µA meter calibrated 200-250 V ac.	100 µA meter calibrated 100-125 V ac.	100 µA meter calibrated 10-15 V dc.
R1 — 1 kΩ, ¼ W resistor.	1 kΩ, ¼ W resistor.	NA
R2 — 1 kΩ, ¼ W linear potentiometer.	1 kΩ, ¼ W linear potentiometer.	NA
R3 — 2.2 kΩ, ¼ W resistor.	2.2 kΩ, ¼ W resistor.	NA
R4 — 47 kΩ, ¼ W resistor.	47 kΩ, ¼ W resistor.	47 kΩ, ¼ W resistor.
R5, 6 — 5 kΩ, ¼ W linear potentiometer.	5 kΩ, ¼ W linear potentiometer.	5 kΩ, ¼ W linear potentiometer.
T1 — 220 V to 24 V, 1 A transformer.	110 V to 12 V, 1 A transformer.	NA
U1 — 1 A, 100 PIV bridge refectifier.	1 A, 100 PIV bridge refectifier.	NA

Table 2

Calibration Adjustments Points for the Expanded Voltmeters

Settings for 250 V ac Meter

Adjust R2, Initial	*Adjust R6*	*Read*	*Adjust R5*	*Adjust R2, Final*
TP1 to TP2 25 V	TP1 to TP3 20 V	TP2 to TP3 5 V	 full scale on M1	TP1 to TP2 0.1 × ac input

Settings for 125 V ac Meter

Adjust R2, Initial	*Adjust R6*	*Read*	*Adjust R5*	*Adjust R2, Final*
TP1 to TP2 15 V	TP1 to TP3 10 V	TP2 to TP3 5 V	 full scale on M1	TP1 to TP2 0.1 × ac input

Settings for 15 V dc Meter

Adjust R6	*Read*	*Adjust R5*
TP1 to TP3 10 V	TP2 to TP3 5 V	TP1 to TP2 full scale on M1

scale to 0 to 5 V. I made the meter face using the excellent program by Jim Tonne, W4ENE, *Meter*, available at **www.tonnesoftware.com**. Using the software, I produced a meter scale reading 200 to 250 V. The pro version of the software even allowed me to add color to the scale.

Construction

For my original project, the expanded voltmeter was built directly into the amplifier. The small parts were built onto a RadioShack project PC board, and the transformer and potentiometers were mounted on the rear of the chassis. The line voltage meter is one of five built into a separate metering panel. (Can a 6 meter amp run with only five meters?) However, the expanded voltmeter circuit can just as easily be built as a stand-alone line voltage monitor, or built into other amplifier designs.

The 125 and 250 V versions are almost identical; the only differences are transformer T1, the scale used on meter M1 and one of the Zener diodes is replaced with a jumper on the low voltage unit. In fact, you could even use the specified transformer — running it on half the input voltage would produce half the output voltage. A 12 V filament transformer is more likely to be in the junk box, though.

Calibration

To calibrate the voltmeter, you'll need a good digital voltmeter (DVM), ideally with 1% accuracy. My Fluke and Beckman meters both offer this level of accuracy. It is also helpful to have a small Variac that can handle the voltage you plan to use, although the unit will be fairly accurate even without this step.

Start with R5 at maximum series resistance, so as not to overload the meter. Read the dc voltages between the test points as indicated in Table 2, and adjust the potentiometers to the voltages shown. What we're doing after the transformer and bridge rectifier is setting a workable voltage level with R2, 25 V for the 250 V unit or 15 V for the 150 V version.

Next we set R6 to "strip away" the bottom of that voltage. In the 250 V unit, this means we see 20 V across the Zeners and R6, or 10 V in the low voltage unit. The remaining voltage on either unit, read between TP2 and TP3 is exactly 5 V. R5 is then adjusted to give full scale on M1.

Finally, we go back to R2 and set that dc voltage to be exactly 1/10 the input ac (RMS) voltage; so for an input of 240 V ac, we should read 24 V dc across TP1 and TP2. If you have a Variac, you can vary the input from 200 to 250 V and confirm that the meter is reading accurately.

And the Bonus is

You can also use the same board (with fewer parts) to build an expanded-scale voltmeter for 13.8 V dc power supplies. Since we're only looking at a maximum of 15 V dc, nothing to the left of TP2 and D2 in the schematic is used in the 10-15 V version. You can use the same PC board, change the meter scale, and only populate the right side of the schematic. Just connect your 13.8 V dc power supply between the points marked TP2 (+) and TP4 (–). The calibration procedure is similar, but only R5 and R6 are used for adjustment.

Now I can monitor ac line voltage easily and accurately, and even see from the other side of the room whether or not it's "in the green."

ARRL Life Member and Amateur Extra class licensee Steve Gilbert, K1SG, has been licensed since age 13, in 1963. He was WA1AYS for over 30 years before getting his current call. He's been an active 6 meter enthusiast since the beginning of his amateur career and now focuses on earth-moon-earth communication. He coauthored "Converting the SB-220 to 6 Meters" in QST *for April 2008, and subsequently contacted EX7MW who was using that amplifier for the contact via the moon.* *(See pp 69-71, this issue.)*

Steve also occasionally operates on the HF bands and needs only North Korea to be at the top of the DXCC Honor Roll. Steve is employed by Herley Industries doing microwave test work. You can reach Steve at 75 W Elm St, Hopkinton, MA 01748 or at **k1sg@aol.com**. QST

New Products

APRS LIVE ADD-ON FOR *DEPICTION* MAPPING SOFTWARE

◊The *APRS Live* add-on for *Depiction* mapping and simulation software offers Amateur Radio operators two-way, real-time visual communications from within a *Depiction* simulation scenario. A third-party add-on produced by Smucker Data Solutions, the *APRS Live* software allows APRS packet information received with a standard radio, TNC and computer setup to be displayed within *Depiction* as simulation elements. For example, search and rescue workers can be tracked alongside a simulation of an 8-foot storm surge, or bike race volunteers can be tracked along race maps. *APRS Live* also enables the sending of short APRS messages from within *Depiction*. *Depiction* and *APRS Live* both function without Internet access, but if the Internet is available, the add-on can access APRS data from any APRS-IS server. Price: *APRS Live*, $39.95. *Depiction*, $199. For more information or to order, visit **www.depiction.com**.

Revisiting a 10 and 6 Meter Mobile Antenna

Get ready for better propagation on the higher frequencies with this two bander.

Charles Rankin, WA2HMM

Almost 40 years ago, Greg Gentile, WB2FXO, and I were light in body and heavy in hair. Now, nature has reversed that — but some things do stay the same. One such phenomenon — 10 meters is still an indicator for things to come on 6 meters. In any case, 10 and 6 meters remain fun places to play radio.

In this age of surface mount devices, it is a serious challenge for the average ham to be able to homebrew his toys, especially transmitters and receivers. Most amateurs are limited in electronic construction projects to accessories, more and more of which are now built into radios. That tends to limit many kinds of useful projects.

That is not the case, however, for an antenna. We all need antennas all the time. We can still build an antenna — wire, aluminum and steel are still the same. Normal hand tools can typically construct most antennas we want to build.

Adding 6 Meters to Your Mobile Station

Most modern transceivers now include 6 meters as the upper band. Ten and 6 meter mobile operation is not just something that would be nice to have, but is readily available for most mobile operators. But that extra antenna on the family vehicle is something that must often be negotiated with family members — the first one wasn't so hard was it?

A Two Band Whip

Now we let's go back 40 years and take a second look at a *QST* article I wrote describing a dual band mobile whip.[1] Let's take a look at what we needed then, and still do, to make an antenna that you can build for operation on both 10 and 6 meters.

[1]C. Rankin, WA2HMM, "A 10-6 Mobile Whip," *QST*, Jun 1970, p 39.

Most of us can get our hands on an old CB whip antenna (full size, stainless steel 9 footer), some solid copper wire (#12 or 14 AWG), some stainless 10-32 hardware and a 10 pF capacitor. Some other miscellaneous materials might include a waterproof coating for the coil and a 5 inch spring. The configuration is shown in Figure 1.

Setting the Trap

The basic concept of this antenna is the fact that a parallel tuned circuit yields very high series impedance at resonance, and much lower impedance far off resonance. So if we place this parallel tuned circuit, or trap, in an antenna, we can divide that antenna into segments that support multiple bands of operation. On 6 meters, the trap acts as an insulator, so just the bottom section acts as an antenna. On 10 meters, the trap acts as a small loading inductor, reducing the total length needed compared to the usual ¼ wave radiator.

Details of the trap assembly are shown in Figures 2 and 3. As I stated in my earlier article, this is only one way of doing the job. Dimensions are not critical, unless you are interested in duplicating this design. The coil form, wire and capacitor can all be changed, as long as you tune it to resonance for 6 meters. Set resonance to the center of the frequency range on 6 meters you plan on working; back then we used a *grid dip* meter. Now, an antenna analyzer could be used. Your SWR measurements should be similar to mine shown in Figure 4.

Whip Fabrication

The whip is cut into two sections — the bottom section to 49 inches (44 inches if you use a 5 inch spring), the top section to 46 inches. The ends are then deburred. These lengths could vary slightly, as final adjustment of the trap can compensate for some minor differences in materials and the position of the antenna on your vehicle.

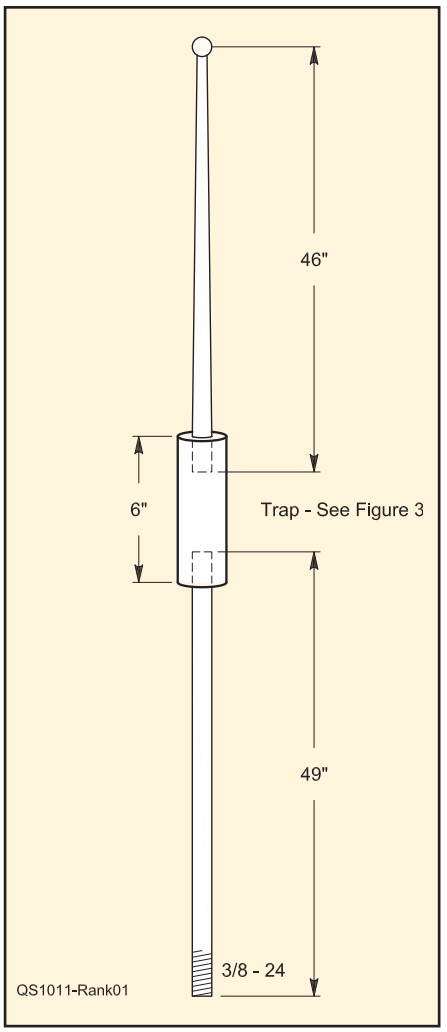


Figure 1 — Dual band whip configuration.

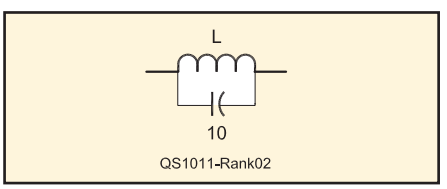


Figure 2 — Schematic of the trap. The capacitor is a 10 pF, 1 kV dipped mica radial lead unit such as the Digi-Key (www.digikey.com) CDV19CF100JO3F-ND. L — See text.

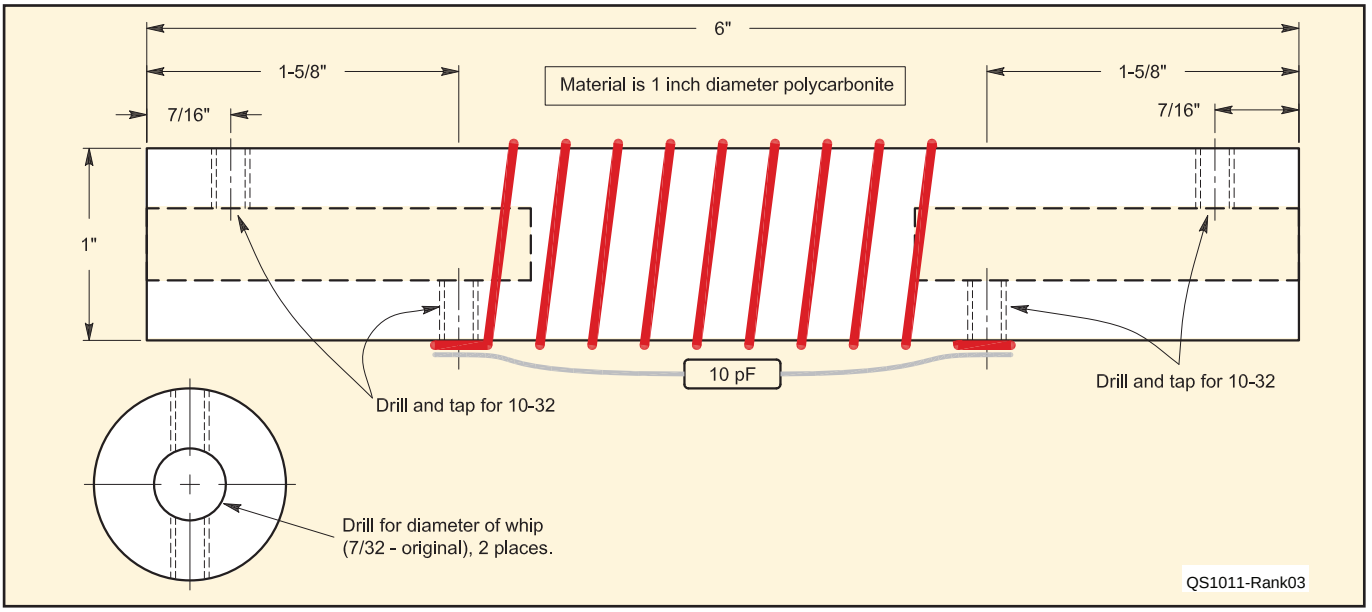


Figure 3 — Details of trap construction. The machine screws are 10-32 × ¾ inch stainless, Digi-Key part H721-ND, stainless steel; the nuts are part H727-ND.

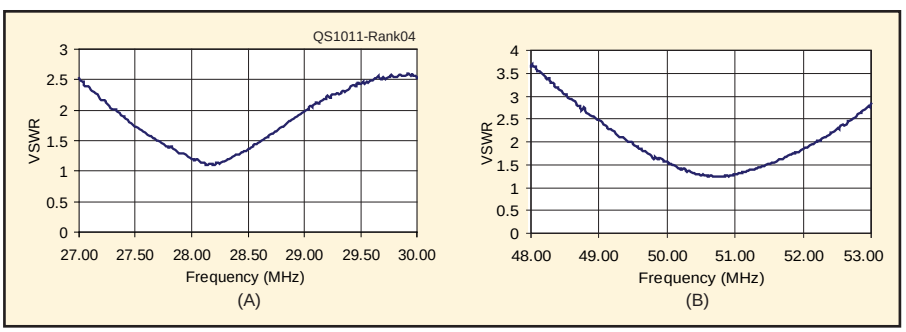


Figure 4 — At (A) measured SWR on 10 meters. At (B) on 6 meters.

I suggest that you use a small half round metal file to make small indentations in the whip at the locations of the screws that attach the coil form. This will help prevent slipping.

The trap on the new 10 and 6 meter mobile whip is built on a polycarbonate form using tin plated #10 AWG wire and stainless steel 10-32 cap screws. After adjustment, the trap is coated with a black liquid rubber insulation. The antenna is fed with 50 Ω coax. Remember: The coax and the capacitor must be capable of handling the power you plan to run.

The usual whip includes male ⅜-24 threads designed to fit into a standard ball mount. The antenna has sufficient wind resistance that a heavy duty mount should be used. A single magnet type mount is not likely to stay in place at highway speeds or if foliage is encountered.

Antenna Performance

As mentioned in the earlier article, the effectiveness of this dual band setup is similar to that of separate whips for each band. The evaluation that Greg, WB2FXO, and I performed 40 years back used Greg's 10/6 meter receiver and S-meter for comparisons. Today I have access to better test equipment, a vector network analyzer and a spectrum analyzer, but an antenna analyzer will do the job.

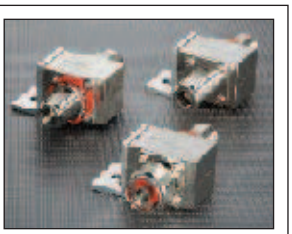
Relative gain measurements were taken using the spectrum analyzer attached to a separate dipole for each band. The dipole was located 50 feet away. Comparing full size single band whips to the dual bander indicated a reduction of 0.74 dB on 10 meters and 0.47 dB on 6 meters — not bad considering an S-unit is defined as 6 dB.

ARRL member and Amateur Extra class licensee Charlie Rankin, WA2HMM, was first licensed in the mid 1950s as WV2HMM. He enjoys DXing on the HF bands and 2 meter mobile in his cars or pickup. He works for Motorola, in the Holtsville, New York facility where he runs the GTEM (EMI/EMC) Lab. He is a charter member of the Symbol Technologies Amateur Radio Club (STARC). Charlie can be reached at 165 Hickory Ln, Smithtown, NY 11787-4429 or at **crankin@dialup4less.com**.

New Products

LIGHTNING PROTECTION PRODUCTS FROM TIMES MICROWAVE

♢The LP-BTR series from Times Microwave Systems offers lightning and surge protection for RF communication equipment. Features include expanded frequency range capability from 20 MHz to 1000 MHz, bulkhead mount capability in addition to flange mount and a weather-seal gasket for bulkhead and feed-through installations. Models include LP-BTR-NFF (N female on surge and protected sides); LP-BTR-NMP (N male on protected side and N female on surge side); and LP-BTR-NMS (N male on surge side and N female on protected side). Price: $65 each. For more information, see your favorite dealer or **www.timesmicrowave.com**.



Announcing —
ARRL Homebrew Challenge III

The new homebrew challenge is to make a low cost, CW and SSB transceiver for the 10 or 6 meter bands.

Joel R. Hallas, W1ZR

JOEL HALLAS, W1ZR

***QEX* Editor Larry Wolfgang, WR1B, makes a contact with a transceiver from the first Homebrew Challenge at W1HQ, the ARRL staff club station.**

The ARRL has sponsored two Homebrew Challenges, designed to test our members' design and construction skills by making useful amateur gear at low cost — and sharing their results with our members. Our first ARRL Homebrew Challenge, announced in *QST* for August 2006, required the construction of a 40 meter, 5 W, voice and CW transceiver built for less than $50 of new parts. The second, announced in February 2009, resulted in a number of creative designs of low cost 50 W linear amplifiers to follow the transceiver. Two were designed to use about $30 of parts and another was a multiband amplifier with many features that cost somewhat more.

This time we announce a challenge to build a transceiver in celebration of the (slow) return of sunspots. This challenge will be in two parts, and readers can enter into either or both:

- A single band, 25 W PEP output, SSB and CW transceiver for 10 or 6 meters (Option 1), prize $200, and
- A 25 W, SSB and CW transceiver that can be switched between 10 and 6 meters, using one or two switches (Option 2), prize $300.

In addition to the cash prize, the winning designs will be published in *QST*, and the authors will receive our usual compensation for the published articles. Additional entrants who meet the minimum requirements and whose projects have interesting design features may also have their projects written up in *QST* or posted to the ARRL Web site.

Instead of challenging entrants to make the transceiver at the lowest cost, this time we will challenge builders to provide the highest quality, best performance and most features within the cost target of $150 for Option 1 and $200 for Option 2.

Entries for either option must be received at ARRL Headquarters no later than *November 1, 2011*. To be considered, each entrant must submit a working transceiver, suitable for testing in the ARRL Lab and on the air analysis by the ARRL staff judges. Documentation required includes a parts list indicating the source and purchase price of each part, and an article draft that includes a design description, construction hints, alignment instruction, and block and schematic diagrams. Photographs may be provided, but any photos that are published will be taken by ARRL staff.

Requirements

For this challenge, some specific requirements are as follows:

- Frequency coverage
  - 10 meters — 28.0 through 28.6 MHz or greater
  - 6 meters — 50.0 through 50.25 MHz or greater
- Frequency readout (mechanical or electronic) resolution: less than 1 kHz
- Receiver noise figure: 10 meters, less than 8 dB; 6 meters, less than 5 dB
- Receiver selectivity maximum: 3 kHz at 6 dB
- Receiver audio output: 0.5 W minimum with less than 10% distortion
- Transmitter must meet all FCC requirements. Note that for HF, spurious signals need to be down 43 dB below the carrier, while they must be down 60 dB on 6 meters.
- TR switching: CW, semi or full break-in operation: Voice, VOX or push-to-talk
- Mic sensitivity: Adjustable, with full 25 W output from standard low impedance dynamic mic or equivalent
- Output of 25 W CW into 50 Ω load with up to 2:1 SWR for at least 30 seconds. No damage driving open or short at antenna jack for 30 seconds.
- Power required: either 120 V ac, 60 Hz mains or a nominal 13.8 V dc supply

In addition to these specific requirements, general requirements are listed in the QST-In-Depth Web site (**www.arrl.org/qst-in-depth**). These are similar to those in the previous challenges, including what is and is not included in the cost calculation. Also on the Web site are the evaluation criteria the judges will use.

PRODUCT REVIEW

ICOM IC-R6 Portable Wideband Receiver

Reviewed by Steve Ford, WB8IMY
QST Editor

My very first receiver, the one that introduced me to the strange noises being generated by people who called themselves "hams," was a monster. The Hallicrafters S-40B was a hulking black box that tipped the scales at something in excess of 25 pounds.

Fast forward 40 years and the breakneck evolution of technology has turned the S-40B and radios like it into little more than beloved curiosities. Over the years we've seen radios become ever smaller thanks to astonishing progress in semiconductor technology combined with ultra-miniature surface-mount components. The new ICOM IC-R6 portable receiver is an example of how far we've come. My S-40B has effectively shrunk to a pocket sized box that weighs less than 8 ounces. Moreover, its frequency coverage has expanded from the depths of longwave to the rarified atmosphere of microwaves. And then there are the IC-R6 memories, multiple scanning functions and … well, at least the S-40B still retains its nostalgia value!

Tiny Package, Large Feature Set

The ICOM IC-R6 is a wideband AM and FM receiver that covers 100 kHz to 1300 MHz (cellular telephone frequencies blocked, of course). At first glance it looks like a handheld transceiver complete with a rubberized PTT button on the side. That actually serves as the FUNCTION and SQUELCH/MONITOR switches. The antenna connector is a female SMA; it sits next to an earphone jack that doubles as the data port. The knob on top is normally used to change frequencies or memory channels. UP and DOWN buttons on the front panel control the audio volume, although you can use the IC-R6 menu options to switch the volume adjustments to the knob and assign frequency tuning to the UP/DOWN buttons.

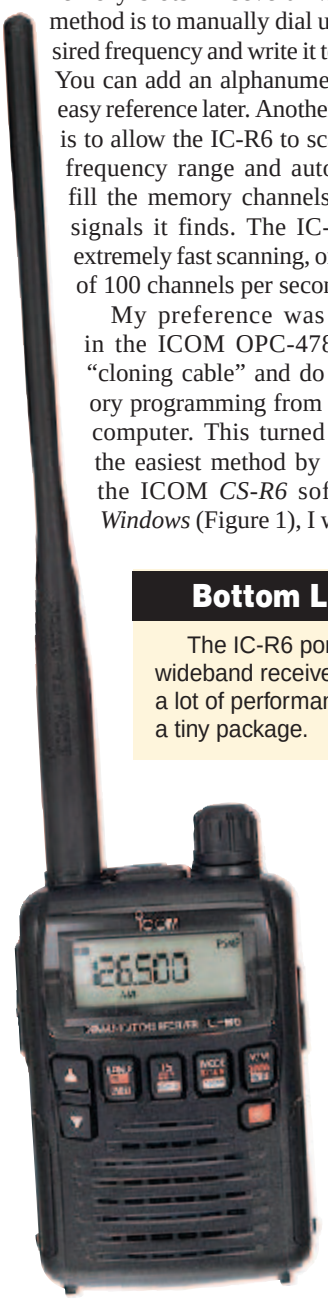
The IC-R6 offers a variable frequency oscillator (VFO) tuning function, but this works best when you're navigating a limited range of spectrum within a given band. There is no way to easily enter a specific frequency directly. Instead, you must first navigate to the desired band, then twist the VFO knob until you see the desired frequency on the liquid crystal display (LCD) — you can step frequencies by MHz to speed the process.

From a convenience standpoint, it's fortunate that the IC-R6 is loaded with memory channels — more than 1300 of them. It is easier to flip through these channels, which can also be organized by band or activity, than it is to rely on VFO tuning. The radio arrives with weather, marine and a slew of shortwave broadcast frequencies preprogrammed. You can populate the remaining memory slots in several ways. One method is to manually dial up your desired frequency and write it to memory. You can add an alphanumeric tag for easy reference later. Another approach is to allow the IC-R6 to scan a given frequency range and automatically fill the memory channels with any signals it finds. The IC-R6 offers extremely fast scanning, on the order of 100 channels per second.

My preference was to invest in the ICOM OPC-478UC USB "cloning cable" and do the memory programming from my laptop computer. This turned out to be the easiest method by far. Using the ICOM *CS-R6* software for *Windows* (Figure 1), I was able to read the contents of the receiver's memory, modify the contents (or add new frequencies) and then write everything back to the radio. You can organize the entire memory array any way you desire, add alphanumeric channel labels, select tone squelch frequencies and designate particular channels to be skipped while scanning.

Bottom Line

The IC-R6 portable wideband receiver packs a lot of performance into a tiny package.



Power Options

The IC-R6 is supplied with two AA size NiMH rechargeable batteries and a small wall charger. If you wish, you can swap the rechargeable cells for AA alkaline batteries, but I found that the NiMH cells provided plenty of listening time.

When it comes to charging batteries in the IC-R6, *it is important to read the manual*. If the batteries are being charged for the first time, or if you've removed the batteries for longer than two seconds, you have to go through a multi-step process to place the receiver in the charging mode. I skipped this page in the manual and found myself frustrated with what I thought was a defective charger!

It is worth noting that there is a drop-in charger option for the IC-R6 — the ICOM BC-194. However, I didn't have the unit to test for this review.

Surfing the Ether with the IC-R6

One of the first things I discovered about the IC-R6 didn't come as a surprise. The radio is supplied with a 6 inch flexible rubber antenna. This antenna is fine for local VHF/UHF signals, but woefully inadequate for shortwave listening. If you confine yourself to the stock antenna, you may hear a few of the louder shortwave broadcasters, but not much more.

Adding a longer antenna makes a world of difference. I had a 4 foot telescoping whip antenna that I attached to the IC-R6 by way of a connector adapter to go from the whip's BNC connector to the radio's SMA connector. Such adapters are available from many dealers. Alternatively, you can use the IC-R6 option menus to switch the external antenna from the SMA jack to the earphone cable. That's right; the IC-R6 has the ability to turn your earphone or headphone cord into an antenna. If you don't have a longer antenna at hand, this option is vastly superior to the flexible antenna for shortwave listening.

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

Be warned that if you take the antenna possibilities to their logical conclusions and connect the IC-R6 to something much bigger, such as an HF dipole antenna, you'll be treated to horrendous overload. Fortunately, the IC-R6 has an attenuator option that goes a long way toward reducing the cacophony.

Speaking of antennas, I was pleasantly surprised to discover that the IC-R6 features an internal ferrite bar antenna for AM broadcast listening. That is something you don't find often in receivers of this type. It isn't a large ferrite, but it made a substantial difference in AM broadcast listening.

Once the radio was fully programmed, listening was pure pleasure. I was eavesdropping on everything from air traffic control to local police and fire, to railroad chatter and, of course, shortwave broadcast. The receiver's triple conversion design is remarkably sensitive. With the IC-R6 connected to my 2 meter mobile antenna, I enjoyed listening to Radio Bulgaria and the BBC on my way to and from the office.

The speaker in the IC-R6 is about an inch in diameter, so audio fidelity is mediocre at best, especially when you have to crank up the volume to overcome local distractions. The IC-R6 listening experience is much better with headphones, even though the design provides audio in one ear only. It doesn't have to be stereo, but having audio in both earpieces of typical stereo headphones would have been nice. [A simple adapter could be fabricated to solve that problem. — *Ed.*]

I had only one minor nit to pick with this radio, one that will probably bother few other listeners. If you're cruising the longwave frequencies (153 to 269 kHz), you quickly discover that the IC-R6 does not allow you to tune in 1 kHz steps. This is a problem because frequency tuning is critical and most longwave stations broadcast on odd-numbered frequencies such as 153 or 161 kHz. Without the ability to tune in 1 kHz steps, you can't zero in on the correct frequencies. The only solution I found was to set up the frequencies in software and write them to dedicated longwave memory channels.

A Handy Handheld

The ICOM IC-R6 packs an awful lot of performance into a minuscule package. I found that it was also very convenient for hunting down spurious signal sources around the house; it might be a good foxhunting receiver as well. With its extreme portability, the IC-R6 is the kind of receiver you can just drop into your pocket whenever you head out the door.

Manufacturer: ICOM America, 2380 116th Ave NE, Bellevue, WA 98004; tel 800-872-4266; **www.icomamerica.com**.

Table 1

ICOM IC-R6, serial number 16001018

Manufacturer's Specifications	*Measured in the ARRL Lab*
Frequency coverage: 0.01-821.995, 851-866.995, 896-1309.995 MHz.	0.01-823.995, 849-868.995, 894-1309.995 MHz.
Modes of operation: AM, FM, WFM Power requirement: 130 mA (rated audio), 65 mA (standby), 30 mA (power save) at 3 V dc.	As specified. 124 mA (max audio, no signal, lights on), 61 mA (standby), 20 mA (power save) at 3 V dc.
AM sensitivity: 10 dB S/N; 1 kHz tone, 30% modulation: 0.495-4.995 MHz, 1.3 µV; 5.0-29.995 MHz, 0.89 µV; 118-136 MHz, 0.63 µV; 222.0-246.995 MHz, 0.63 µV; 247.0-329.995 MHz, 0.63 µV.	10 dB (S+N)/N, 1-kHz, 30% modulation: 0.150 MHz, 3.12 µV; 0.205 MHz, 1.78 µV; 0.290 MHz, 1.30 µV; 0.530 MHz, 1.16 µV; 1.710 MHz, 0.93 µV; 3.300 MHz, 0.68 µV; 7.350 MHz, 0.71 µV; 11.875 MHz, 0.59 µV; 15.315 MHz, 0.69 µV; 21.650 MHz, 0.65 µV; 25.885 MHz, 0.59 µV; 50.4 MHz, 0.5 µV 120.0 MHz, 0.52 µV; 366.0 MHz, 0.48 µV.
FM sensitivity, for 12 dB SINAD: 1.625-4.995 MHz, 0.32 µV; 5.0-29.995 MHz, 0.25 µV; 30.0-469.995 MHz, 0.18 µV; 470.000-832.995 MHz, 0.32 µV; 833.0-1029.995 MHz, 0.28 µV; 1030.995-1309.995 MHz, 0.35 µV.	For 12 dB SINAD: 1 kHz tone, 3 kHz deviation: 29.0 MHz, 0.18 µV; 40.0 MHz, 0.15 µV; 52.0 MHz, 0.15 µV; 72.0 MHz, 0.15 µV; 146.0 MHz, 0.18 µV; 162.5 MHz, 0.17 µV; 223.0 MHz, 0.15 µV; 440.0 MHz, 0.16 µV; 465.0 MHz, 0.16 µV; 800.0 MHz, 0.32 µV; 902.0 MHz, 0.24 µV; 1280.0 MHz, 0.14 µV.
WFM sensitivity, for 12 dB SINAD: 76.000-108.000 MHz, 1.1 µV, 175.000-221.995 MHz, 1.1 µV; 470.000-770.000 MHz, 1.8 µV.	For 12 dB SINAD: 1 kHz tone, 50 kHz deviation; 88.1 MHz, 1.00 µV; 98.1 MHz, 1.05 µV; 107.9 MHz, 1.03 µV; 200.0 MHz, 1.10 µV; 600.0 MHz, 1.61 µV.
IF rejection: Not specified.	29.0 MHz, 76 dB; 52.0 MHz, 19 dB; 72.0 MHz, 19 dB; 146.0 MHz, 82 dB; 223.0 MHz, 22 dB; 440.0 MHz, 63 dB; 902.0 MHz, 84 dB; 1280.0 MHz, >133 dB.
Image rejection: Not specified.	29.0 MHz, 64 dB; 52.0 MHz, 52 dB; 72.0 MHz, 74 dB; 146.0 MHz, 76 dB; 223.0 MHz, 51 dB; 440.0 MHz, 82 dB; 902.0 MHz, 77 dB; 1280.0 MHz, >133 dB.
FM adjacent channel rejection: Not specified.	20 kHz offset, 29 MHz, 47 dB; 52 MHz, 52 dB; 146 MHz, 46 dB; 223 MHz, 47 dB; 440 MHz, 49 dB; 902 MHz, 46 dB; 1280 MHz, 46 dB.
FM two-tone third order dynamic range: Not specified.	20 kHz offset, 29 MHz, 71 dB*; 52 MHz, 71 dB*; 146 MHz, 74 dB*; 223 MHz, 76 dB*; 440 MHz, 73 dB*; 902 MHz, 72 dB*; 1280 MHz, 77 dB*. 10 MHz offset, 29 MHz, 106 dB; 52 MHz, 72 dB; 146 MHz, 78 dB; 223 MHz, 75 dB; 440 MHz, 74 dB; 902 MHz, 81 dB; 1280 MHz, 93 dB.
Squelch sensitivity: Not specified.	29 MHz, 0.34 µV; 52 MHz, 0.34 µV, 146 MHz, 0.38 µV; 223 MHz, 0.36 µV; 440 MHz, 0.30 µV, 902 MHz, 0.66 µV; 1280 MHz, 1.08 µV.
IF/audio response: Not specified.	Range at –6 dB points, AM: 128-5190 Hz.
Audio output power: 80 mW typical into 8 Ω external speaker at 10% THD.	75 mW at 8.5% THD.
Size (height, width, depth): 4 × 2.3 × 1.3 inches; weight, 7.1 oz.	
Price: IC-R6, $200; CS-R6 *Windows* programming software, $50; OPC-478UC USB cable and *Windows* drivers, $60; BC-194 charger stand, $35.	

*Measurement was noise limited at the value indicated.

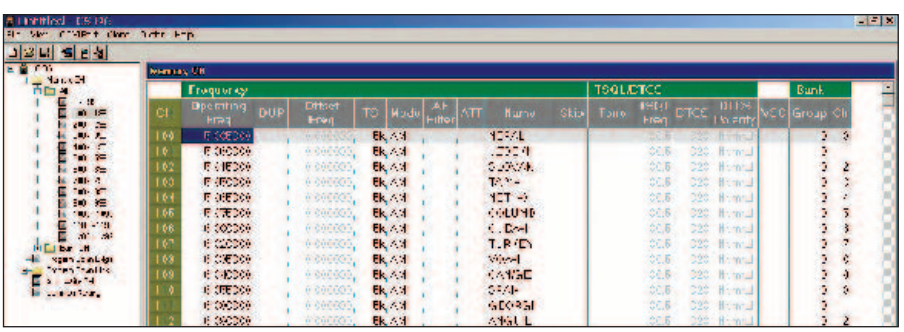
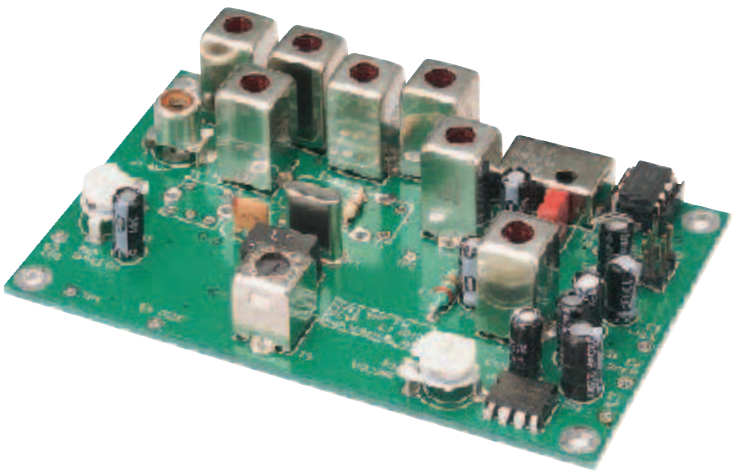


Figure 1 — The ICOM *CS-R6* software for the IC-R6.

Hamtronics R303-137 Weather Satellite Receiver Board



Reviewed by Mark Spencer, WA8SME
ARRL Educational and Technology Program Coordinator

I have been a user of the NOAA polar orbiting satellites sending *automatic picture transmission* or *APT* imagery for years. Additionally, during the ARRL Teachers Institutes, I encourage teachers to use these NOAA satellite signals and their imagery in their classrooms. A number of TI graduates have installed satellite ground stations at their schools and share imagery and weather observations across the county.

For hams interested in exploring the satellite facet of the hobby, the NOAA satellites are an excellent resource because their VHF signals at 137 MHz are relatively strong. They are easy to receive with basic equipment, and a variety of computer software packages (many freely available) make the display of the imagery from space a snap. The typical received image is illustrated in Figure 2, which was produced during this review. Though you can receive the NOAA signals with a regular 2 meter FM radio or police scanner tuned to the 137 MHz channels, quality reception of the APT signals requires a wider receiver bandwidth than FM voice. A receiver designed for APT reception gives far better results.

Overview

The Hamtronics R303-137 receiver is a replacement for the successful R139 weather satellite receiver that I have used for many years. It's is a weather satellite adaptation of the Hamtronics commercial-grade VHF FM receiver. The R303-137 has four frequency synthesized channels that cover the NOAA satellite frequency plan and it has an IF bandwidth that is optimized to receive APT imagery.

The receiver is not a plug-and-play unit and comes as a circuit board only. The user installs and solders interconnecting cables and wires to connect the board to a 12 V power source, antenna, speaker and computer sound card. (You can mount it in a suitable enclosure if desired, but that's not necessary.) Putting the receiver on the air requires only basic soldering skills and would be a good first project for those interested in hands-on construction.

[1]The eight element Yagi antenna is detailed online at **www.arrl.org/ariss-tracking-interface**. Though the dimensions are for 2 meters, the antenna is easily scalable for 137 MHz. Contact WA8SME at **mspencer@arrl.org** if you would like the dimensions for the weather satellite version of the antenna.

The Review Setup

I tested the receiver using two antenna systems. The first was a high end antenna system that consists of a homemade eight element, right hand circularly polarized Yagi with an antenna mounted preamp and low loss hardline coax from the antenna to the shack.[1] The antenna is mounted on a computer controlled azimuth/elevation (az/el) rotator system that automatically tracks the satellite. This antenna system has been developed over the years and gives consistent horizon to horizon, noise free imagery.

The second antenna was a starter system that consisted of a homemade turnstile antenna with a run of 75 feet of RG-8X coax with and without an antenna mounted preamp.[2] The display software was *WXTOIMG* running on a typical laptop computer.[3]

From the Box to First Image

The review receiver came with the optional power supply cube and a few pages of documentation. The documentation, though it appears Spartan, is well written and contains all the information you need to set up and connect the receiver to the external parts required for operation. Following the directions, it doesn't take long to solder the required wires to the through hole solder pads and make connections to the power supply, speaker, computer sound card and antenna.

Channel selection is made by jumper-

[2]The documentation refers to the turnstile antenna design as published in the *ARRL Weather Satellite Handbook* (unfortunately this excellent resource is no longer in print). If you would like the details of the turnstile antenna referenced and used in this review, contact WA8SME at **mspencer@arrl.org** and request an extract that includes the information.

[3]The display software used in the review can be downloaded from **www.wxtoimg.com**.

Bottom Line

With a little work, the R303-137 weather satellite receiver board offers a great way to receive fascinating weather satellite images.

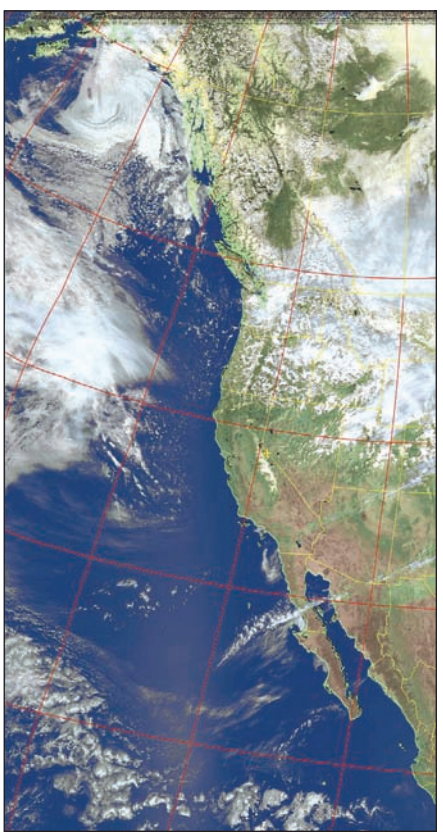


Figure 2 — This image was received with the R303-137 connected to a Yagi antenna and mast mounted preamp.

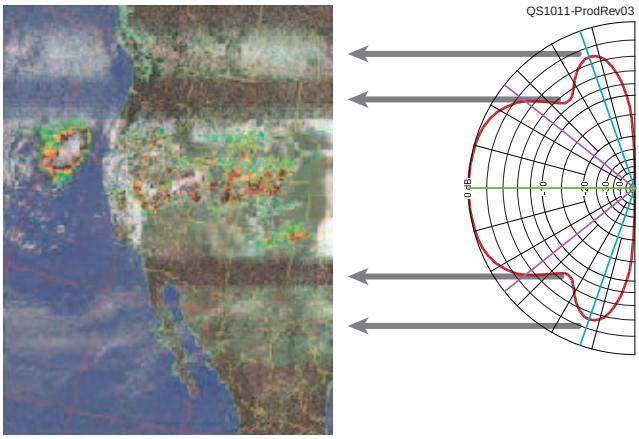


Figure 3 — Image received using a simple turnstile antenna with no preamp. Note how noise bars in the image correlate with nulls in the antenna pattern.

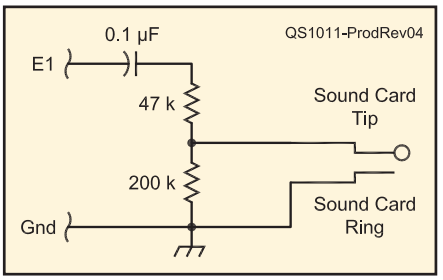


Figure 4 — Schematic of the pad used to reduce the receiver audio output for better compatibility with computer sound cards.

Table 2
Hamtronics R303-137 Weather Satellite Receiver

Manufacturer's Specifications	*Measured in the ARRL Lab*
Frequency coverage: 137.9125, 137.620, 137.100, 137.500 MHz.	As specified.
Power requirement: 13.6 V dc at 38-100 mA.	Full volume, no signal, 90 mA.
Minimum operating voltage: Not specified.	6.9 V dc.
Mode of operation: FM.	As specified.
FM sensitivity: 0.2 µV.	For 12 dB SINAD, 9 kHz deviation: 137.100 MHz, 0.27 µV; 137.5-137.9125 MHz, 0.23 µV.
FM adjacent channel rejection: Not specified.	100 kHz offset, 46 dB.
FM two-tone, third-order IMD dynamic range: Not specified.	100 kHz offset, 46 dB.*
Squelch sensitivity: 0.15 µV.	137.5 MHz, 0.12 µV.
Speaker audio output: 1 W, 8 Ω load.	Full volume, 926 mW at 7.6% THD. THD at 1 V_{rms}, 2.1%.
Size (width, depth): 4.0 × 1.5 inches; weight, 3 ounces.	
Price: R303-137 PC board, $229; ac adapter, $9.50, LNK-137 preamp, $99.	

*Measurement was noise limited at the value indicated.

ing the appropriate pads to ground. The documentation suggests using a rotary wafer switch connected to the frequency select pads through 1N914 or similar switching diodes. During my satellite operations, I use only the newest birds (N19 and N18) of the constellation, requiring only two frequencies. Therefore an SPDT switch is all that's required.

The receiver SQUELCH and VOLUME controls are mounted on the circuit board and there is no scan function. This may seem like a limitation, but in reality it is not. In practice, the only time I listen to the audio during a satellite pass is while I am giving a demonstration; otherwise the speaker is switched out or the volume turned down so that it is not audible. Likewise, since I am not monitoring the satellite audio, I leave the squelch wide open. Finally, there are times when multiple satellites are within range at the same time, so a scan function might cause the receiver to lock on the wrong satellite. Consequently, on my R139, which does have a scan function, I leave the scan off and manually select the desired frequency.

Once wired up, I connected the R303-137 to the antenna and waited for the first pass. The receiver worked the first time and the results were identical to those obtained with my old R139 receiver as illustrated in Figure 2. Throughout the day I jumpered the frequency selection pads to the other three channels and captured similar results from the other birds. The only surprise was that the audio out of the COMPUTER INTERFACE port, E1, was at too high a level to be controlled by the *Windows* sound card control panel. The receiver produced more than adequate audio to drive the speaker and the squelch functioned as advertised.

Next I connected the receiver to the temporary turnstile antenna. The receiver produced acceptable results, consistent with the limitations of the antenna, as illustrated in Figure 3. I modeled the turnstile and displayed the elevation plot (rotated 90°) next to the imagery. There is remarkable correlation between the nulls of the antenna and the bars of noise in the image.

I inserted an antenna mounted preamp, but there was little improvement in the image quality. The preamp may help with coax line loss, but it does little to make up for marginal antenna performance. There is ample sensitivity in the R303-137 to compensate for reasonable coax line losses.

The simple turnstile antenna offers respectable results and I know of schools that produce excellent quality images with these fixed antennas (though it takes some tweaking to optimize the installation).

I Wish They Had...

In working with the R303-137 receiver, I found a few things that would improve the product.

- The documentation mentions that the power cube positive and negative leads are identified by ribbing on the positive lead (both leads are white). These ribs are a bit subtle and could be easily missed. If the power leads happen to be connected backward, the receiver will not work and there is a good possibility that the audio amplifier IC will be damaged by the reversed voltage. I wish that there were a protective diode installed in the positive voltage line to prevent damage.
- The through hole pads used to make off board connections are well marked and easy to get to. There is, however, a lack of convenient and easily identifiable ground pads for completing the interconnections. I wish that there were ground through hole pads right next to the off board connection pads to make ground returns more convenient.
- The documentation addresses two ways to feed the audio from the receiver to the computer sound card — connecting to the speaker audio output line, or connecting to a dedicated audio line that samples the audio before the audio output IC. The audio

level to the computer is critical for quality imagery. If you elect to use the speaker audio, any change in speaker volume will affect the imagery. Therefore I prefer to use a dedicated computer audio connection that is independent of the speaker volume.

The output level of the dedicated audio line, however, is fixed and at too high a level to be handled by the *Windows* sound card VOLUME control. The voltage divider circuit depicted in Figure 4 was inserted between the E1 pad on the receiver board and the computer sound card. I wish the receiver provided a way to adjust the audio output for the computer sound card connection.

■ The antenna connector mounted on the receiver board is a phono jack, I would prefer a more traditional coax connector such as a BNC jack. The phono jack works, but I found that the plugs that I had on hand in the shack would not seat all the way into the connector. Hamtronics sells an optional phono plug that probably fits just fine.

Conclusion

The last of the NOAA series of APT satellites was launched a few months ago (N19). Once the existing four birds go silent, we will lose a wonderful resource. However, I estimate that the birds will last for another 12 to 15 years, so any investment in accessing these birds is well worth the effort. The R303-137 receiver works well and is a good choice. In my view, not being plug-and-play is a plus and will encourage the development of construction skills.

Manufacturer: Hamtronics, Inc, 65 Moul Rd, Hilton, NY 14468; **www.hamtronics.com**; e-mail **sales@hamtronics.com**.

Wouxun KG-UV2D and KG-UVD1P Dual Band Handheld Transceivers

Reviewed by Bob Allison, WB1GCM
ARRL Test Engineer

Wouxun (pronounced, "Oh Sheng"), is a new name on the market. Undoubtedly, many radio amateurs have seen Chinese VHF/UHF handheld transceivers offered via on-line auction services directly from China with a temptingly low price. However tempting, these handheld transceivers transmitted throughout their entire frequency range and lacked basic FCC certification for use in the USA. Wouxun was granted FCC certification for the KG-UVD1P under Part 90 rules for commercial radios, clearing the way for use in the amateur bands.

In this review, we will look at the performance of Wouxun's KG-UVD1P and KG-UV2D, and ARRL General Counsel Chris Imlay, W3KD, will clear up misconceptions about the use of these radios in the amateur bands.

Over the summer I tested the KG-UVD1P at the ARRL Lab and had completed my review when, to my surprise, the KG-UV2D was released to the market. Wouxun's US distributor, Ed Griffin, W4KMA, informed me that the KG-UV2D is identical to the KG-UVD1P, except for a slightly different case and an improvement to one of the display functions. I got the new model, and Lab test results showed identical performance. This review covers the 2 meter/70 cm version. A 2 meter/1.25 meter version is available as well.

Out of the Box

After a successful day instructing kit builders at ARRL Expo at the 2010 Dayton Hamvention®, I eagerly checked out the KG-UVD1P handheld I had purchased. Inside the box, I found the radio, flexible antenna, battery pack, hand strap, belt clip and a drop-in battery charger. The radio shipped with a charged battery, and soon I heard the locals chatting about the day's events.

As always, read the manual first. You'll need some time to understand what the manual is trying to say, as the Chinese to English translation is at times puzzling and at other times amusing. For example, the transceiver has two receive frequencies, the "Master" frequency (channel A) and the "Vice" frequency (channel B). Needless to say, Wouxun's English is a lot better than my Chinese. The manual includes a useful *Shortcut Operation Sheet* for 30 functions.

Bottom Line

Wouxun has produced a fully functional dual band handheld transceiver for a lower than usual price. The KG-UV2D has its quirks and as long as the user purchases the programming cable and software, it should provide trouble-free operation.

Look Over

Unlike most current handheld transceivers, the Wouxun uses a *female* SMA connector on the 7 inch flexible antenna, which tightens snugly to the top of the body (adapters for other connector types are available). To the right of the antenna is a very bright LED flashlight. Next in line are the rotary encoder and ON/OFF/VOLUME controls. In front of the rotary controls are a green LED that lights when the squelch opens and a red LED indicating TRANSMIT.

The left side features the PUSH-TO-TALK switch and two "side keys." SIDE KEY 1 is used for momentarily turning on the dial lamp, enabling FM broadcast band reception, scanning functions and the SOS channel. SIDE KEY 2 opens the squelch for monitoring weak signals or turns on the flashlight. The right side features speaker (8 Ω) and mic jacks. Both jacks are used with the optional programming cable.

Each side has a battery latch, and both must be pressed firmly downward to detach the battery. There is provision for operating this transceiver with an external dc supply using an optional 12 V battery eliminator.

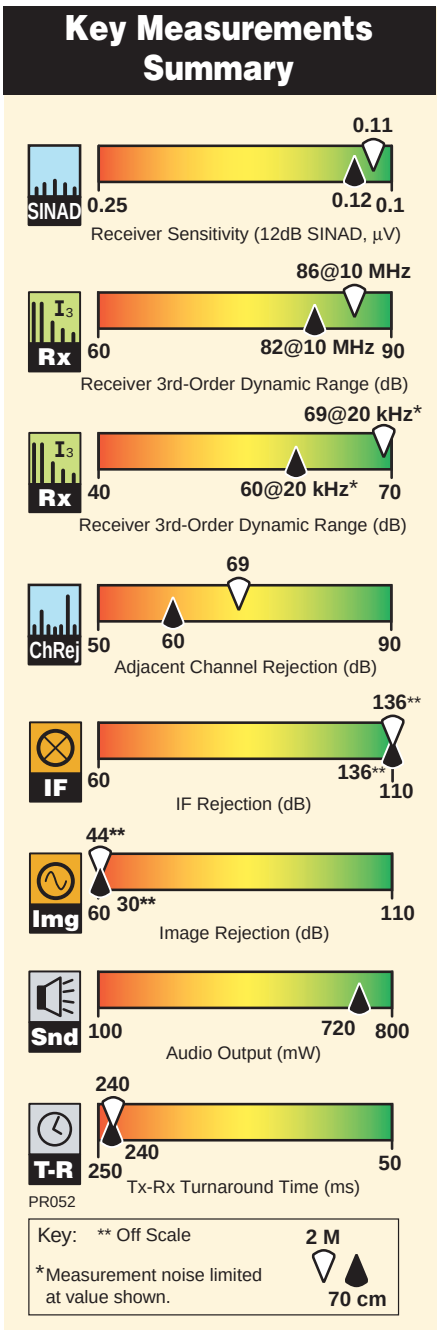
The 1 inch speaker opening on the front panel greets the user with a V shaped grille design. Below that is the A/B button to shift transmit from Channel A to B. You can listen to two frequencies at once, but both receivers are muted upon transmit so this is

not a full duplex transceiver. The TDR button just below the speaker switches the receiver from single band to dual band operation.

The easy to read 9/16 × 1½ inch display is backlit automatically when you press SIDE KEY 2 or any key on the front panel and it stays illuminatred for about 4 seconds. The 16 button keypad includes the function button and shortcuts to some features. The number, # and * keys are fully functional DTMF keys; odd tones are emitted through the speaker if other keys are pressed during transmission.

Lab Testing

Lab test results are shown in Table 3. These results are for the KG-UV2D, but the KG-UVD1P I tested was virtually identical.



There were no unexpected problems during testing, but I will note a few things I would like to see improved.

While the minimum squelch threshold was 0.05 µV (good), the maximum squelch threshold was 0.15 µV — not useful to block out weak co-channel users. I'd like to see at least 5 µV maximum.

I found the S meter to be virtually useless. The radio shows full scale S-meter readings with a very low level signal input, making received signal level comparisons difficult. A more useful sensitivity range would be helpful, especially if working satellites or while participating in radio direction finding activities. I've owned handhelds with no S meter, so I didn't consider this to be a major drawback.

The other testing issue was a rather poor ability to reject images, especially on the 70 cm band. While this isn't a problem with the flexible antenna, images may be an issue if the radio is used with a higher gain external antenna in RF congested areas.

Tests showed the KG-UV2D to be very sensitive, with respectable dynamic range figures and good IF rejection. RF output was slightly higher than specified on both bands at full charge, as was audio output from the external speaker jack. The KG-UVD1P and KG-UV2D both meet FCC requirements for spurious signal and harmonic suppression. Spectrally, the KG-UV2D tested even better than the KG-UVD1P.

On the Air: It Talks!

The Wouxun KG-UV2D can speak either in English or Chinese to announce pressing the key pad numbers or while programming functions, though it does not announce the specific selection made for each function. For example, if I'd like to adjust my RF output power, I press the MENU button and *function select* is announced. I then rotate the encoder knob around to read TXP (function 04), I then press the menu button again and *power select* is announced. I rotate the encoder knob to read LOW and press menu again and unfortunately, it announces *enter*. Still, this transceiver is useful for visually impaired hams. Buddy Brannan, KB5ELV has written, "Tips and Hints for Eyes Free Operation" of the KG-UVD1P. It's available on the Wouxun.US Web site.

I made many contacts on 2 meters and 70 cm and received reports of good voice clarity and correct modulation level. Receive audio quality is very good, with plenty of extra volume to overcome background noise. An icon on the display indicates a signal is being received on the "Vice" (B) channel, eliminating confusion as to what frequency or channel is active. I noticed no unusual heating of the case during high power operations.

The battery takes about 5 hours to fully charge. One feature I almost missed was a 12 V dc input jack at the base of the charging stand to charge the battery pack with an external 12 V supply, such as a car battery, if needed. During three days of normal use, the batteries held up very well. I cannot call this device a battery hog.

The lightweight polycarbonate case is very comfortable to use. I made it a point to use the KG-UVD1P nearly every day for a period of two months. While long-term reliability is still unknown, my initial impression is that with care, durability problems shouldn't be encountered.

Programming

The slightly older KG-UVD1P has three display modes, but the nomenclature is confusing. For example, *frequency mode* is called *VFO mode* on other VHF FM transceivers. *Channel mode* is normally called *memory mode*. Function #21 selects the *working mode* (display mode), which selects frequency mode, channel mode and *name display* mode. While the user can quickly toggle between frequency and channel mode by pressing MENU + TDR, Function 21 must be used to get back into the name display mode. The KG-UV2D solved this issue by allowing the MENU + TDR toggle to change the display from frequency to channel mode with name included in the display, a much needed improvement.

My first attempt at programming channel memories into the KG-UVD1P resulted in frustration. Manually programming this radio is cumbersome and not intuitive, but can be done with practice.

My advice is to purchase the optional USB programming cable. The instructions that came with the programming cable were clearly written and included the necessary information to download USB drivers and programming software. There are several USB driver choices. Although Wouxun. US suggested the Prolific driver for my *Windows XP* system, I could not get that one to work so I tried the Wouxun driver, which worked the first time. You can also download a program called *FindComPort* (you need to assign a port number before programming).

The Wouxun software is easy to use but basic. I soon had most of the 128 available channels programmed and named. Channel numbers are announced while in either the channel or name display modes. I programmed my favorite repeaters and simplex frequencies in channels 1 to 5. I found that I could change memory channels without looking at the radio while driving.

Other Features

Other popular and more expensive handheld transceivers are packed with use-

Table 3
Wouxun KG-UV2D, serial number J08-8772

Manufacturer's Specifications	Measured in ARRL Lab
Frequency coverage: Receive and transmit, 136-174 MHz; 350-470 MHz, 76-108 MHz ("FM Digital").	Receive, 136.0-174.995, 350.0-470.995 MHz, 76-108 MHz (FM broadcast); transmit 144.0-147.995, 420-449.995 MHz.
Modes: FM.	FM, FM narrow.
Power requirements: 7.4 V dc (battery only).†	Receive, battery power, 287 mA (max vol, no signal, lights on), 30 mA (power save); transmit, 1.43 A high, 0.77 A low (8.4 V dc).
Receiver	**Receiver Dynamic Testing**
FM sensitivity: 12 dB SINAD, 0.16 µV.	For 12 dB SINAD, 146 MHz, 0.11 µV; 162.4 MHz, 0.11 µV, 440 MHz, 0.12 µV.
FM two-tone, third-order IMD dynamic range: Not specified.	20 kHz offset: 146 MHz, 69 dB,* 440 MHz, 60 dB*; 10 MHz offset: 146 MHz, 86 dB, 440 MHz, 82 dB.
FM two-tone, second-order IMD dynamic range: Not specified.	146 MHz, 84 dB; 440 MHz, 99 dB.
Adjacent-channel rejection: 25 kHz offset, 70 dB; 12.5 kHz offset, 60 dB.	20 kHz offset: 146 MHz, 69 dB; 440 MHz, 60 dB.
Spurious response: Not specified.	IF rejection, 146 and 440 MHz, >136 dB; image rejection, 146 MHz, 44 dB; 440 MHz, 30 dB.
Squelch sensitivity: Not specified.	At threshold, 0.05 µV; 0.15 µV (max).
Audio output: 0.5 W.	0.72 W at 10 % THD into 8 Ω (external speaker). THD at 1 V RMS, 1.8%.
Transmitter	**Transmitter Dynamic Testing**
Power output: VHF, 5 W, UHF 4 W.	146 MHz, 5.2 W (high), 1.3 W (low); 440 MHz, 4.3 W (high), 1.4 W (low) at 8.4 V dc (full charge).
Spurious signal and harmonic suppression: >60 dB.	146 MHz, >70 dB; 440 MHz, >70 dB, meets FCC requirements.
Transmit-receive turnaround time (PTT release to 50% of full audio output): Not specified.	Squelch on, S9 signal, 240 ms.
Receive-transmit turnaround time ("tx delay"): Not specified.	146 MHz, 30 ms; 440 MHz, 50 ms.
Size (height, width, depth): 4.1 × 2.3 × 1.5 inches, weight, 8.8 oz.	
Price: KG-UV2D (146/440 or 146/222 MHz), $107. KG-UVD1P (146/440 MHz), $107. USB programming cable, $18; speaker mic, $14.	

†7.4 V, 1300 mAh Li-ion battery and drop-in charger supplied. Available options: 1700 mAh Li-ion battery, $24; 12 V battery eliminator, $12; dual slot charger, $24; 12 V car charger, $10; AA battery pack, $8.
*Measurement was noise limited at the value indicated.

Is It Legal?

The FCC doesn't require equipment authorization for any "Amateur Radio" transmitter to be operated under Part 97, except those that incorporate scanning receivers, which require a grant of certification. If an Amateur Radio transmitter also includes frequencies allocated to other services, and if the device is intended to operate in those other services as well as the Amateur Service, then the transmitter must be certified for all non-Part 97 radio services for which it is intended to operate. The FCC uses the term "intended to operate" as being equivalent to "capable of operation."

Wouxun is able to legally market a device that operates in the bands specified and that has a scanning receiver, because it has a certification grant (for Part 90 operation) which satisfies the certification requirement with respect to the scanning receiver. It can be operated by Part 97 licensees and by Part 90 licensees in their respective frequency bands.

Wouxun US chooses to limit the frequency range of the amateur version of the device to ham bands only. Restricting the frequency range of the device to ham bands only is okay as a Class I permissive change (without recertification) as long as the means for restricting the frequency range in the amateur version of the device is not done with hardware changes and without any denigration of the characteristics of the device as reported to the FCC. Wouxun US presumably wants to make sure that Part 97 licensees do not operate the device on Part 90 channels, and vice-versa. It is good practice for them to market the ham band only version to hams, and to market the Part 90 band only version to Part 90 licensees. Good fences make good neighbors.

— Chris Imlay, W3KD, ARRL General Counsel

ful functions. While the KG-UV2D is not nearly as sophisticated, it does have a few useful added features. The LED flashlight, for example, is very effective. While effective, the flashlight is not always functional. With the squelch open, you cannot turn the flashlight on. Consequently, if the flashlight is already on, you must have a closed squelch to shut it off. Strange, but considering the flashlight button is also the momentary SQUELCH OPEN button, I'm not surprised.

Both radios include an FM broadcast tuner. Called "FM Digital" in the manual, the tuner is analog only. Frequency selection is accomplished by turning the encoding knob or by pressing either the UP or DOWN button. Audio is clear but some of the strongest stations overload the receiver, causing crackles in the sound. Reorienting the antenna reduces this unwanted effect. It appears that in China, the FM broadcast band is 76 to 108 MHz. I was reminded of this regularly since it reverts to 78 MHz each time the radio is turned on. While it's cumbersome to crank the knob to reach our FM broadcast band starting at 88 MHz, I'm still pleased that this inexpensive transceiver has this feature.

Other features include a stopwatch, an SOS function, a VOX and the ability to switch from high to low power and back while transmitting by pressing the TDR button.

It is interesting to have a handheld transceiver that can speak Chinese. I've learned how to count from zero through nine and words such as enter and function. Most of the time, I use the English mode and I have to admit, I have grown fond of the young lady with the Chinese accent inside my radio.

Distributor: Wouxun.US, PO Box 451, New London, NC 28127; tel 704-463-5820; **www.wouxun.us**.

TECHNICAL CORRESPONDENCE

AN AUTOMATIC LOW-PASS FILTER (LPF) BYPASS SWITCH (THE DOCTOR IS IN, OCT 2009)

♢The October 2009 "Doctor Is In" column discusses the pros and cons of having an external low-pass filter (LPF) following the transceiver, concluding that while an external LPF is not required by the FCC, having one is good engineering practice to reduce out of band radiation as much as possible. I am a proponent of having an external LPF in-line whenever feasible. In my case, even though TV stations are broadcasting digital signals these days, and both analog converter boxes and digital TVs seem to be much less sensitive to RFI, I want that extra margin of safety that an external LPF provides.

In-Line Low-Pass Filter

Having a LPF in-line while operating HF will minimize the chance that I will interfere with nearby neighbors who may have devices operating above the HF range. One of the cons, as the "doctor" mentions, is that a 30 MHz cutoff filter must be removed in order to operate on 6 meters. [At least one manufacturer, R. L. Drake, offered a LPF with a 52 MHz cutoff frequency. — *Ed.*] When I forget to do this, which is not infrequently, at the first transmission my Elecraft K3 HF and 6 meter transceiver immediately lets me know by shutting down. Another con for me is the necessity of rearranging the PL-259 plugs whenever I operate 6 meters.

To improve operating convenience, not to mention reduce wear and tear on the connectors, I decided to construct an automatic LPF bypass switch triggered by the K3 BAND OUTPUT signals. This device then automatically removes the LPF from the signal path if the operating frequency is moved to the 6 meter position. A three position switch is provided to select automatic control (radio selects LPF), normal (LPF in the circuit) or bypass (LPF out of the circuit). This makes manual selection easy if the band output signals need to be overridden, or if they are not available. An LED indicates whether or not the LPF is bypassed. Other HF and 6 meter transceivers may have different band data coding, but the circuit should be easily adaptable to them as well.

Circuit Description.

A schematic diagram of the automatic switch box is shown in Figure 2. Two on hand 12 V dc coil SPDT relays are used, one for switching the LPF input side and the other for the LPF output side. Other than availability, using two relays in place of a single DPDT relay provides some amount of physical separation thereby minimizing potential stray LPF input-to-output coupling. Each relay also has a measured open contact capacitance of 4 pF, which equates to having a 2 pF capacitance across the LPF IN to LPF OUT terminals. This relatively high shunt impedance does not appear to change my LPF filter's performance. The relays are rated at 5 A at 240 V ac continuous, which is more than adequate for continuous power levels in the 600 W range for low (< 1.5:1) SWR. So far I have had no problems using my 600 W amplifier with the bypass box and I believe the upper power limit may be over 1 kW for CW and SSB amateur service, provided hot switching is not attempted.

The relay driver circuit consists of two commonly available small signal transistors, Q1, an NPN device, and Q2, of the PNP variety. Both transistors are off when the LPF is in line and both are on when the LPF is bypassed. Zener diode D5 provides noise immunity for Q1, preventing unintended turn-on due to RFI inside the box. The turn-on threshold for Q1 is the 6.8 V Zener voltage plus the ~0.4 V base to emitter threshold voltage or in total ~7.2 V. Q1 turns on Q2,

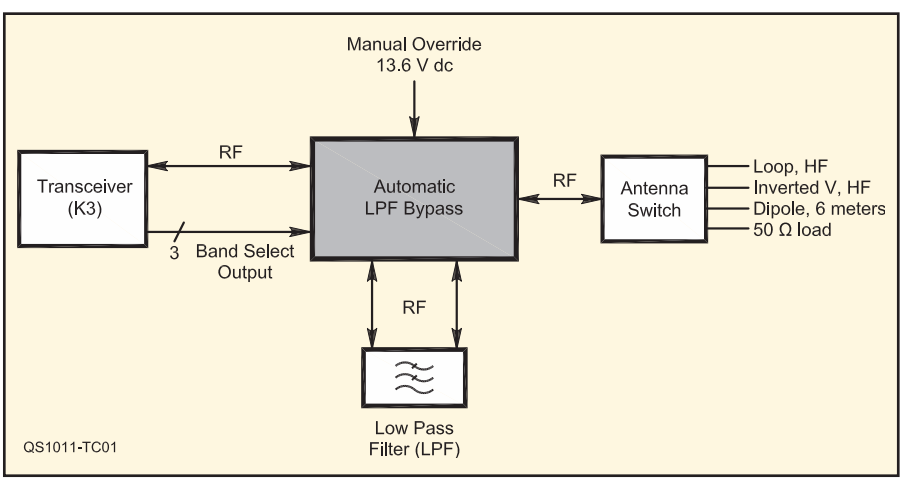


Figure 1 — Block diagram of the K1LC automatic LPF selection arrangement.

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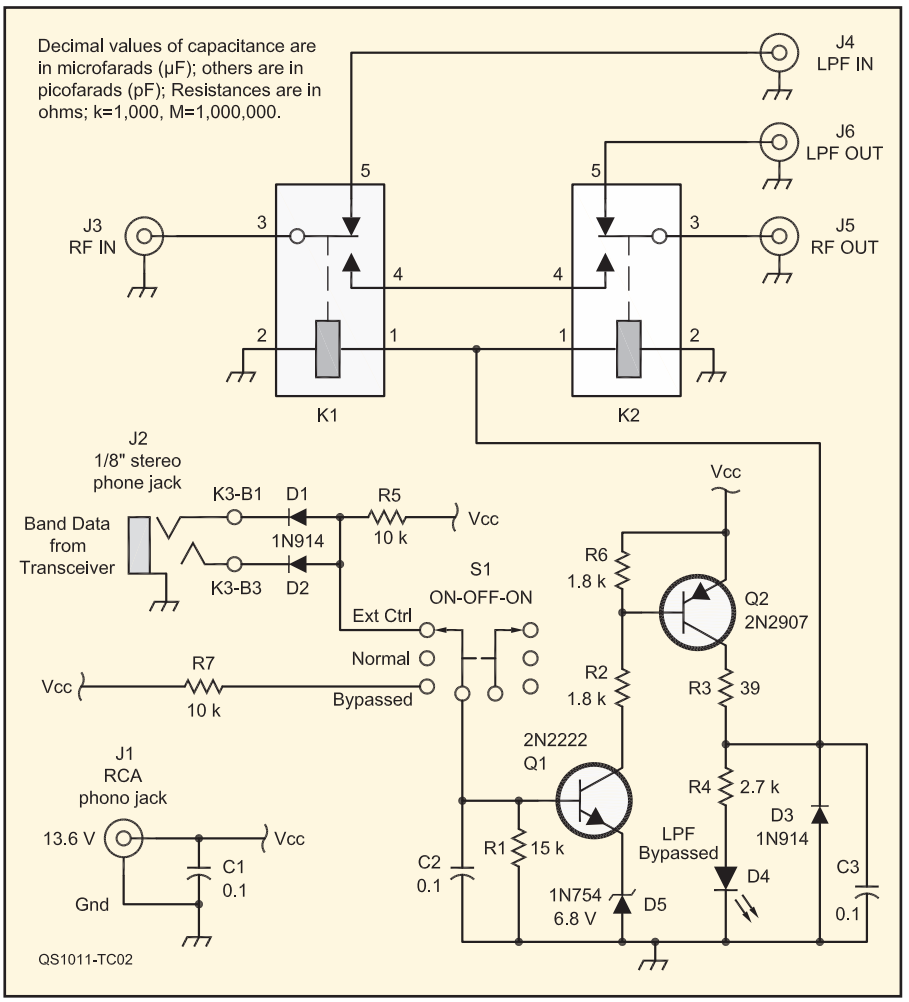


Figure 2 — Schematic diagram and parts list of the LPF automatic bypass switcher.

C1-C3 — 0.1 µF, 50 V disc ceramic capacitors.
D1-D3 — Silicon diode, type 1N914.
D4 — Light emitting diode.
D5 — Zener diode, 6.8 V, type 1N754.
J1 — Phono jack, RCA type or coaxial power connector.
J2 — ⅛ inch stereo phone jack.
J3-J6 — SO-239 type coax panel jack.
K1, K2—SPDT miniature relay, 12 V dc coil, 5 A, 240 V contacts.
Q1 — 2N2222 NPN small signal transistor.
Q2 — 2N2907 PNP small signal transistor.
R1 — 15 kΩ, ¼ W, 5% resistor.
R2, R6 — 1.8 kΩ, ¼ W, 5% resistor.
R3 — 39 Ω, ¼ W, 5% resistor.
R4 — 2.7 kΩ, ¼ W, 5% resistor.
R5, R7 — 10 kΩ, ¼ W, 5% resistor.
S1 — DPDT, center-off miniature toggle switch.

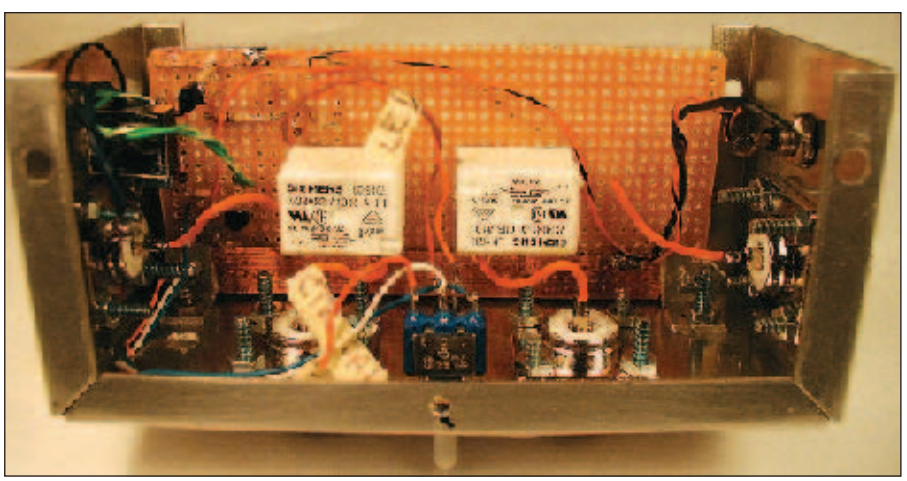


Figure 3 — Interior view of switching box. The white rectangles are relays K1 and K2.

activating both relays and illuminating the LED. R3, a 39 Ω resistor, limits Q2 current and drops the 13.6 V supply voltage to about 12 V for the relays.

Decoding the K3's band signal outputs is quite easy. To indicate band selection the K3 provides four open-drain outputs BØ, B1, B2 and B3. Depending on the selected band, these signals are either low or open. With external pull up resistors they produce low or high logic level signals. Fortunately to detect when the 6 meter band is selected it is only necessary to look at two of these signals, B1 and B3. Both are open or in the high state only when 6 meters is selected. Diodes D1 and D2 decode this condition and turn on Q1, provided S1 is in the automatic control position. D1 and D2 can be eliminated if no other equipment uses the band signal outputs. To minimize RF pickup I use a shielded twisted pair line to connect the K3's B1 and B3 band signal outputs to the LPF bypass box via a ⅛ inch stereo plug. Internal wiring is not critical other than keeping the RF runs as short and direct as possible and away from other wires.

Construction

Figure 3 shows the construction arrangement. The chassis consists of a two piece 2¼ × 2¼ × 5 inch aluminum project box. Also required are a three position toggle switch, LED, four SO-239 coax jacks for RF IN, RF OUT, LPF IN and LPF OUT. There is also a ⅛ inch stereo jack for BAND DATA input and an RCA phono jack for 13.6 V dc power. The inside contains a copper clad perforated board with two SPDT relays, relay driver and band signal decoder. I added two self tapping screws, one on each side, to better secure the bottom section to the top section for improved RF tightness.

I find the Automatic LPF Bypass box a useful addition to my shack and hopefully others will as well. — *73, Bud Colclough, K1LC, 11 Patriots Way, Hingham, MA 02043-3667*; **k1lc@arrl.net**

A FAN CONTROLLER FOR THE MFJ-4125 POWER SUPPLY (FEB 2010)

◊Alan Bloom's *QST* article illustrates a common misunderstanding about temperature sensors. Since many of us use these devices for a variety of purposes, the article presents a good opportunity to understand them better. Most current temperature sensors whether active, such as the MCP9701 in the article, or passive such as RTDs (resistance temperature detectors), come in plastic packages. The most common package is the TO-92 shown in the article. Even thermistors, which are often dipped in epoxy, behave similarly to a degree.

Plastic is a relatively poor conductor of heat. Because of this, most of the heat transfer in a plastic packaged device occurs not through the body, but through the leads. Figure 4 in the article shows a carefully formed *small metal half-round cable clamp* designed to transfer heat to the sensor. The truth is, if the clamp were removed and the transistor left hanging in mid-air there would probably be no discernable change in behavior.

If good thermal contact between the sensor and the heat sink is desired in this case, the clamp should be removed and the IC straightened up and inserted with the shortest possible leads. These leads should be bent and soldered to the largest copper pads and traces possible. The traces should then be thermally coupled, with a silicon pad or similar material, to the heat sink. Since one of the pads is grounded, as presumably is the heat sink, direct physical connection with silicon grease would be an even better option.

In many cases these temperature sensors measure ambient temperature, so the exact thermal model is not highly significant. If measuring a temperature that is not ambient, however, you will obtain best performance using an accurate thermal model. Trying to measure heat through the plastic case of the sensor is analogous to trying to measure the secondary voltage of a transformer by attaching meter leads to the laminated core. *— 73, Wilton Helm, WT6C, 320 Old Y Rd, Golden, CO 80401-9563,* **wt6c@arrl.net**

The author responds:

Thanks for your comments. I'm well aware that for surface mount packages, nearly all the thermal conductivity is through the leads, not the package. However, I have never heard that about through-hole devices.

The MCP-9700/9701 is available in both surface-mount and through-hole packages. The data sheet says:

...A low-temperature thermal path between the die and the PCB is provided by the pins. Therefore, the sensor effectively monitors the temperature of the PCB. However, the thermal path for the ambient air is not as efficient because the plastic device package functions as a thermal insulator from the die. This limitation applies to plastic-packaged silicon temperature sensors. If the application requires measuring ambient air, consider using the TO-92 package.

That sounds like it agrees with you except for the last sentence, which seems to imply that the TO-92 package must be sensing through the package rather than the leads in order to measure air temperature rather than PC board temperature.

One further clue from the data sheet is that the junction-to-air thermal resistance of the SOT-23 surface-mount package is 336°C/W but only 131.9°C/W for the TO-92 package. Now it's true that the TO-92 package has fatter leads, but they are also much longer than the leads on the SOT-23. If most of the thermal conductivity is through the leads, then you would not expect the TO-92 to have such a lower thermal resistance.

I think the most important clue is that after running the supply at maximum load for several minutes, the sensor was indicating over 80°C. The air was definitely not getting that hot! It had to have been measuring the temperature of the heat sink, not the air.

So I'm not convinced that there isn't good thermal conductivity through the package. I used the clamp to get maximum contact area so that the sensor would be sensing mostly the heat sink temperature rather than the air temperature. I feel confident it does that. *— 73, Alan Bloom, N1AL*

Technical Correspondence items have not been tested by *QST* or the ARRL unless otherwise stated. Although we can't guarantee that a given idea will work for your situation, we make every effort to screen out harmful information.

Materials for this column may be sent to ARRL, 225 Main St, Newington, CT 06111; or via e-mail to **tc@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 a work, please send the author(s) a copy of your comments. The publishers of *QST* assume no responsibility for statements made herein by correspondents. QST

New Products

MFJ 80/160 METER MATCHING UNIT FOR 43 FOOT VERTICALS

◊ The MFJ-2910 (right) is a matching unit that can improve efficiency on 160 and 80 meters when used with a 43-foot all band vertical antenna. Installed at the base of the vertical, the MFJ-2910 is designed to significantly lower losses in the coaxial feed line and unbalanced-to-unbalanced transformer (unun) typically used to feed these antennas. It has a switch for 160 meters, 80 meters and off (for the other bands) and is rated for 1500 W PEP. The MFJ-2910 includes a remote power injector so a separate power cable for the switching circuitry is not required. The unit is housed in a weatherproof PVC cabinet. Price: $249.95. To order, or for your nearest dealer, call 800-647-1800 or see **www.mfjenterprises.com**.

BIRD WATTMETER UPGRADE FROM ARRAY SOLUTIONS

◊ The AS-43A (right) from Array Solutions is a digital replacement for the analog meter movement in Bird 43 directional wattmeters. The AS-43A works with Bird 43 elements for any frequency range and 14 selected power ranges from 1 W to 25 kW. It's powered from AA cells and is said to operate for up to 400 hours with the backlight off or 50 hours with it on. The conversion involves removing the old meter movement and installing the new module in the same space. Price: $189. For more information or to order, see **www.arraysolutions.com**.

RADIO OPERATIONS CENTER SC SOFTWARE FROM CSS

◊ *Radio Operations Center SC* software from Creative Services Software now supports control of Alinco, ICOM, Kenwood and Yaesu transceivers. *Radio Operations Center* programs offer a quick and easy way to get on the air with the digital modes, and they allow operators to use just one program for digital. The software has a built in logbook and radio control, and applications include ragchewing, DXing, contesting, traffic handling, emergency communications and more. Price: $39.95 each. For more information, visit **www.cssincorp.com**.

W1ZR

THE DOCTOR IS IN

Q Donald, N4VIP, asks about the definition of S-unit in "Hamspeak" in the August 2010 issue of *QST*. It said "…Each S-unit is intended to represent a factor of 2 in input voltage at the receiver antenna terminals." He wonders how that equates to the 6 dB definition of a standard S-unit, since he learned that a factor of 2 is 3 dB.

A Calculating decibels can be a bit confusing. While a factor of 2 in power at the same impedance is, indeed, equal to 3 dB, a factor of 2 in voltage (as stated), results in a power ratio of 2^2 or 4 (the double voltage results in twice the current, too). Note also that Ohm's law for power is $P = E^2/R$. Thus a voltage ratio of 2 equates to a power level of 4 or 6 dB. The same factor of 2 also shows up directly in the formulas used to calculate decibels.

For power: $dB = 10 \times \text{Log}_{10} (P_2/P_1)$, while for voltage:

$dB = 2 \times 10 \times \text{Log}_{10} (V_2/V_1)$

$= 20 \times \text{Log}_{10} (V_2/V_1)$

Q Gary, KC7FHP, asks: I have long been confused about the FCC's definition of peak envelope power (PEP). "Hamspeak" on page 105 of the July issue of *QST* talks about the average of the peak. I understand that PEP is at the peak of the modulation envelope. But then if I use CW, the modulation is always at its peak. Is that what PEP means when it is defined as the average power supplied to the transmission line at the crest of the modulation envelope?

A It does sound a bit confusing. First, change your mind set to think in terms of "average power." Average power is the product of $V_{RMS} \times I_{RMS}$, which is what most meters read. So yes, if your CW transmitter puts out 1500 W average power, that is also your PEP output and it is within the FCC limit.

The confusion comes with voice modulation. The power from an SSB transmitter varies with the voice envelope, and is hard to follow on a basic analog power meter because of the finite inertia of the meter needle and coil assembly. A *peak reading* wattmeter performs an electrical hold function to capture the reading at the peak of the speech waveform and thus indicates the average power at the peak of the voice waveform. If you were to whistle into an SSB transmitter, the power would sit at the peak as long as you held a constant whistle. Again, it is the average power during the peak of your speech waveform.

Q Chris, NB5T, notes: I am thinking of replacing my G5RV antenna with one or more HF band specific dipoles with the intent of reducing background noise, especially on 40 and 80 meters. Tuned antennas are effective radiators and one might expect that they would more efficiently receive the wavelengths for which they are tuned. Antenna modeling for best efficiency or effectiveness seems to be geared toward transmitting signals and not toward receiving them, and I am not sure how to investigate or research how much better a dipole would be at receiving signals than a G5RV. How much more effectively or efficiently (if any) would signals be received by using a single or multiband dipole than a G5RV? How much of an improvement in background noise might I expect, and is there any antenna modeling that could be performed to demonstrate receive effectiveness or efficiency using band-specific dipoles?

A You will find many advantages from having more efficient antennas, but unfortunately less noise will not generally be one of them.

If you are concerned about the usual HF atmospheric noise, it, along with the signals, will increase in strength as you improve your antenna system efficiency. The only way to improve your S/N from the antenna is to determine the directions that the noise is coming from and adjust your antenna orientation to reduce pickup of noise (and signals) from those directions.

In some cases, the noise is not atmospheric, but comes from power lines or localized electrical machinery and other equipment. If so, a dipole (or G5RV) null may be useful in reducing the noise. Atmospheric noise, however, tends to come from most azimuths, but not from all elevation angles.

On the lower bands, 160, 80 and to a lesser extent 40 meters, serious DXers use Beverage, loop and other specialized receive antennas to reduce noise. These antennas are actually less efficient than a dipole, but they pick-up from low angles, reducing the noise from high angles while reducing the strength of the low angle signals by a lower amount. The result is a weaker signal than from the dipole, but a higher S/N — usually a good trade on the low bands.

The G5RV type antenna is actually about as efficient a radiator as a resonant antenna of similar size. The loss of efficiency is mostly due to the less than perfect match to the coax on some bands. The high SWR on the coax results in increased loss (of both signal and noise). After I determined that I had 4 to 6 dB of loss in the 100 feet of high quality coax going to my G5RV, I replaced the coax with low loss window line all the way back to my tuner. I have been happy ever since.

Because the G5RV has nulls in its azimuth pattern, particularly on the higher bands, it is still good to have a few dipoles around to fill in the pattern.

Antenna modeling is a great way to determine the pattern on each band. The response will be the same for both transmit and receive. Antennas such as G5RVs and dipoles are able to be modeled on the demo version of *EZNEC* that comes with *The ARRL Antenna Book* or is available for download from **www.eznec.com** at no cost.

Q Frank, W2NJ, asks: My antenna support point (a nicely weathered oak tree) sits about 70 feet away from my shack entry point. I've been using coax fed antennas up to now, and I generally run a 100 foot length out to the antenna. I prefer not to trim it — who knows when I might need the extra footage. So I either coil the excess as a 1:1 balun at the antenna feed point or simply in a neat coil inside the shack.

I'm now replacing the coax-fed antenna with a window line fed 20 meter dipole. Again, I have 100 feet of line that I'd like to leave intact. I figure I need about

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

85 feet of feed line. What's the best way to neatly store the excess 15 feet? If I were to wind it into a neat coil (each turn snugly flat within the previous turn, then held in place with electrical tape), would it in any way affect performance?

A I suspect you will be happy with your choice, especially since it will be easier to use the antenna on other bands. Unfortunately, that is one of the limitations of window line. Unlike properly terminated coax, in which the fields are within the shield — window or open wire line has fields extending out from the line several times the wire spacing distance. In order to have minimum loss and the designed characteristics of the line, it needs to be away from other objects including the ground, by a comparable distance. Thus it won't operate properly if tightly coiled as you propose.

There are times, such as for impedance matching purposes, in which additional line is required. One correspondent recommended wrapping it in a spiral around a plastic cylinder with appropriate spacing between turns. That should work, although I haven't tried it. I have run it in a large hairpin between basement ceiling joists. I held it off the wood, and away from pipes and other wiring, using screw in TV type standoff insulators and brought it back on the opposite joist.

It's good to start out with some extra line, since you may need to trim it a bit if it doesn't tune properly on all bands.

Q Dick, W6SGJ, asks: I have a question about the polarization of the directional discontinuity ring radiator (DDRR) antenna. Typically the orientation of an antenna determines its polarization. Most of the DDRR is physically horizontal, so why is it a vertically polarized antenna?

A The DDRR (see Figure 1) was an antenna patented in the 1960s for shipboard use as a compact vertical radiator. The DDRR was subsequently a popular topic in the amateur press for some years thereafter.[1,2,3] Robert Dome's article concluded that the DDRR was really a very short, capacitively hat loaded, vertical monopole rather than a new class of antenna. Because of the short vertical radiator section, as with any heavily loaded antenna, the input impedance and radiation resistance are very low, resulting in a very inefficient and narrow bandwidth antenna.

The antenna's polarization is a function of the orientation of the electric field, which radiates from the short vertical section going to the "ring" loading structure. Since that part is vertical, the polarization of the antenna is vertical.

No one has talked much about DDDRs for some years, I guess since its limitations were determined. There are many ways to make a loaded short vertical monopole, and most suffer from the same limitations. Yes, it *will* work — an antenna can be very small and still radiate, as long as you can get power to it — but much of the power will be end up in the antenna's losses.

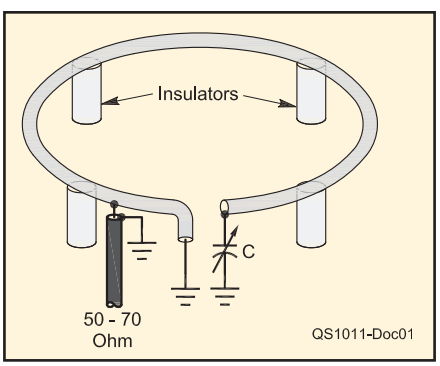


Figure 1 — Drawing of a "DDRR," in reality a short vertical monopole with capacitive end loading. In use, the antenna is mounted a few inches above a metal plate or screen, serving as the ground.

Q Ed, K9EGS, has a couple of questions regarding amplifiers: I have read in advertisements that the first 600 W makes most of the difference compared to a barefoot 100 W signal. They state that 600 W gives a person 2 S-units more than 100 W. So if my barefoot signal was an S-6 at the other person's receiver S-meter, then my signal with a 600 W amplifier would be an S-8. Is that correct?

They also state that the difference between a 600 W amplifier and a 1.5 kW amplifier is less than 1 S-unit increase at the other person's receiver. So if my barefoot signal was an S-6 at the other person's receiver S-meter and my 600 W signal was an S-8, then my signal with a 1500 W amplifier would be an S-9. Is that correct?

If these statements are correct, it seems like a strange concept. The average person would think that the difference between a 100 W signal and a 600 W signal would be that the 600 W signal would be 6 times stronger. Using that same way of thinking, the 1500 W signal would 15 times stronger than the barefoot 100 W signal.

The reason that I ask all this is because I am contemplating the purchase of an amplifier. I like the price and the reviews for a 600 W amplifier. If the above statements are true, then I can't see spending 3 or 4 times the amount or more for a 1.5 kW amplifier. The same manufacturer makes an 800 W unit, but that increase (from 600 W) would not seem to be worthwhile if the difference between the 600 and 800 W amps are only a fraction of an S-unit. Am I comprehending this concept correctly?

A The confusion comes from the fact that S-units are related to decibels (dB), a logarithmic function. The problem is compounded by the fact that most S-meters are not designed to meet the standard, originally proposed by Collins and adopted by some standards bodies. The Collins standard is:

S-9 = 50 μV at the antenna terminals, and
Each S-unit represents a 6 dB difference.

Some recent transceivers actually have S-meters that work that way. Some even have the reading independent of RF gain, preamp and attenuator settings — as it should be by the definition. Many transceiver manufacturers seem to like to have meters move more so they will seem more sensitive. Therefore, if you check on the air, you can get many different answers.

A power increase of a factor of 4 is 6 dB = 1 S-unit. Thus increasing from 100 W to 400 W, or 400 W to 1600 W (if we were allowed) would each give a 1 S-unit increase at the far end. And yes, the first increase is usually cheaper than the second.

Using the Collins definition, your proposed increase from 100 to 600 W represents a factor of 6, or 7.8 dB — 1.3 S-unit. That is significant, about the same as going from a dipole to a good three element Yagi. That's what I use and it makes a real difference under marginal conditions.

To go from 600 to 1500 W is an increase of a factor of 2.5, about 4 dB or 0.7 S-unit. About half the increase of the first step. To jump the whole way from 100 to 1500 W is an increase of a factor of 15, about 11.8 dB, or almost 2 S-units. Note that adding 7.8 to 4 = 11.8 dB, because adding logs is the same as multiplying the numbers.

In summary, the first jump does make the most difference and gives the best bang for the buck (that's why I ended up there). The next increment might be more cost effective with antenna changes rather than amplifier upgrades, although there are some low cost older amps around.

Of course doing everything (1500 W and a better antenna) will make the most difference!

[1]W. English, W6WYQ, "A Practical DDRR Antenna," *73*, Jun 1970, pp 20-35.
[2]W. English, W6WYQ, "A 40-Meter DDRR Antenna," *QST*, Dec 1971, pp 28-32.
[3]R. Dome, W2WAM, "A Study of the DDRR Antenna," *QST*, Jul 1972, pp 27-36.

Do you have a question or a problem? Ask the Doctor! Send your questions (no telephone calls, please) to "The Doctor," ARRL, 225 Main St, Newington, CT 06111; doctor@arrl.org. QST

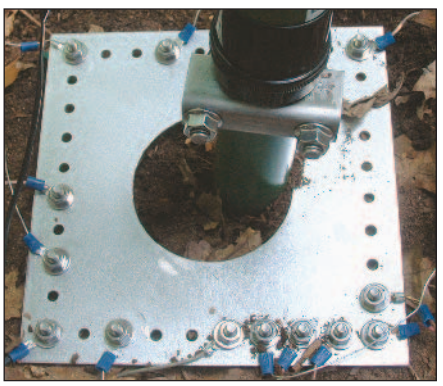
SHORT TAKES

S9v Multiband Vertical Antenna

Change is good, painful as it may occasionally be. Recently my local electric company decided to undertake a sweeping upgrade of the lines along our street. This entailed replacing the ac drop to our house with a new line arriving from a very different angle. Unfortunately, the new ac drop was going to pass entirely too close to my short inverted L antenna. It was time to move.

The fact that I'm living on a tiny bit of land — and that I'm married to a wonderful woman who, despite her general affability, doesn't enjoy the sight of my antennas — reduced my options considerably. After a quick survey, I decided it was time to go vertical in the trees along the properly line. To accomplish this I needed something light, stealthy and easy to erect.

The S9v arrives as a 45 inch collapsed fiberglass tube assembly. The radiator wire is drawn into the bottom of the tube as you extend the sections.



The S9 radial plate. The antenna fits over the mount and rests on the saddle clamp (also available from S9 Antennas). The antenna can also rest directly on the soil if necessary.

Thirty-one feet of vertical antenna soaring into the branches. It is difficult to see, but that's the idea!

Enter the S9v

I decided to order a 31 foot S9v vertical from S9 Antennas. Along with the antenna, I also ordered the S9 portable ground mount and radial plate. The antenna arrived as a collapsed multisegment fiberglass tube assembly only 45 inches in length. Dangling out of the bottom of the tube was a 31 foot length of insulated wire — the S9v radiator. The antenna doesn't come with instructions, so before I got started I had to download and print the manual from the S9 Web site.

I chose a spot among the vegetation and pounded the mount into the rocky Connecticut soil. The mount is little more than a spike within a steel tube. After a few minutes of hammering with a mallet, it was securely in place.

The antenna telescopes easily. You simply pull each section forward and then twist and lock. A stainless steel screw makes sure each section stays in place. The radiator wire is drawn into the tube from the bottom as you extend the sections.

Deploying the S9v took all of 15 minutes and with its forest green camouflage the fiberglass tube blended perfectly among the leaves. With the last section extended and locked, I lowered the antenna onto the mount. The mount fits snugly into the bottom of the antenna — no screws or clamps needed. Finally, I fished out the end of the radiator wire as instructed.

Cutting and laying the radial wires involved an hour's worth of work. I had to be careful to arrange them away from my wife's garden and her precious Japanese maple. I used some nifty little radial staples available from Ross-Radio (**radialstaple.wordpress.com/ross-radio/**). You stretch out the radials on top of the grass, secure them with the Ross staples, and within a few months Mother Nature buries the wires for you.

On the Air

The S9v can be used as a monoband 40 meter antenna without a tuner, but I wanted multiband performance. So, I installed an RF-sensing remote antenna tuner in a weatherproof enclosure at the base. Back at the station, I was pleased to see that the tuner quickly found an impedance match on every band from 40 through 6 meters. It even tuned the S9v to a 1:1 SWR on 80 meters, although the antenna is only ⅛ wavelength at that frequency.

The "secret" of the S9v is that it is basically a wire vertical antenna with the radiator enclosed within a tube. The tube provides support (otherwise you'd have to attach the wire to a 31 foot tall tree branch) as well as insulation. The S9v is flexible, capable of surviving 40 MPH sustained winds. If you're expecting a big storm with near-hurricane force blasts, the antenna slides off the mount in seconds. You just lift the tube and lay it down.

The S9v seemed to perform quite well. Even with poor summertime conditions on 40 meters, I worked a Serbian station as my first contact. Others gave good signal reports and some were astonished to learn that I was using a vertical antenna.

One of the best hallmarks of the S9v's "performance," however, occurred when my wife strolled into the back yard and asked if I had "set up the new antenna yet." She didn't realize that she was standing just 15 feet from it. I merely smiled and pointed.

Manufacturer: S9 Antennas, PO Box 524, Royse City, TX 75189; tel 469-426-8554; **www.s9antennas.com**. *$89.95. Radial plate with stainless steel hardware; $24.95. Portable ground mount; $21.95.* QST

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

W1ZR

GETTING ON THE AIR

Receiver Noise Figure — What's It All About?

In the June 2010 issue of *QST*, I made the case that maximum sensitivity is not always desirable in an HF receiver; in fact, it can be detrimental if it limits effective dynamic range.[1] This is because the received signal to noise ratio (S/N) on HF, especially on the lower HF bands, is usually limited by external noise not internal receiver noise.

This is not generally the case as we move toward and into the VHF range. Terrestrial noise tends to get lower as frequency increases with the result that on VHF — and sometimes on the HF bands above 20 meters — the S/N is limited by the noise generated within a receiver. It's easy to hear this noise — just replace your antenna with a 50 Ω load and turn up the gain. In order to hear a signal above the noise, it has to be stronger than the noise in your receiver. While it's true that a trained CW operator can sometimes receive a signal at or even below the noise level, it is certainly easier to copy if it is above the receiver noise floor.

What's Sensitivity All About?

Sensitivity is usually expressed as the level of a signal at the antenna terminals that results in a specified S/N at the output of the receiver. Sometimes the specified S/N is a factor of 10 times the power (10 dB S/N), and sometimes it is at the level at which the noise and the signal are equal (0 dB S/N). The amount of noise from a receiver, and hence the sensitivity, is a function of a number of factors — one of the most significant being the bandwidth.

The wider the bandwidth, the more noise is received. Try changing receive filters while you listen to that 50 Ω load. If everything is working properly, the noise power should increase in direct proportion to the bandwidth. Thus, changing from a 0.5 kHz CW filter to a 2.5 kHz SSB filter should result in a five fold (2.5/0.5) increase in noise, or equivalently a five fold decrease in sensitivity. This is why sensitivity is always specified at a particular bandwidth.

[1]J. Hallas, W1ZR, "Receiver Sensitivity — Can You Have Too Much?" *QST*, Jun 2010, p 43.

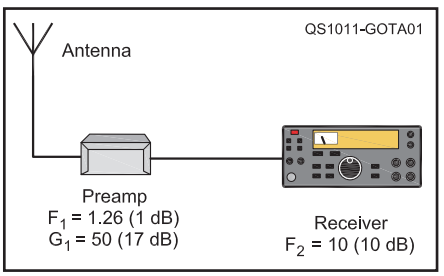


Figure 1 — Configuration of a typical VHF receiver with an external preamp. F is noise factor (noise figure), G is gain.

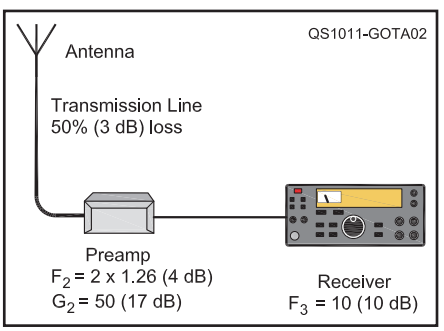


Figure 2 — The addition of lossy transmission line between the antenna and the preamp degrades the noise figure by the amount of loss in the line.

Enter *Noise Figure*

It would be nice to be able to compare VHF receiver performance without having to specify the receiver bandwidth. VHF preamps, for example, don't usually care what the bandwidth of the receiver that follows it is, so we should be able to test and compare them without worrying about the bandwidth.

To do so, we compare the noise out of a real receiver with that of an ideal receiver of the same bandwidth and other conditions. The sidebar includes a discussion of the noise performance of an ideal receiver — our yardstick.

Improving Receiver Sensitivity with a Low Noise Preamp

If we wish to improve our receiver noise figure, we can put a low noise preamp in front of our receiver. Note that the noise figure of the combination will never be quite as good as that of the preamp because the rest of the receiver contributes noise as well. As the gain of the preamp is increased, the S/N of the preamp has more effect. Figure 1 shows the situation.

The noise factor of the receiver and preamp can be determined from knowledge of the noise factor of the original receiver, as well as the gain and noise factor of the preamp as follows:

$$F = F_1 + (F_2 - 1)/G_1 \qquad \text{[Eq 1]}$$

It should be clear that the total noise factor will always be greater than that of the first stage. The more general system noise factor for multiple stages is determined in a similar way:

$$F = F_1 + (F_2 - 1)/G_1 + (F_3 - 1)/(G_1 \times G_2) \ldots \qquad \text{[Eq 2]}$$

The values shown in Figure 1 represent fairly typical performance of an older 2 meter receiver and a modern preamp. Plugging them in, we get:

$$F = 1.26 + (10 - 1)/50 = 1.26 + 0.18$$
$$= 1.44 \text{ or } 1.6 \text{ dB}$$

Because of the gain of the preamp, the 10 dB noise figure of the receiver itself just adds 0.6 dB to the noise figure of the preamp. This demonstrates that the first stage is most important in total receiver noise figure if:

- It has a low noise figure, and
- It has enough gain to dominate the noise in the following stages.

Of course excessive gain at this point can overload the following stages, limiting the receiver dynamic range, just as in the HF case discussed in the earlier article. All designs require compromises. For most V/UHF work, noise performance has a somewhat higher priority than dynamic range. Of course if you are a contester and have high power VHF stations as neighbors, your priorities might be different.

What About That Transmission Line

Note the transmission line between the

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

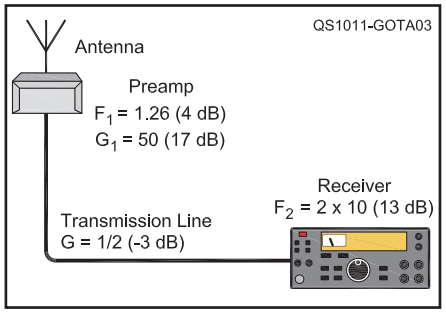


Figure 3 — Moving the preamp to the other end of the transmission line, as shown, minimizes the impact of transmission loss on VHF receive.

antenna and the preamp. In an HF system, any loss in the line will decrease both the received signal and the received atmospheric noise by the same amount. Unless the loss is so great that we are limited by the noise in our receiver, our HF S/N will be unchanged. Of course, it will degrade our transmitted signal as well, and that will decrease the S/N at the station we're trying to work. At VHF and above, the transmission line loss will reduce our desired signal, while the noise generated in our receiver remains the same. Thus the S/N, and thus the noise factor will be reduced by the amount of loss.

A fairly typical 100 foot run of RG-213, plus connectors and lightning arrestor, will have a loss at 144 MHz of about 3 dB. This is quite significant, often resulting in the major limitation of VHF station performance (see Figure 2). Note that we invested good money for that 1 dB noise figure preamp and now have a system noise figure of 3 + 1.6 or 4.6 dB — quite a reduction in sensitivity. Fortunately, there is a straightforward way to make it better.

Rearranging for Better Noise Figure

At VHF and above, we certainly don't want to lose antenna height by reducing the transmission line length. We can improve the receiver noise performance, however, by moving the preamp to the antenna location. If we do that, we have the low noise, high gain, amplifier at the signal source. The 3 dB reduction in noise figure now applies to the receiver rather than the preamp, so we haven't gotten away free. Still, we are pretty close to what we could do without a transmission line:

$F = 1.26 + (20 - 1)/50 = 1.26 + 0.38$
$= 1.64$ or 2.1 dB

We have, of course, added a few implementation issues. We will need to provide remote power, control and transmit-receive switching (we don't want to transmit through our sensitive preamp). In addition, weatherproofing will be required. These are all problems that have been solved many times, and commercial units are available.

Our 3 dB transmission line also reduces our transmit power by a factor of two. While not exactly the subject of this article, this side of the problem will reduce the received S/N at the far end by the same 3 dB. Amateurs who use the compact power amplifier/preamp combinations can often weatherproof the whole unit and install it with the antenna. Note that the current draw of a high power amplifier at 12 V dc will require cost and weight prohibitive wire to get it to the top of the tower.

One solution is to collocate the power supply with the amplifier and run 120 V ac wiring to the top of the tower. Now that we have added even more weight and wind resistance to the top of the tower, perhaps it's time for a design compromise! QST

Noise from an Ideal Receiver

Yes, even an ideal receiver will have some noise due to the electron motion that naturally occurs in real conductors. We can (but fortunately don't usually have to) actually calculate the noise from such an ideal receiver at room temperature as follows:

Noise power out = G × k × T × B

where the noise power is in watts, G is the system gain from the input to output and B is the equivalent bandwidth in hertz. This is the equivalent rectangular bandwidth, very close to the operating bandwidth of modern digital signal processing (DSP) based gear, but somewhat wider than the usual crystal or mechanical filter bandwidth.

T is the absolute temperature in kelvins, assumed to generate the noise in a resistor at the input. On planet Earth, this is usually taken as 290°C, but note that it will be different for space systems, and some earthbound but cryogenically cooled receive preamps as well.

k is Boltzmann's constant equal to 1.38×10^{-23} in units that make everything come out right.

In terms of the noise at the antenna terminals, the noise at the receiver input, that's just kTB.

If we "run the numbers," we find that for our ideal receiver with a 2.5 kHz bandwidth, the equivalent noise power at the input is $1.38 \times 10^{-23} \times 290 \times 2.5 \times 10^3 = 1.0 \times 10^{-17}$ W, or 1.0×10^{-14} mW, –140 dBm or 0.02 µV at 50 Ω. If we repeated the calculation for a 500 Hz CW bandwidth, we would get –147 dBm or 0.01 µV at 50 Ω.

A signal at the receiver input at that level would just equal the noise — often considered the *minimum detectable signal* or MDS. If we want to know the signal required for a 10 dB S/N, for example, it's just 10 dB higher.

Comparison to a Real Receiver

If we measure the noise output from our real receiver, we will find that it is higher than that from the ideal receiver. If the gain, bandwidth and input and output impedances are the same, the noise power from our real receiver can be expressed as F × G × k × T × B, where F is the factor by which we must multiply the noise from the ideal receiver to get the noise from our real receiver. This is called the *noise factor*. The noise factor is just the ratio of the S/N at the output to that at the input. If we express the noise factor in decibels, we get the *noise figure* (NF). Because we are dealing with power, that is: $NF = 10 \times \text{Log}_{10}(F)$.

New Products

SOLID STATE 9 CM POWER AMPLIFIER FROM KUHNE ELECTRONIC

◊ The MKU PA 3430A from Kuhne Electronic (DB6NT) is a linear power amplifier covering 3400-3600 MHz. The two-stage amplifier uses an LD-MOSFET and requires a 28 V dc, 3.8 A power supply. Output power is rated at 20 W typical, 30 W fully saturated and input power is rated at 210 mW typical. The amplifier is mounted in a milled aluminum case and uses SMA connectors. The photo shows the PA 3430A along with a matching MKU 34 G3 transverter for the 9 cm band. For pricing and additional information, visit **www.kuhne-electronic.de**.

NØAX

HANDS-ON RADIO

Experiment 94 — SWR and Transmission Line Loss

SWR (standing wave ratio) is something everybody measures — it's one of the most widely used numbers in ham radio. But not everybody understands what SWR is and what affects it. In this month's experiment, we'll have a quick refresher on SWR basics and then examine the effect of losses in the transmission line on the SWR you measure back at the shack.

SWR Basics

If power traveling through the transmission line encounters a load impedance, Z_L, different from the transmission line's characteristic impedance, Z_0, some of the power is reflected back along the transmission line. This creates a stationary pattern of voltage (and current) along the line. The stationary pattern is called a *standing wave* and the ratio of the peak to minimum voltage or current is called the *standing wave ratio* or *SWR*. (A complete treatment of SWR is available in *The ARRL Antenna Book*.[1])

SWR is a numeric way of describing the relationship between the transmission line's Z_0 to the load impedance, Z_L, such as the impedance of an antenna. The simplest SWR calculation is SWR = Z_L/Z_0 or Z_0/Z_L, whichever is greater than 1. (SWR is never less than 1:1, pronounced "one to one.") If a 50 Ω transmission line is connected to a 75 Ω load, the SWR = 75/50 = 1.5:1. If the load is 25 Ω, the SWR = 50/25 = 2.0:1.

In order to work with the incident or forward power, P_f, traveling toward the load and reflected power, P_r, traveling away from the load, it is useful to define a *reflection coefficient*, denoted by the symbol ρ (rho). Sometimes the symbol Γ (gamma) is used.

$$|\rho| = \frac{\text{SWR} - 1}{\text{SWR} + 1} \quad \text{and} \quad \text{SWR} = \frac{1 + \rho}{1 - \rho}$$

This equation only calculates the magnitude of the reflection coefficient, which is a complex number when either the line or load impedance contains reactance.

The amount of forward and reflected power can be used to calculate the SWR (and vice versa):

$$\rho = \sqrt{\frac{P_r}{P_f}} \text{ and } \text{SWR} = \frac{1 + \sqrt{P_r / P_f}}{1 - \sqrt{P_r / P_f}}$$

Thus, forward and reflected power, SWR and the reflection coefficient are all conveniently related.

Line Loss

No transmission line is perfect — some of the power input to the line will be dissipated as heat. The heat is the result of either resistive loss (proportional to the square of the current) in the conductors or from losses in the dielectric (proportional to the square of the voltage). This is called *line loss*. The amount of loss in the transmission line as power flows through it to a load with $Z_L = Z_0$ is called the *matched-line loss*, abbreviated ML and measured in dB per unit of length, such as dB/ft.[2]

ML increases with frequency and is usually specified in dB/100 feet at several frequencies, often 1-10-100-1000 MHz. For example, the table of transmission line characteristics on page 24-18 of *The ARRL Antenna Book* shows that RG-58C/U (Belden part number 8262) has an ML of 0.4 dB/100 feet at 1 MHz, 1.4 dB/100 feet at 10 MHz, 4.9 dB/100 feet at 100 MHz, and 21.5 dB/100 feet at 1 GHz. (This would not be a good transmission line for use on the 23 cm band!)

Loss Due to SWR

If the load impedance is not equal to that of the transmission line, causing some of the power to be reflected from the load, not all of it is absorbed by the load. If the load is an antenna, that means not all of the power is radiated. The reflected power travels back to the other end of the line where all or part of it may be reflected again for another trip to the load. Eventually, all power input to a transmission line is either dissipated as heat in the line or absorbed by the load or generating source impedances.

Is this extra loss a problem to worry about? On HF, for SWR of less than 2:1, the additional loss over and above ML due to part of the power being reflected is usually less than 0.5 dB. For lines of reasonable length, this is an insignificant amount in nearly all circumstances. Once the SWR reaches 3:1 or higher, however, the additional loss can be noticeable, or worse. Figure 1 is a graph of additional loss due to SWR for varying values of ML.

To use Figure 1, first determine ML for the length of transmission line being used. (Table 1 lists data for a few common cables and Figure 23 on page 24-20 of *The ARRL Antenna Book* shows ML for 100 feet of many types of common transmission lines over the frequency range from 1 to 1000 MHz.) Then use Figure 1 to determine the additional loss and add it to the ML to obtain the total loss.

For example, what is the total loss of a 200 foot piece of RG-58C/U at 100 MHz if the SWR is 4:1? The manufacturer specifies ML for RG-58C/U as 4.9 dB/100 ft at 100 MHz, so ML for a 200 foot length is

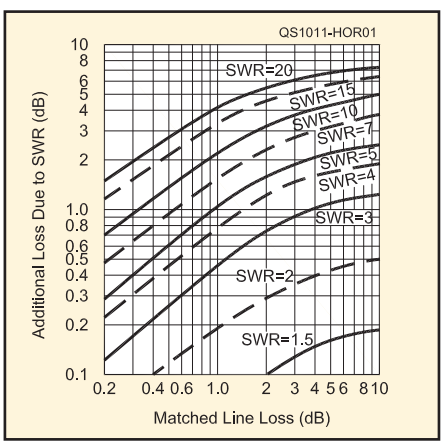


Figure 1 — Additional line loss due to SWR as measured at the load. Total loss is equal to ML plus the additional loss.

[1]R. D. Straw, Editor, *The ARRL Antenna Book*, 21st Edition. Available from your ARRL dealer or the ARRL Bookstore, ARRL order no. 9876. Telephone 860-594-0355, or toll-free in the US 888-277-5289; **www.arrl.org/shop**; **pubsales@arrl.org**.

[2]S. Ophanidis, *Electromagnetic Waves and Antennas*, ECE Department, Rutgers University, **www.ece.rutgers.edu/~orfanidi/ewa/**, Chapter 10.

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Table 1

Matched Loss (ML) of Common Transmission Lines as a Function of Frequency

Line Type	*ML for 100 feet at Frequency (MHz)*			
	1	*10*	*100*	*1000*
RG-213	0.2	0.6	1.9	8.0
RG-8X	0.2	0.7	2.3	7.4
RG-58C/U	0.4	1.4	4.9	21.5
RG-59	0.3	0.9	2.6	8.5
RG-174	1.9	3.3	8.4	34.0

Cables with the same RG designation from different manufacturers may differ in characteristics. Consult manufacturers' data sheets.

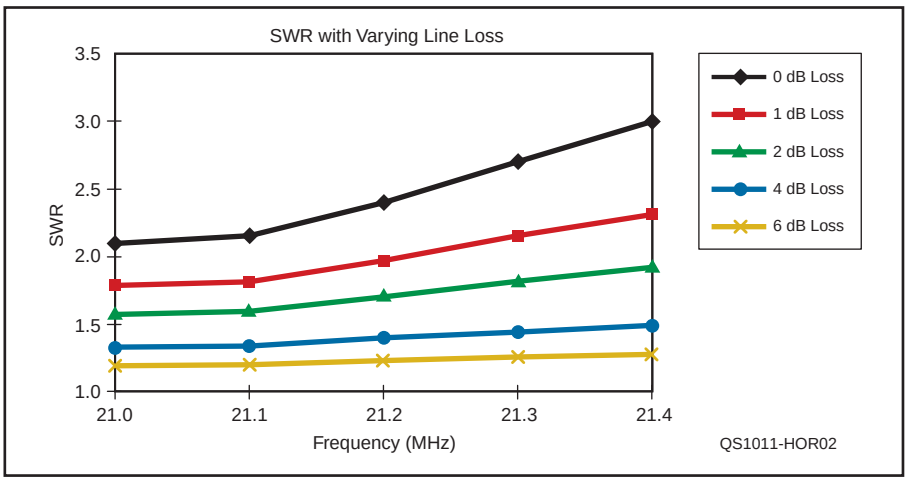

Figure 2 — Increasing line loss (ML) reduces SWR of a 15 meter quad measured at the input to the transmission line. The top curve (0 dB line loss) shows SWR at the antenna that is the same as input SWR for a lossless line.

2 × 4.9 = 9.8 dB. From Figure 1, start at ML ≈ 10 dB on the horizontal axis and follow a vertical line up to where it intersects the SWR = 4 curve. On the graph's left hand vertical axis, that intersection is just less than 2 dB, so additional loss is about 1.9 dB. Total loss is then 9.8 + 1.9 = 11.7 dB. Again, this would not be a very good transmission line choice, since only about ¼ of the input power would make it into whatever load is attached.

Input SWR

Note that the caption for Figure 1 refers to *SWR measured at the load*. When first studying SWR, say for a license exam, the study material often states that "SWR does not change along a transmission line." For this statement to be true, the transmission line must be lossless. Why? Because some of the reflected power is lost due to ML on its return trip from the load back to the source. As we get closer to the source, less of the original forward power has been lost, so its value is increasing! From the second equation, you can see that if P_r decreases and P_f increases, then SWR gets closer to 1:1. In other words, line loss causes the SWR at the input to the line — *input SWR* — to be lower than if it were measured at the load, the point at which the ratio of P_r to P_f is lowest.

Let's take this to an extreme and assume that we have a very, very long and lossy transmission line and apply some power to it, P_f. If we measure SWR at the input to the line, it will always be 1:1 because no power ever returns from the load and $P_r = 0$. It doesn't matter what the load impedance is at all! This is an important lesson: line loss reduces input SWR.

Most transmission lines are not terribly lossy in the frequency ranges they're designed for, but how much do they really affect the typical SWR curve? Figure 2 shows the effects of loss on the input SWR curve for a 15 meter quad antenna for ML values of 0, 1, 2, 4 and 6 dB. As you can see, the lossier the line, the better the antenna looks — in terms of SWR, anyway. With 6 dB of line loss, you might wonder why your received signal is weak, even though SWR never exceeds 1.3:1. (The formula for input SWR was obtained from Reference 2 and an *Excel* spreadsheet is provided on the Hands-On Radio Web site for making these calculations and graphs.[3])

Observing the Effects of Line Loss

You can observe this effect yourself with the help of an antenna analyzer that can operate at and above 100 MHz, such as an MFJ-259 or similar instrument. Acquire a long piece of coaxial cable and short the far end of the cable with a short piece of wire, creating a load SWR equal to infinity. (A short circuit is easier to create than an open circuit due to stray capacitance.) Connect the antenna analyzer to the other end, set to a frequency of a few MHz. The SWR indication should be very high or infinite. Now increase the frequency while watching SWR on the analyzer. As frequency increases, you will see SWR begin to decrease. For most cable types, above 100 MHz SWR will decrease rapidly. Compare different types of cable to see the effects of line loss. The lower the input SWR reading (at the analyzer), the lossier the line at that frequency because load SWR is infinite!

For Further Reading

Read the Transmission Lines chapter of either the *ARRL Handbook* or the *ARRL Antenna Book* for more information about these amazing cables that we take for granted.[4] The mathematically inclined reader may enjoy browsing through Reference 2 or any engineering textbook that covers transmission lines.

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

[4]*The ARRL Handbook for Radio Communications,* 2011 Edition. Available from your ARRL dealer or the ARRL Bookstore, ARRL order no. 0953 (Hardcover 0960). Telephone 860-594-0355, or toll-free in the US 888-277-5289; **www.arrl.org/shop**; **pubsales@arrl.org**. QST

New Products

ALEXLOOP WALKHAM PORTABLE MAGNETIC LOOP ANTENNA

♢The AlexLoop Walkham is the latest portable magnetic loop antenna design from Alex Grimberg, PY1AHD. The Walkham covers 7 to 30 MHz and is rated for 20 W on SSB or 10 W on AM/FM. The antenna can be carried in a padded carrying case and quickly assembled for operation. Price: $299 plus $50 shipping to the US. Other versions are available. For more information or to order, visit **www.alexloop.com**.

AG1YK

HINTS & KINKS

PEAK READING CIRCUIT FOR PASSIVE WATTMETERS

◊Many companies sell small peak-reading conversion boards for older passive wattmeters lacking this feature. These are easy-to-build circuits that usually require power, such as a battery or external wall wart supply. They can be wired to provide either the new peak-reading behavior or the standard unmodified wattmeter readings. The circuit is usually installed between the detector and the meter. The peak function is selected with a double-pole, double-throw (DPDT) switch. If you wish to also turn a battery on and off with the switch, a three-pole, double-throw switch is required — not an easy type of switch to find.

Here is a simple circuit (see Figure 1) that reduces the switch requirement to a single-pole, double-throw (SPDT) switch. It allows the selection of peak or average readings and turns off the battery when the peak circuit is not in use. My circuit makes use of a latching relay. A latching relay is one that can be set to a certain state and then retains that state after the coil current is removed. They are polarized relays, meaning that to reverse the set state you simply reverse the direction of current in the coil. They typically require a short pulse of current to set or change state.

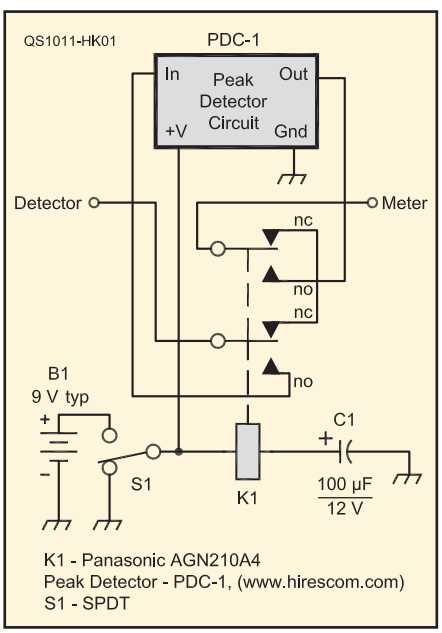

Figure 1 — Schematic diagram of the peak detector circuit.

In this circuit, an SPDT switch is used to connect a latching relay coil to the battery or ground. There is a capacitor in series with the coil. The capacitor needs to be large enough so that the relay actuates. When the switch is turned on, voltage is applied to the coil, charging the capacitor and activating the relay. When the switch is set to the off position, the capacitor discharges through the coil. Because the current is flowing in the opposite direction from turn-on, the latching relay switches to the other state. The advantage of using a latching relay is that no power is used by the relay while the circuit is on. An inexpensive and tiny latching relay is specified in the schematic, but any latching relay of appropriate voltage can be used — you may have to experiment with the value of C1.

The DPDT contacts of the relay are used to switch the peak reading circuit in or out of the circuit between the sensor and the meter. — *73, Tony Brock-Fisher, K1KP, 15 Webster St, Andover, MA 01810-1109,* **k1kp@arrl.net**

TROUBLESHOOTING WITH THE MFJ-259B ANTENNA ANALYZER

◊While trying to work some HF DX, I noticed my RF output had dropped to zero and the SWR had gone sky high. Moments before, everything was working fine. There were no indications of a problem, such as smoke, arcing or noise.

I did the routine checking of jumper cables, connectors and the coax switch and found nothing out of place. I then started isolating the devices in the RF line one by one. When I came to my desktop amplifier the problem disappeared.

I put the amplifier on the workbench and did a quick ohmmeter check. The reading was okay. I removed the cover and everything looked normal. I wondered how I could duplicate the fault without turning on the line voltage.

I decided to use my antenna analyzer as an RF source and a dry type dummy load. As soon as I turned on the antenna analyzer the SWR went to the top of the scale. The only thing between the input and output connectors is the TR relay. On my amplifier, this relay is an open frame type and easy to inspect. The contacts looked okay; there were no binding or burned contacts.

While watching the meter, I used a wood probe to move things around. Suddenly the SWR dropped down to normal. I found one of the SO-239 connectors was bad. It had worn out from normal use and would not grip the pin on the PL-259. It would pass a dc voltage from my ohmmeter but would block the RF signal. I replaced both input and output SO-239s and the problem was solved.

Using the antenna analyzer made a dangerous job safe. This same method could be used in the entire RF line in your station, from the transceiver to your antenna. — *73, Phillip Mikula, WU8P, 6901 Hammond Ave SE, Apt B, Caledonia, MI 49316-7651,* **wu8p@arrl.net**

MEASURING "FOUR SQUARE" DUMMY LOAD POWER

◊It has been well established that the only meaningful way to monitor the performance of a "Four Square" array fed with a hybrid coupler is to measure the power dissipated in the dummy load.

To measure the "dumped" power, I have placed the directional coupler from a wattmeter in series with the dummy load located at the center of the array and used long leads (200 feet) to the meter placed in the shack. There seems to be no power difference between readings at the remotely located meter and measurements taken near the terminating resistor.

I used spare conductors in the 10 conductor unshielded control cable (with ferrite chokes at both ends) to connect to the meter. The wires are all #18 AWG. I wound as many turns as possible on two stacked MFJ ferrite chokes at the coupler end of the cable. At the meter end in the shack, I wound a few turns of the cable onto a snap-on ferrite bead. The original cable supplied with the wattmeter is unshielded.

This configuration is much easier, and less

costly, than locating the dummy load in the shack connected to the hybrid coupler with a long run of coax. John Devoldere, ON4UN, describes a similar arrangement using an RF detector and a voltage comparator circuit.[1] *— 73, Ira Lipton, WA2OAX, 96 Hemlock Ln, Liberty, NY 12754,* **wa2oax@toast.net**

MOUSE TRAP GRABBER

◊I recently needed to retrieve one end of a rope that was hanging from a mast at the top of my tower so I decided to use a mousetrap in an unconventional way.

Using a typical spring-loaded trap, I removed the holding bar and the catch but left the holding bar staple (afterward I realized I could have left the bar and catch in place). I drilled two holes, each about ¾ inch from the trap edges and continued drilling through a length of ⅝ inch OD aluminum tubing that I saved from an old antenna. Then I bolted the mousetrap to the aluminum tube (see Figure 2).

I bent the head of a tenpenny finishing nail into a circle and tied a suitable length of string through the opening. The next step was to pull down the trap hammer and, at the same time, insert the finishing nail through the holding bar staple and over the hammer, holding the hammer in the "armed" position.

After assembling the necessary length of tubing needed to reach the rope at the top of the tower, I positioned the mousetrap next to the rope, pulled the string and, with some luck and a few tries, caught the rope. When the rope is caught, twist the mousetrap around it several times to be sure it is secured. *— 73, Bill Kirk, NJ1X, 17 Bellevue Ave, Winchester, MA 01890,* **wk9879@verizon.net**

[1]J. Devoldere, ON4UN, *Low-Band DXing*, 4th edition, p 11-75. Available from your local ARRL dealer, or from the ARRL Bookstore, ARRL order no. 9140. Telephone toll-free in the US 888-277-5289, or 860-594-0355, fax 860-594-0303; **www.arrl.org/shop**; **pubsales@arrl.org**.

BILL KIRK, NJ1X

Figure 2 — A mousetrap gimmick to catch the "tail" of a rope hanging out of reach.

INLINE FUSE POWER PROBLEM

◊In the February 2009 "Hints and Kinks" column, George Peters, K1EHW, discusses problems with the Molex connectors used on the IC-706MKII and IC-706MKIIG radios.[2] I have seen similar problems with Molex connectors. Also, I once owned an IC-706MKII. While I did not have trouble with the Molex connectors on that rig, I did have problems with the fuse holders in the supplied power cord. I had shortened the power cord to 3 feet and installed Anderson Powerpole connectors. I connected it either to my vehicle battery or my deep-cycle battery with #10 solid copper wire soldered to gold plated ring terminals on the battery end and Anderson Powerpole connectors on the other end.

While the radio worked fine from a 13.8 V dc supply or in my vehicle with the engine running, with the engine off or running from a 12 V deep-cycle battery, I was having problems even when the batteries were fully charged. Upon investigating, I found that there was a combined voltage drop of 1.75 V across the fuse holders at full power transmit (100 W FM into a dummy load). The voltage was dropping below the minimum operating voltage during transmit. I replaced the factory fuse holders with inline spade type fuse holders and 20 A spade fuses. The combined voltage drop across the new fuse holders is 0.5 V.

Better results could possibly be obtained by using the gold-plated fuses and holders used for high power car stereo installations. *— 73, Martin Campbell, KBØHAE, 218 N Gertrude St, Burlington, IA 52601-2830,* **kb0hae@arrl.net**

PANEL LABELING

◊"Hints and Kinks" has had several good suggestions for custom label materials and procedures. In my search, I found that by using Microsoft *Word* or Corel's *Word Perfect* I can make ideal labels using any one of several available sizes of the "Clear Mailing Labels" from Avery.

[2]G. Peters, K1EHW, "IC-706 Connector Problem," *QST*, Feb 2009, p 79.

ART BARTLETT, KA1RX

Figure 3 — An example of an Avery clear mailing label used for equipment identification.

After printing the label I applied it in place and then sprayed acrylic spray over the area to protect and seal the label. You can also use any clear fingernail polish. Figure 3 shows an example of this approach with the label on a wood frame. The size used in this case was 1⅓ × 4⅛ inches. It has been on my boat for three seasons so far without any changes or deterioration. *— 73, Art Bartlett, KA1RX, 3605 Britt Ter, Virginia Beach, VA 23452,* **ka1rx@verizon.net**

LOOSE ICOM POWER CONNECTOR

◊In reference to K1EHW's writing about Molex connector problems, I first came upon this problem with an ICOM IC-910H. It refused to output full power on either 2 meters or 70 cm. After much troubleshooting, alignment effort and a trip to the ICOM service center it was discovered the problem lay with the Molex connector on the end of the power cable. In fact, the connector slid off the end of the cable with the slightest pull. I checked the power cable from an IC-706 and obtained a similar result. I firmly reattached the Molex connectors on each of the power cables, both by pressure and soldering. Now the IC-910 output is normal. *— 73, Matt Harker, KC5DBH, 56500 South 550 Rd, Rose, OK 74364,* **kc5dbh@yahoo.com**

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

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Ham Friendship Transcends Time and Space

A DX contact evolves into a lifetime friendship.

Peter Brandenberg, K2MMT

I received a phone call from my friend Fred, whose father, Jeff Brasch, ZS6AWX, and I met on 15 meters nearly 24 years ago. Fred just returned from Melbourne, Australia having brought his wife and children from Atlanta to Melbourne so his father could be present at Fred's son's Bar Mitzvah. Jeff, because of his failing health was unable to make the trip to Atlanta. Only days after they returned to Atlanta, his father's condition worsened. His brother, Stanley called his sister Vivienne and Fred who all turned around and flew back to Melbourne to be with their dying father. Fred knew how close his dad and I had been and he kept me aware of his father's condition via text and e-mails.

When they called and e-mailed me from Melbourne to say that Jeff had died, it felt like my best friend had died. It didn't feel like it was someone on the other side of the earth who I saw only a dozen times, yet spoke to every week since our first contact years earlier.

15 Meters to South Africa

It started in 1986 when I had my first great contact on 15 meters with Jeff, ZS6AWX, in Klerksdorp, South Africa. He and his spouse Rhoada, ZS6AWY, had been hams since 1957, my last year of high school.

I was running a Kenwood TS-930S transceiver into a new TL-922 linear and a 3 element triband beam at 70 feet. Jeff also had a triband beam running barefoot with his Yaesu FT-101 transceiver. The propagation between South Africa and the eastern USA was excellent. I'm an avid CW operator yet my speed has slowed substantially as I have gotten older and I seem to spend less time on the air than I used to. Only about 5% of my hamming is on SSB. That was my lucky day.

Above: A meeting of long distance friends. From the left Peter, K2MMT, his spouse Barbara, Jeff, ZS6AWX, and Rhoada, ZS6AWY. (Photo courtesy Peter Brandenberg, K2MMT.)

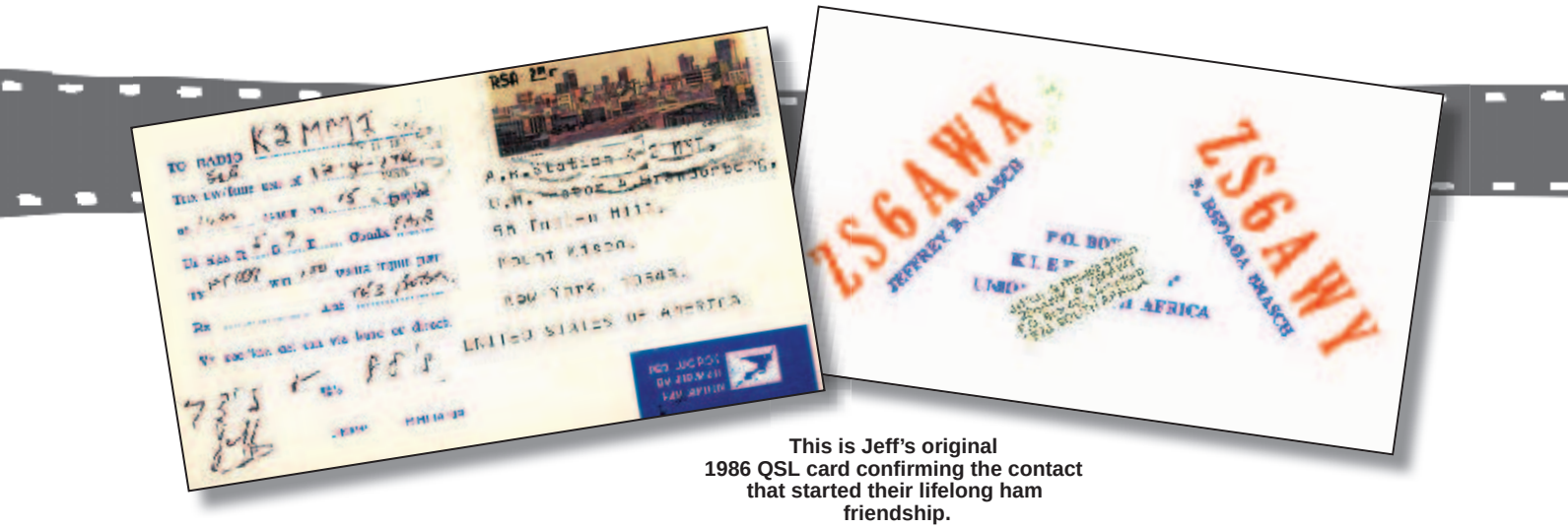
I never enjoyed contests or counting countries. I just enjoyed meeting people of all cultures and backgrounds, whether in my town or across the globe. I must have dozens of logbooks and boxes of QSLs yet not a clue how many countries I've worked in my 56 years as a ham.

That initial contact was so interesting that we arranged a schedule for the next weekend and that went to the next weekend and the next, and so on. These on the air schedules usually took place on Sunday mornings in New York (afternoons in South Africa). Our ham radio relationship eventually brought together both of our families — four generations spanning five continents. At these gatherings the ages ranged from our grandchildren, some newborn, up to the eldest family member Bobba Sheina, Rhoada's mother, who passed away in 1990 at 103.

We both had a similar heritage and celebrate the same holidays and culture. Over the years we shared wonderful family stories. We enjoyed talking about our children, and then as we became grandparents we even shared more joy and sometimes sadness and even frustrations. Jeff was a real family man who had a heart of gold. All three of their children left South Africa, Vivienne in 1977 and Stanley and Fred in 1986, the same year that Jeff and I met on the air. Jeff and Rhoada missed their sons and daughter and did their best to travel to visit them, in the United Kingdom, America and Australia.

Their son Fred, a bachelor, moved to New York City in 1986. Stanley and his wife Arlene moved to Melbourne, Australia in 1986. Their daughter Vivienne moved first to London in 1977 and then she and her family relocated to Boca Raton, Florida in 1985. The Brasch family spread out as is true about so many from South Africa and many other countries. I believe at one time they may have had relatives on every continent except Antarctica.

Jeff was about 15 years my senior, but we shared a kindred spirit. As a result of my weekly contacts with my friend Jeff, my wife and daughters always knew where I was every Sunday morning. Rhoada, ZS6AWY, put in a word from time to time.



This is Jeff's original 1986 QSL card confirming the contact that started their lifelong ham friendship.

Bobba Sheina often had a few comments to make as she eavesdropped on our contacts. Through their South African grapevine Jeff's extended family in five countries all knew about his ham friend Peter in America.

First Time Together

Jeff and Rhoada came to the US in the late '80s to visit their children in Florida and New York, allowing us to meet for the first time. No longer were we separated by thousands of miles, a microphone, a speaker and loads of electronic equipment — it was face-to-face. We spoke on the phone from Fred's apartment and made arrangements for me to pick them up and visit us in Westchester County, spending a few days with my family. Like millions of other South Africans, Jeff was very attached emotionally to his country, but his children and grandchildren were extremely close to his heart and it was difficult to be so far away from them.

One place that Jeff asked to visit while at our home was the ARRL in Connecticut. We went up for the day, had lunch with an old ham friend of mine who once was a League employee, then to the ARRL where we got a special visitors tour and visited their famous station, W1AW.

The Winds of Change

The political changes in South Africa started making their life far more uncomfortable. The time came for them to leave the country they loved and join their family who had already become accustomed to their new lives abroad. In 1992 they left South Africa permanently and moved to VK-land where their son Stanley, his wife and children had been living since 1986.

Our 7 years of weekend contacts came to a stop when they moved to a condo with strict antenna restrictions. We were brokenhearted that Jeff had to give up hamming. His move didn't stop our friendship, as by that time phone calls were inexpensive and we had Skype. So we continued to keep in touch and keep each other up to date on our lives. This relationship was unlike the thousands of contacts I've had. I was lucky on that rare day in 1986 when I was using SSB, probably trying out my first linear, and my tower and beam.

In 1993 Jeff's son Fred married Elaine, a wonderful young woman he met in New York where she practiced law. They were married in Atlanta near her family, all displaced New Yorkers, and they eventually settled there in 1996. My wife and I attended their wedding in March 1993. Fred, Elaine and my family became very close. We used to meet for dinner often and they visited us at our home as well.

You Must Be the Radio Ham

Elaine had a party the night before their wedding at her sister's home. Although we had never met the guests and relatives, we were accepted as if we were family. When we rang the doorbell, Fred's brother Stanley, who brought in his family from Australia, greeted us, saying "you must be Peter Brandenberg the radio ham my dad has been telling us about for years!" He then put his big arms around me (he's 6 foot 1 and a big fellow) and gave me a great big bear hug. I thought he might have broken some of my ribs.

At the party we spent time with Jeff's daughter Vivienne, whom we had previously met in Florida and when she visited New York. There were uncles, aunts, cousins and friends who came from places in Africa I never heard of, Asia, South America, South Africa and even someone from Brooklyn.

It was a fantastic evening, as were the next few days, at their wedding and other parties that followed. Jewish families love to party, especially South Africans, and boy did we party.

Unlike the tens of thousands of my other ham contacts, this one was my best in the 56 years I've been on the air. Today our families and friends have shared the pain of losing a wonderful loving friend. ZS6AWX is now a Silent Key, but never will that Silent Key be silent in my heart. When I turn on my rig, I am somehow thinking that ZS6AWX might be listening somewhere. 73 Jeff ZS6AWX de K2MMT SK.

Peter Brandenberg, K2MMT, an ARRL member, was licensed as KN2MMT in 1954 and later upgraded to General with the call K2MMT. Peter's first rig was a Heathkit AT-1 (3 tubes 35 W CW). He later designed and built a twin 807, 150 W amplifier for the AT-1 and a cathode modulator for AM. In 1956 he became an original member of the New Rochelle (New York) Radio Club.

In 1960 Peter moved into Manhattan. His first apartment was a small studio that had a tiny alcove where he installed his KWM-1 transceiver. The antenna was a 250 foot long steel piano wire from his 11th floor window to the roof of a ham friend's building a block away. The wire crossed over all of the brownstone buildings in between.

He married Barbara in 1971 and spent his career working in the shopping center real estate business. They have two daughters, Lauren and Erica, and three granddaughters, Zoe, Sasha and Olivia. Peter likes to ragchew using his Yaesu 817, Elecraft KX-1 and some other low power radios. He can be reached at 71 Burr Farms Rd, Mount Kisco, NY 10549, **k2mmt@mac.com**.

Working Ultra Long Path from the Eye of the World

EMEers survive bugs and burnouts to activate Kyrgyzstan on 6 meters.

Mike Chirkov, UN8GC/EX7MW, and Oleg Ivin, EX8MLT

There was plenty of open space around the yurt camp to set up the M² antenna.

The idea of operating moonbounce from Kyrgyzstan was conceived several years ago when Oleg, EX8MLT, and Mike, UN8GC (also EX7MW) discussed present 50 MHz working conditions in their cities. Oleg had been struggling to pull weak signals out from under interference from a nearby 8 kW TV transmitter and Mike had been fighting the noise of busy Almaty, Kazakhstan for years. We discussed other places in Kyrgyzstan where weak signal DXing could be done. Since Kyrgyzstan is mostly covered by high mountains, there are many places with low noise conditions to enjoy VHF DXing on 50 MHz. One of them is Lake Issyk-Kul located about 180 km southeast of Bishkek.

Planning the Trip

Even though the idea of an EME operation in Kyrgyzstan had been "up in the air" for a long time, we started to get serious about it in the spring of 2009. Since moonbounce operation is the most challenging task of 6 meter DXing we had to plan carefully in order to be successful.

Sporadic-E (E_s) season usually starts in Central Asia in the beginning of May, so it made little sense to plan an EME DXpedition to Kyrgyzstan during the E_s months. According to our Moon prediction software the first suitable window in 2009 was August 17-23. So we made the commitment to get on the air from EX-land then.

Mike had some EME experience from his home in Almaty as well as the basic equipment. The major missing part was a suitable high-gain antenna. Fortunately M² Antenna Systems (**www.m2inc.com**) makes the 6M8GJ antenna specifically for DXpedition work. Offering over 14 dBi gain, it fully collapses into a 1.2 meter long bag that weighs just over 15 kg.

Next we had to decide on the location. For optimal results we wanted a site that permitted us to point our antenna over the lake during moonrise and moonset. This would give us much needed ground gain to work the "big guns" and single Yagi stations. Fortunately, Oleg's wife, Victoria, had a summer job at one of the tourist yurt camps on the southern shore in Tossor, a superb location for our objectives.

In order to contact stations from Europe and Asia we needed elevation capability for our antenna, since the Moon was at about 40-60° elevation in Tossor when it was rising or setting in Europe, Japan or Australia. Lance, W7GJ, designed and built a sturdy elevation mount, which he arranged to deliver to Mike via Mick, W1JJ, during Mike's business trip to the United States. The elevation mount enabled tilting of the antenna anywhere from 1-50°, which was more than adequate for our goals.

We set up a Web site at **6meme.ex7mw.com**, which had information about our operating schedule and procedures as well as news as we prepared for the trip. We chose to use Twitter updates for quick communications with hams interested in our operating status.

To get to our site we had to take a 330 km trip from Bishkek. Mike also had to travel to Bishkek from Almaty, an additional 220 km. Finally, with everything as ready as we could make it, we set out to the lake on Saturday, August 15.

Issyk-Kul

With its sun-kissed beaches and silky waters, Lake Issyk-Kul is sometimes called the "Pearl of Central Asia." Visitors to Issyk-Kul are surprised to learn that its name means "hot lake" — it never freezes, even during the coldest winters. It is known in Kyrgyz folklore as the "Eye of the World."

Our Camp

Our site was a yurt camp belonging to the Kyrgyz Federation of Tai Ji Quan. The Federation holds seminars, cultural events and conferences on oriental philosophy, religion and arts. We stayed in a yurt, a traditional tent-like structure used by nomads in the central Asian steppes. The yurts provide quite comfortable accommodation but for those coming from western civilization they take some getting used to. We slept on the ground, with only a half-inch carpet between the soil and ourselves. This kind of exotic experience just made our DXpedition even more exciting.

Antenna and Shack Installation

We arrived around 6 PM and still had some daylight. There were no obstructions when pointing our antenna toward the rising or setting Moon. The antenna was aimed south only for European moonrise but with 40-50° of elevation, we lost our ground gain.

Our first task was to figure out how to install the antenna and where to place our equipment. Our yurts were either too small for all the equipment or too distant from our antenna location. The solution was to place the equipment in the trunk of Mike's SUV, which could accommodate all of it and provide a relatively comfortable shelter in case of bad weather.

Lake Issyk-Kul, the "Pearl of Central Asia," made a beautiful backdrop for our EMExpedition.

We began assembling our antenna at about 8 PM. Despite the hour and our exhaustion, we were determined to meet our moonrise goals. Mike had previously marked the element positions and sizes but the darkness descended on the camp rapidly and we had to do most of the job using flashlights. Vladimir, EXØO, helped us with the process of antenna and mast assembly and slightly after midnight local time we managed to raise the antenna about 15 meters away from our improvised shack. It was very exciting assembling the antenna and raising it in the dark in a rush to get ready for the moonrise and possibly our first contact.

After a quick check of SWR we saw it was not ideal but adequate for the job. Connecting our equipment in haste, exhausted from the long day, yet excited about the whole adventure, we were ready to copy the first moonbounce signals.

First Contacts

The first night of our operation degradation was high — about 5 dB. To our complete amazement once the Moon rose the frequency was full of EME signals. We couldn't believe our eyes and ears since we literally saw everyone calling us. It looked like a pileup on the waterfall and at first we didn't know who to respond to.

Of course, the first signals we were seeing and even hearing came from the big guns. Soon after our operation began we got W7GJ in the log. Lance was booming in at our location. Unfortunately, during the first window we didn't manage to put many other contacts in the log since this was the first time we had operated 6 meter EME from a DXpedition and didn't have the right skills for handling JT65A EME pileups. The first night we operated using EX8MLT since Oleg wanted to be the first ever Kyrgyz station to log a 50 MHz EME contact. He was very happy to have worked Lance for a first one from his homeland.

We soon realized that the background noise level at our location was very low. Tinkering with the output level controls on the RigExpert (**www.rigexpert.net**) transceiver-to-PC interface, we found we had a sensitivity at least 12 dB better than in Almaty. Also, *SpecJT* (**www.jt6m.org**) showed a beautiful display without any birdies or "downtown" noise. We were amazed at how well we could hear stations. With *JT65*, the operator expects to see signals on the computer screen, but we were actually *hearing* some stations on our transceiver's loudspeaker.

Since it was way past midnight and very dark, the lights of our equipment attracted a swarm of mosquitoes and other insects. They were swirling around the ambient lights of the TS-2000 display as well as the glowing Eimac tubes of our amplifier. Many of the insects were sucked into the high power circuits by the powerful intake fan. One of the critters created a scary arc inside the power amplifier. Concerned about worse problems the bugs could cause, we decided to shut down our equipment. That night we rested peacefully well satisfied with the results of our first on-air operation.

The Big Sunday

Sunday, August 16 was the big day for us since we managed to log eight contacts with mostly US stations. We even worked Ross, T61AA, through fading from his Afghan location about 1100 km away shooting over the high Pamir mountain ranges, our only non-EME contact. Starting in *JT6M* with him we soon realized we could hear his signals well due to an E_s opening between us. This led to an SSB contact.

The strongest station on August 16 was Mick, W1JJ, with his "block busting" –16-dB signal. Although the tempo of our contacts wasn't high, every new contact gave us deep satisfaction since our signals were copied after traveling half a million miles through space.

Mike also managed to make a contact using his Kyrgyz EX7MW call sign with Steve, K1SG, for whom this was the first ever 6 meter contact with Central Asia.

Troubles Began

As usually happens, after you establish an operating routine and are getting results, you get the feeling that something needs to be improved… In our case, we felt our Yagi antenna could be "a little more straight." We thought it wouldn't hurt to take it down for a quick "face lift." We wish we knew how deceptive our perceptions were.

Once we began tilting the antenna, the bottom of the mast suddenly got out of control and the whole antenna went crumbling down from a few meters right onto the sand. Thank goodness for the sturdy M^2 design. It survived the crash with only a few bent elements. After fooling around with it for about 2 hours we managed to fix the damage and get it back into the initial operating position. We all regretted our foolishness and lack of preparation for such a task and were grateful we didn't completely lose our main EME tool. "If it ain't broke don't fix it!"

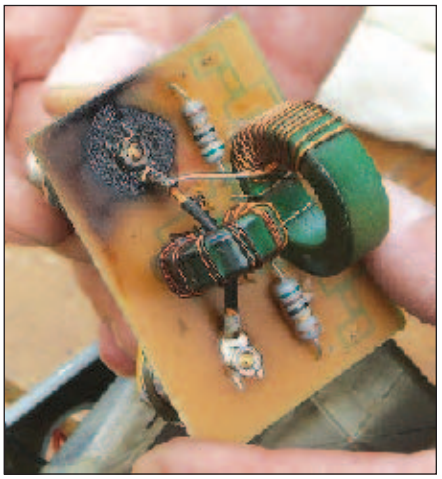
But that was not all. Almost every day as we continued to operate we were faced with one challenge after another.

SWR Meter Burn-down

In order to control the tuning and output power from our Heathkit SB-220 power amplifier, we employed a Diamond SX-100 SWR and power meter (**www.diamondantenna.net**), which was rated up to 3 kW forward power.

On one of the beautiful Issyk-Kul mornings,

The "shack in the back." The EME station setup in the rear of Mike's SUV.



PCB toast for breakfast.

with the Moon coming up, we turned everything on and started to tune up. We were frightened by a column of smoke ascending from one of the cables connected to our SX-100. We immediately shut down and started searching for the problem. We discovered that an arc inside the Diamond SX-100 "toasted" the SWR measuring bridge diodes. This left us without a reliable way to tune our amplifier's output pi-network. What made the situation even worse was the complete absence of RF rectifier diodes suitable for the SWR meter on site.

Fortunately Oleg, being a seasoned RF engineer with many years of ham and professional experience, managed to find a creative way of fixing the SWR meter. He found a garden lamp operating from a battery charged by a small solar panel that employed dc rectifier diodes. Despite the fact that these were power, not RF diodes, they still indicated the power going into our antenna. They literally saved our operation.

N-Type Connectors Fail

Another challenge was the complete burning out of N-type connectors both at the antenna driven element stub and at our SO-239 to N-type adaptor. There was no reasonable explanation for this happening since we had made sure to tighten the connectors before going on the air. Again, thanks to Oleg's creativity we managed to make some quick repairs.

Power Amplifier Failure

But that was not all we had to endure for our opportunity to be the first 6 meter EMErs in Kyrgyzstan. Next, we encountered a sudden loss of the high voltage supply in our amplifier. The 0.82 Ω shunt resistor connecting the cathode circuit to the amplifier's ground failed. An RF choke "mined" from a Chinese cell phone charger served well for the rest of our operation.

EME Operation Frustrations

Despite the fact that we kept adding new stations to the log during the week there were many we were sad at losing, such as KH7Y, KG6DX, VK4ABW, W8PAT, G5WQ and OH2BC as well as a number of others. We were a bit disappointed to see relatively low EME activity from Europe despite many capable stations and experienced operators there.

It was frustrating to see the effect of Faraday rotation [a rotating of the polarization of a signal related to the ionosphere's density and the earth's magnetic field — *Ed.*] on our signals as we could hear and reliably decode many stations who didn't even see our signals at all. The Faraday effect destroyed reciprocity at most times. Our lack of European contacts was also partly because we had less RF noise and better sensitivity than many stations who called us.

While we improved our EME operating skills over the course of the DXpedition, our inexperience hurt us. We missed several moonrise windows into Europe, which reduced our overall score. Since we used two different call signs for the operation, sometimes people got confused and called us with the wrong call sign in their "to radio" field.

Antenna Performance

Despite all the setbacks, we had many positives. We managed to continuously add new stations in the log. Having worked the big stations, we also had quite good success with those who used a single Yagi. Since we could tilt up the antenna to 40-50°, stations could hear us on their moonrise or moonset. Of course, if our antenna was elevated to 40° we lost our ground gain. That elevation was employed only after the Moon was up over 20° on our side. All in all the 6M8GJ antenna performed excellently.

Initials

Our week-long operation resulted in working the following stations and DXCC:

EX8MLT — W7GJ, K2ZD, K6MYC, W1JJ, T61AA, K4RX, K7AD, K2AXX, N5DG, ES6RQ, IW5DHN, W1VHF, NRØX, W7IUV, KJ9I, JR6EXN, JH2COZ, N6RMJ, NN7J, G4IGO and CT1HZE

EX7MW — K1SG, W1JJ, W7GJ, N3CXV and PE1BTX

In total we had eight countries, 26 EME contacts and one terrestrial contact.

In August 2010, Mike and Oleg again operated from Lake Issyk-Kul as EX6EME. This operation added 19 JT65A contacts, bringing the total to 45, including KH7Y from Hawaii, ZL3NW/ZL3TY from New Zealand and some European and North American stations.

Our Biggest Achievement

While working from Lake Issyk-Kul we kept getting notes from various US friends about the elevated interest in our activity all over North America. Many stations copied our signals even if they had small antennas. Many managed to work us. This seems to have caused many hams to seriously consider becoming active for moonbounce operation on the band. That's exactly what we wanted to see happen. With the current solar cycle bottom we have every chance to enjoy the ultimate VHF DXing experience by getting into *JT65A* digital mode and 6 meter EME. If you are interested in 6 meter EME please join our mailing group — see **MagicEME@googlegroups.com**.

All photos courtesy of Mike Chirkov, UN8GC.

Mike Chirkov holds the call signs UN8GC, EX7MW, 8Q7GC, KZ1R. His main ham radio passion is VHF DXing. His favorite activity is 6 meter EME. He has been around on the magic band since the early 1990s. Mike can be reached at PO Box 15, Almaty, 050009, Kazakhstan, **mike.chirkov@un8gc.com**.

Oleg Ivin's, EX8MLT, an ARRL member is primarily interested in VHF satellite DXing. Most of his time he spends operating on the 144 and 432 MHz bands via low-orbit amateur radio satellites. He is also a keen 6 meter operator. He has been on the band for over 10 years and has managed to log a great number of DX contacts, thus allowing hams from numerous countries to get a new one. He can be reached at 720017 PO Box 742, Bishkek, Kyrgyzstan, **ex8@mail.ru**.

Alt-Rock Meets Ham Radio

Thanks to 1940s bandleader Alvino Rey, W6UK, the rock group Arcade Fire is spreading the image of Amateur Radio far and wide.

Allen Pitts, W1AGP

An unexpected confluence in the worlds of music and Amateur Radio came to light in late August. The story begins with guitarist Alvino Rey, W6UK, renowned in both the world of music (as a 1940s bandleader, recording artist and "the father of the pedal steel guitar") and in the realm of Amateur Radio. Rey and his "talking guitar" performed at several ARRL Southwestern Division conventions over the years. He became a Silent Key in 2004 at age 95. "He was great and a lot of fun as well as a long-time League member," recalled former Southwestern Division Director Fried Heyn, WA6WZO. There's more about Alvino Rey at **www.bigbandlibrary.com/alvinorey.html**.

Flash forward: Today, two of Alvino Rey's grandsons, Win and William Butler, are members of the Montreal-based rock group Arcade Fire. Winners of multiple international awards, creators of three major albums plus incredible stage shows and with a huge fan base of "twenty-somethings" on two continents, Arcade Fire is a major player in today's music scene (see **www.arcadefire.com/**).

In August, the group was promoting their latest album, *The Suburbs*. One track, "We Used to Wait," relates to when communication was primarily by letter and postcard. Several hams who attended their shows told us that QSL cards were among the graphic images flashed onstage. In addition, a drum sported an "AF" variation of the ARRL diamond: The letters ARRL were replaced by A and F in two corners with the same letters repeated upside down in the other two corners. The band's use of Amateur Radio symbols was too good of an opportunity to pass up, so we contacted the band. Will was kind enough to answer a few questions during a break while AF was on tour.

COURTESY ARCADE FIRE

The rock band Arcade Fire uses QSL cards and a take-off on the ARRL diamond as an homage to W6UK (SK), the grandfather of two band members, Will and Win Butler. Will is at the front.

Q Your grandfather, Alvino Rey, W6UK, was a well-known guitarist and internationally known radio amateur. He also was a major promoter of the ARRL. How close were you to your grandfather? What do you remember best about him?

A We were very close to Alvino — he lived to be pretty old, and he was sharp the whole time, so we had a fair amount of time with him. He spent a lot of time in the basement. There were two rooms down there: his studio, where he practiced guitar (mostly classical it seemed — he always wanted to be a better classical player), and his radio room, where ungodly squeals and squelches would emanate from.

Q Did he ever try to get you or your brother Win involved in getting licensed and becoming a ham?

A No. I think had we approached him, he would have offered, but he really had a world to himself down in his radio room, and I think we didn't want to disturb him.

Q Arcade Fire is described as an "Indie Rock Band." How do you see yourselves?

A I don't know that we would self-identify as an "indie rock band." We definitely play rock and roll. And we are definitely independent. The term "indie rock" has certain sonic connotations that I would want to stay away from. But without the sonic side, the "independent" philosophy is very important to us. There's been a long history of bands artistically compromising, or even falling apart completely because of higher ups telling them what to do. Since we had the opportunity to not enter that world — since we gained some success on our own, without borrowing money — well, we're pretty happy about that.

Q Thinking about the words "amateur" as it is used in "Amateur Radio" — what are your thoughts on the need for independence from large and/or corporate influences in communication between people?

A I think independence is hugely important in communications. Don't get me wrong — I'm not a drastically anti-corporate fellow over here. I think corporations can be very good at what they do. But they are always doing it for the money. It's good motivation, but when you start dealing with people, or art, when your primary concern is how to make money, I think the "quality of services" decline rapidly in the search for a higher profit. And in the worst cases, corporations can disregard all other concerns in making that profit.

Q Do you feel that corporate interests have changed not only the means, but also the very ability to have personal communications on a deeper (existential) level? How?

A I don't think that corporations have changed our deeper ability to communicate. I think humans today are very similar to humans 50,000 years ago. That's a just a personal philosophy, really. I think there's been about the same ratio of good to bad people throughout all history.

I think that corporations have definitely affected the means of personal communications — but I think it's largely been for good. I think of cell phones, and e-mail and Googling stuff on the Internet, and I feel that our options for communications are growing every day.

On the flip side, you have commercial radio being owned by fewer and fewer people, and getting stupider and stupider, and you have folks trying to figure out how to screw up the Internet. But by and large I'm an optimist.

Q How much control do you have over the creation and distribution of Arcade Fire's music?

A We have basically complete control over all aspects of the Arcade Fire's life. On the creation end, it's just us in a room with our friends making music. And when the music is ready, we let it out of that room. We retain ultimate control, but really, the hard part was building a great team of people we could trust, and now that we have that, life is a bit easier.

Q Who came up with the idea of using Alvino's QSL cards as a backdrop to your on stage performance?

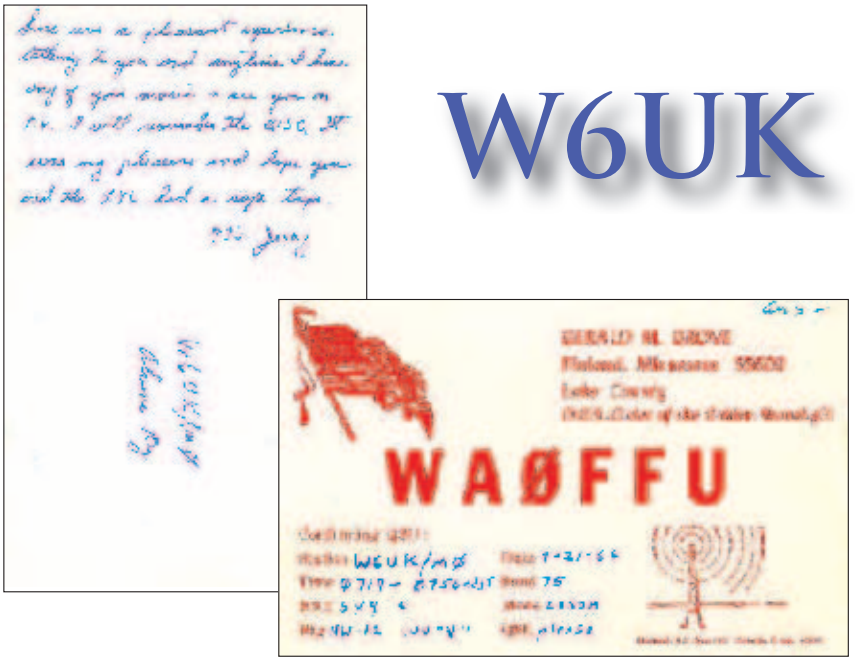
A My mom got Alvino's QSL cards after he died, and when we were working on this album, Win asked if he could borrow them. We gave them to our artwork people, Vincent and Caroline, and they incorporated some of the fonts (and the ARRL logo, you might have noticed...) into various bits of our artwork. For the stage show, our video guy is really talented. The song "We Used to Wait" is about writing letters, and it seemed a natural fit to use the QSL cards. We try to give out secret plugs to Alvino whenever we can.

Q Your Google Chrome video for "We Used to Wait" has symbols (and really neat ones!) popping up in boxes all over the screen. What do you see as the symbolism of the QSL cards on stage?

A When we were making *The Suburbs*, we definitely thought a lot about what it means to make an album in the digital age. It felt funny to start an album on a physical medium like tape, and then move it to computer to complete it, and then basically e-mail it out to the world to consume it. It felt like the music would be getting less and less real. So in the final stages of the album, during the mastering, we cut each song to acetate, and then digitized them (or not, if the songs were going to vinyl). Just as a reminder that the music actually physically existed (and it also sounds slightly better going through that process — it's subtle, but it does change things).

I think of the QSL cards as something like that — making physical proof of something that just occurred out in the ether. Getting something concrete — when really it was the connection that mattered. Just like the music is important in the album — whether you hear it on a crappy mp3, or watch a fan video on YouTube or whatever. But that physical side of things is a comfort.

W6UK



A couple of W6UK's QSL cards.

Q Did you expect that hams would notice them?

A We figured it would get out. Our mom got a kick out of seeing them up on the screen.

There was one funny moment in the promotion of the new album — we wanted to post a postcard online, and we needed a generic postcard back to use, so we scanned in the blank back of a QSL card. I guess the call sign letters bled through a bit, and someone on our fan site saw that and reversed the letters and saw that it was W6AM [well-known DXer Don Wallace, now a SK]. I guess there was a brief conspiracy theory that we were going to release the album first over ham radio.

It's nice to put out little reminders of Alvino. He always said that he wanted to be an electrical engineer, but that he could always make his living at music, so he was a musician instead. His radio world was as important to him as anything.

Q What else would you like to tell Amateur Radio operators around the world?

A The band was just in Guglielmo Marconi International Airport in Bologna, Italy, and we were thinking of you fondly.

Q Any chance of you and Win becoming hams in the future?

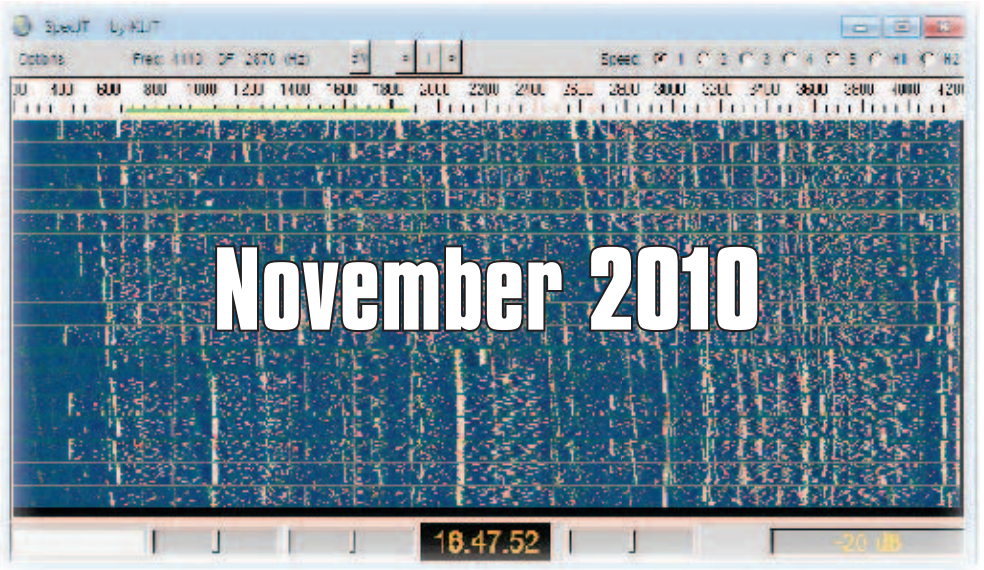
A Well, I know it's not totally required anymore, but I would feel bad becoming a ham without being fully fluent in Morse code. So that's step one.

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

Frequency Measuring Test

Join the competition to be hamdom's most accurate amateur.

H. Ward Silver, NØAX



Once again, the Frequency Measuring Test (FMT) returns to the airwaves on the evening of November 10, Wednesday evening at 9:30 PM Eastern Time (0230 UTC on Thursday, November 11). The FMT will be conducted by volunteer stations with exceptional frequency stability and timing accuracy. The transmissions will be made from the stations of K5CM (Oklahoma), W8KSE (Ohio), WA6ZTY (Northern California) and W6OQI (Southern California).

We will have just made the switch back to standard time, approaching the winter solstice and total darkness will have settled in over the West Coast. This should result in stable conditions all across the continent, although it's always a good bet that Messrs Doppler and Murphy will have something in their bag of tricks! FMT signals should be receivable across nearly all of the North American continent and into the Caribbean. In fact, if conditions are good, Western European stations may be able to hear the signals from W8KSE and K5CM — will we have some entries from "across the pond"?

In this day and age, is frequency measurement still an important part of Amateur Radio? Of course! Knowing one's frequency is required of all hams for both regulatory compliance ("stay in the band") and operating convenience, particularly on the new narrowband digital modes like PSK31.

You can use your transceiver all by itself — the frequency accuracy of most radios sold in the past decade is specified as ±10 ppm or better. By calibrating your radio to a known frequency reference such as WWV (**www.nist.gov/physlab/div847/grp40/wwv.cfm**) or CHU (**www.nrc-cnrc.gc.ca/eng/services/inms/time-services/short-wave.html**) and letting the radio reach an even, stable temperature, your measurements can be within 1 ppm. The FMT announcement in the November 2006 issue of *QST* includes a sidebar on calibrating a receiver to an over-the-air frequency reference.[1]

Transmission Format

The format will be the same "classic" format used for the April 2010 FMT — measuring the exact frequency of an unmodulated carrier. Each transmission will begin with a 4 minute identification and general call followed by a 3 minute transmission of the carrier after which the station will identify and then change bands. There will be several minutes between each set of transmissions. The schedule is shown in Table 1.

The basic techniques for making carrier frequency measurements are the same as described in the October 2002 FMT announcement in *QST*.[2] Many of the previous "how-to" FMT announcements and results are available on the ARRL's FMT Web site at **www.arrl.org/frequency-measuring-test**.

In April's FMT a few stations simply measured the transmissions of W8KSE then stopped. To encourage full participation, stations submitting a measurement of all seven transmissions with better than 1 Hz accuracy will receive special mention in the "Green Line" at the top of the results.

Future tests will be announced on the W1AW Frequency Measuring Test Web page. The organizers may have something "a little different" in mind for April 2011, so stay tuned.

[1] **p1k.arrl.org/pubs_archive/107727**

Table 1
November 2010 FMT Schedule

All times are in UTC on November 11. For example, 0230 UTC is 9:30 PM Eastern Standard Time on the evening of November 10.

Station	Test Begins	Frequency (kHz)
W8KSE	0230 UTC	7055
W8KSE	0245 UTC	3575
K5CM	0300 UTC	3578
K5CM	0315 UTC	1844
WA6ZTY	0330 UTC	7097
W6OQI	0345 UTC	7067
W6OQI	0400 UTC	3567

Submitting Reports

Your report should be submitted via the online report form on the W1AW FMT Web page at **www.b4h.net/fmt/index.php**. Along with your call sign and e-mail address, enter your most accurate measurement on each band. There will be windows to list your equipment, describe the method you used to make the measurements and enter any Soapbox comments.

Measurement data must be entered by 10 PM EST on Sunday, November 14 (0300 UTC, November 15). Participants may input their data more than once — the final entry will be the one used for the results. Transmitted frequencies will be included with the results to allow participants to determine the accuracy of their equipment and methods. The results from the April 2010 and previous FMTs are available on the W1AW FMT Web page.

[2] **p1k.arrl.org/pubs_archive/103316**

Use Beacons to Spotlight Band Openings

Radio beacons alert you to where the open bands are.

Steve Sant Andrea, AG1YK

"I wonder if any of the bands are open?" you think to yourself. "I guess I'll tune around and see if I hear anyone."

That's certainly one way to see what the ionosphere is up to, but there is also a way to tell not only *if* the band is open but *to where* and how good the opening is.

Beacons — Ham Radio Lighthouses

A beacon is a station that broadcasts a repeating CW signal on a specific frequency. As a lighthouse guides ships, a beacon helps guide your operating toward the frequencies where your RF will do the most good. Listening for beacons can tell you quickly whether a particular band is open and if so to what area and how strong signals are.

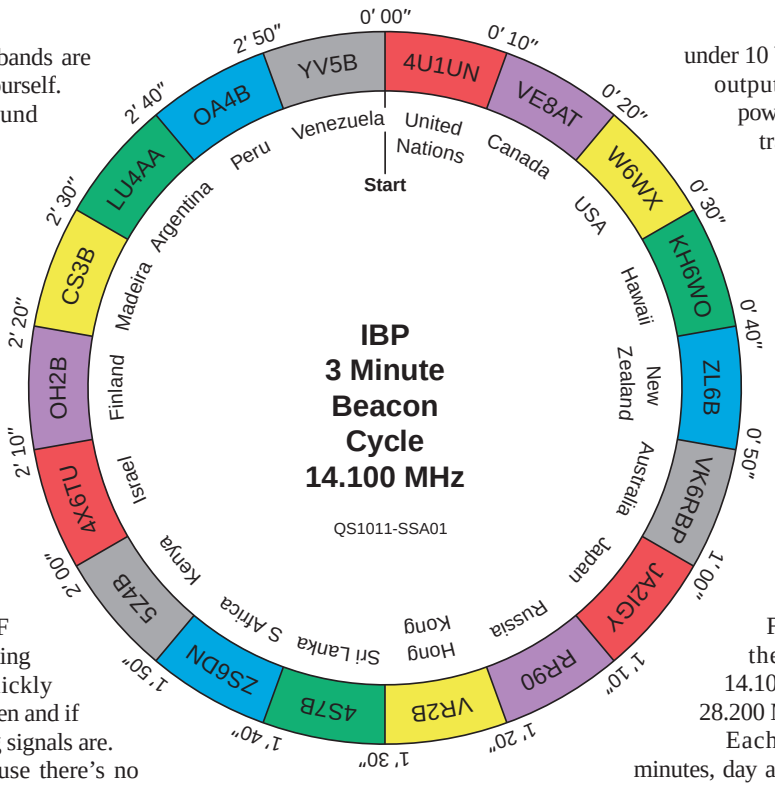
A band can be dead because there's no propagation or because no one is transmitting. We can't do anything about the first problem but for the second problem beacons come to the rescue. The multitude of amateur beacons ensures that there is always a station transmitting.

Finding Beacons

"Okay, so beacons can tell me which band is open to where, but how do I find a beacon for the frequency and area I am interested in?"

A fair question since there are beacons operating on all of the ham bands. Initially, the best way to become familiar with the available beacons is to access some of the beacon lists on the Internet. Beacon lists can be found on the AC6V Amateur Radio and DX Reference Guide Web site (**www.ac6v.com**). At AC6V, just select BEACONS from the master index and you will open the beacon page that has links to various beacon lists. Another list can be found at The DXZone (**www.dxzone.com**) listed under DX RESOURCES.

There are also many beacon lists for individual bands. For the 10 meter enthusiast, 10-10 International (**www.ten-ten.org**) maintains a list of 10 meter beacons. Beacon lists also exist for 6 and 2 meters. In fact, there are lists for all the ham bands up to 79 GHz!



This "clock" represents a complete 3 minute cycle of the 18 IBP beacons operating throughout the world.

Using Beacons

"Well, I searched the lists and came up with some beacons. Now what?"

First, if you have a beam antenna, remember to turn it to the proper azimuth for the beacon's location. Now tune your receiver to the frequency of the beacon you have selected.

The majority of beacons operate in the CW portions of the bands. Can't read CW? Since beacons are automated they repeat the same transmission. If you are on the right frequency and the station you hear repeats the same CW sequence over and over — in perfect code — it is most likely the beacon you are seeking. Note that even if you lack CW skills, if you listen to these repeating patterns for a few minutes you will be able to make out the individual code characters. Just write them down and use a Morse code table to decipher them yourself.

Now that you have the beacon you want, note how strong it is. Check its listing again. How much power is it radiating? Most beacons are under 100 W with many under 10 W. Some broadcast a "stepped output," transmitting once at full power then reducing the power of transmissions following a specific pattern. If you are hearing a 10 W beacon at S-2 then your 100 W station will produce an S-4 or 5 signal in the beacon's area. Worth a shot, right?

International Beacon Project

Of particular note is the International Beacon Project (IBP), a system of 18 beacons located all over the globe. Organized and managed by the Northern California DX Foundation (**www.ncdxf.org**), these beacons all operate on 14.100, 18.110, 21.150, 24.930 and 28.200 MHz.

Each beacon transmits every 3 minutes, day and night. A transmission lasts 10 seconds and consists of the beacon's call sign sent at 22 WPM followed by four 1 second dashes and then a 2 second gap. The call sign and the first dash are sent at 100 W. The remaining dashes are sent at 10 W, 1 W and 100 mW. At the end of the gap the next beacon begins its transmission and the first one repeats the pattern on the next frequency.

For example (see diagram), beacon 1, 4U1UN, begins at cycle time 0 minutes and 00 seconds and transmits on 14.100 MHz for 10 seconds. Next, beacon 2, VE8AT, transmits on 14.100 MHz beginning at cycle time 10 seconds till cycle time 20 seconds. This continues until beacon 18, YV5B, begins transmitting on 14.100 at cycle time 2 minutes and 50 seconds ending at cycle time 3 minutes. Then 4U1UN starts the cycle over. This pattern is repeated on the other frequencies. This regular pattern also provides a method for identifying the individual beacons. If you have an accurate clock synchronized to a time standard, the time you hear a beacon will identify which beacon is transmitting.

So the next time the band seems dead, check its pulse by listening for a beacon.

Steve Sant Andrea, AG1YK, is ARRL Assistant Editor. He can be reached at **ag1yk@arrl.org**.

Say Thanks this Thanksgiving

Nominate a Reporter for the Bill Leonard, W2SKE, Professional Media Award

Allen Pitts, W1AGP

2010 has been a great year for Amateur Radio's public relations activities. Not only did Field Day get more media attention than ever before, the number and quality of the media hits about us increased dramatically. Because of the media attention, more people became "radio aware," which contributed to the dramatic increase in the number of hams overall. Government agencies and offices, large and small, kept Amateur Radio on their agendas in part because of the media coverage of our services. There were also more articles about our technological activities. It's a time to be thankful — and to thank the media professionals who wrote, recorded and videotaped stories about us.

TV, radio, magazines, newspapers, blogs, Webcasts — we were in all of them in 2010. Now it is time to say *thank you* to the professional media people who made it happen. The way to do that is to nominate them for the *Bill Leonard, W2SKE, Professional Media Award*.

This national level, annual award honors *three* professional journalists whose outstanding audio, video or print coverage best reflects the enjoyment, importance and public service value of the Amateur Radio Service.

The Award is divided into three categories, each with its own award:

- Audio formats
- Visual formats
- Print and text formats

The award is sponsored by the ARRL — the national association for Amateur Radio. Nominations are judged by members of the ARRL national PR Committee and the final decision will be made by the ARRL Board of Directors at their meeting in January 2011. The winners each receive an engraved plaque and a donation of $250 will be made in each of their names to the charity of their choice. The deadline for receiving nominations is December 10, 2010.

The award was created as a tribute to the late CBS News President Bill Leonard, W2SKE, an avid Amateur Radio operator. Recipients must be professional journalists in print, electronic media or multimedia. The term "professional" refers to full time, part time, stringers, freelancers and contract journalists. In the case of a group project, the recipient may be the group but only one prize will be awarded. We're looking for media pieces that are truthful, clear and accurate, and reflect high journalistic standards. The award will be granted to the work deemed the best reflection of the enjoyment, importance and public service value of Amateur Radio.

Let's show our appreciation to those reporters who put Amateur Radio in the public eye.

Bill Leonard, W2SKE

While media professionals can submit their own work, we've had a lot of good stories in 2010 that deserve hams' thanks, action and consideration. Amateur Radio services in floods, fires and storms were well covered — and many of these stories could be winners. Special events and promotions also got excellent coverage as did contacts with the International Space Station and other technical achievements. If a reporter covered your activity well, nominate him or her!

Audio Format

Submit a CD with audio file(s) in MP3 format with the name of the candidate written on each disk.

Visual Format

Submit a CD with an MP4 file or DVD of the work with name of the candidate written on each disk.

Print Article

Submit clear, easily readable copy of printed text, any related Web addresses and 8.5 × 11 sheets displaying the writing in situ as it appeared to the public. (Photocopies are fine.)

All entry forms and supporting disks and documentation must be received by December 10, 2010. Mail the entry packets to:

Manager of Media Relations
American Radio Relay League
225 Main St
Newington, CT 06111

For more information about the award, and to obtain a nomination form, go to **www.arrl.org/bill-leonard-award** or contact ARRL's Media and Public Relations Department, **apitts@arrl.org**, tel 860-594-0328.

New York Judge Declares Amateur Radio Is Not a Cell Phone

In many states and localities, it is illegal to talk on a cell phone (without a hands-free device) while behind the wheel. Doing so can result in a ticket and possibly a large fine. On May 30, 2010, when a New York ham was talking on his mobile rig, he didn't think he was doing anything wrong. He wasn't, of course, but the New York State Police officer who pulled him over and cited him with a $100 fine didn't quite see it that way.

Steve Bozak, WB2IQU, of Clifton Park, told the ARRL that when he was pulled over while driving to Troy — about 16 miles away — he assured the officer that he was not speaking on a cell phone, but on his Amateur Radio handheld transceiver. According to Bozak, the officer said "it was all the same" to him. So Bozak decided to fight the ticket in court.

"Honestly, it's not the fine or the ticket, but that all the other hams who use mobile radios have to hide the fact we are mobile in Troy," he told the ARRL just days after he was cited. "I will do my best to settle this politely and correctly, for all of the ham community. So I will follow the course and have my day in court, to 'tell it to the judge.' This matter affects 38,000 hams in New York State."

Unfortunately, when Bozak had his day in court for a pre-trial conference, the prosecutor refused to dismiss the case. But he didn't give up and took his case to City Court where, on September 8, at the request of Bozak's attorney — ARRL Volunteer Counsel Jeremy Rase, KC2JRD — the judge dismissed the case in Bozak's favor. He argued that his use "of a handheld Amateur Radio does not fit the definition of a mobile telephone, and as such, the present charge should be dismissed." The prosecutor's office did not submit a response in opposition.

Saying that New York's Vehicle and Traffic Law defines a "Mobile Telephone" as a "device used by subscribers and other users of wireless telephone service to access such service," and that a "Wireless Telephone Service" is defined as "two-way real time voice tele-communications service that is interconnected to a public switched telephone network and is provided by a commercial mobile radio service," the judge decided that Bozak's handheld transceiver did not fit that description.

"A review of 47 C.F.R. §20.3 reveals that Citizens Band Radio Service is defined under private mobile radio service not commercial mobile radio service," the decision read. "Therefore, the Court finds that the use of an Amateur Radio device does not fit the definition of a mobile telephone as defined under the Vehicle and Traffic Law."

"While the court cited the Citizens Band Service instead of the Amateur Radio Service, the ruling very is favorable to amateurs on the precise point of law raised," said ARRL Regulatory Information Manager Dan Henderson, N1ND. "The principle of law is spot on. This is a great ruling in New York and exactly what we had thought would happen."

ARRL GOES ANOTHER ROUND WITH RECONROBOTICS

On August 16, ReconRobotics — manufacturers and marketers of the Recon Scout, a remote-controlled, maneuverable surveillance robot designed for use in areas that may be too hazardous for human entry — filed with the FCC an opposition to the ARRL's *Petition to Deny Applications*. The ARRL petition asked the FCC to deny dozens of pending Public Safety Pool license applications for the Recon Scout device, which operates in the 430-448 MHz band. On September 1, the ARRL filed its reply.

Calling the ReconRobotics *Opposition to Petition to Deny* "rather strident," the ARRL countered the firm's claim that the ARRL's petition was "frivolous" and "filed solely to cause delay." "Every one of the [84] pending applications contains serious technical errors and none is grantable," the ARRL maintained. Nor was the filing aimed at causing a delay: "Delay in adjudication of the pending applications is of no value to the hundreds of thousands of licensed Amateur Radio operators who regularly utilize the 420-450 MHz band at all hours of the day and night and who stand to suffer serious interference from, and perhaps cause interference to, these devices."

The Recon Scout — manufactured and marketed by ReconRobotics — is a remote-controlled, maneuverable surveillance robot designed for use in areas that may be too hazardous for human entry. The FCC granted a waiver to ReconRobotics for the device to operate between 430-448 MHz, a portion of spectrum available to the Amateur Radio Service on a secondary basis.

In its *Opposition*, ReconRobotics acknowledged that ARRL members have a frequency allocation in the 420-450 MHz band, but then suggested (without actually asserting) that the ARRL lacks standing (or "party in interest" status) to file its *Petition to Deny*. "This suggestion is not seriously advocated however, and indeed it cannot be; the vast majority of ARRL's members are licensed Amateur Radio operators, who are authorized to use, on either a fixed or mobile basis anywhere in the United States

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

and its possessions and territories, the entirety of the 420-450 MHz band," the ARRL explained. "Each of the subject applications, therefore, is a potential interference source to (and from) every licensed Amateur Radio operator. It is readily apparent that ARRL is a 'party in interest' within the scope the Commission's rules. There is no doubt whatsoever that ARRL is an interested party and is entitled to file its *Petition for Reconsideration*."

The ARRL believes that authorizing the sale, marketing and use of the ReconRobotics device in these applications based on the faulty waiver "directly brings about the harm complained of in ARRL's *Petition for Reconsideration*, including seriously erroneous warning labels and user instructions in the manuals, which ReconRobotics itself conceded (in its opposition to ARRL's *Petition for Reconsideration*) should be changed."

What ReconRobotics did not address in its *Opposition* is of critical importance, the ARRL pointed out. None of the subject applications requested a waiver of the Commission's Rules — the waiver order did not include a waiver of the table of allocations. "There is *no* domestic allocation for Public Safety land mobile services anywhere in the 420-450 MHz band," the ARRL emphasized. "Because the ReconRobotics waiver, which was limited to *Part 90 service rules*, is insufficient by itself to support the grant of an application by Part 90 mobile eligibles to operate the device in a band that is not allocated or available to those eligibles and because none of the subject applications requested or justified a waiver of the Commission's Rules, the subject applications are all defective and should be dismissed."

ARRL SEEKS TO PROTECT 2304 MHz OPERATION

In May, as a partial implementation of its National Broadband Plan, the FCC adopted amendments to its rules for Wireless Communications Services in the 2.3 GHz band to permit mobile broadband services — in addition to fixed services — in the 2305-2317.5 and 2347.5-2360 MHz bands. The *Report and Order* (*R&O*) in WT Docket No 07-293 was published in the *Federal Register* on August 2, 2010, triggering a 30 day window for petitions for reconsideration. On September 1 the ARRL filed a *Petition for Clarification or Partial Reconsideration*, asking the FCC to "clarify, or partially reconsider a single aspect" of the *R&O*.

Specifically, the ARRL requested that the Commission affirm:

- That Section 2.102(f) of the Commission's rules applies to Wireless Communications Service (WCS) fixed and mobile operations, so that harmful interference that is caused to Amateur Radio Service operations in the 2300-2305 MHz band is to be remedied by WCS licensees.
- That the current out-of-band emission (OOBE) limits for WCS devices set forth at Section 27.53(a)(3) of the Commission's rules continue to apply to mobile, portable and fixed facilities across the *entirety of the 2300-2305 MHz band* following the rule changes implemented in this *Order*.

The Amateur Radio Service has a secondary allocation at 2300-2310 MHz. The fixed and mobile services are primary at 2305-2310 MHz, but at 2300-2305 MHz the amateur allocation is not shared domestically with any other service. "The band is regularly and substantially utilized by radio amateurs for narrowband (*i.e.* 3 kilohertz bandwidth emissions or less) long-distance propagation communications using exceptionally weak received signal levels, most especially around 2304 MHz," the ARRL pointed out in its comments. "This type of operation has proven over time to be completely compatible with deep-space research and other operations below 2300 MHz, and the ambient noise levels in the 2300-2305 MHz band are historically very low, making the band attractive for amateur weak-signal communications, the principal amateur use."

The Commission noted some amateur stations operating around 2304 MHz "may experience an increased antenna noise temperature caused by the implementation of mobile WCS operations, and will have to tolerate this change in the RF environment. Due to the technical flexibility allowed to amateur stations in Part 97 of our rules, however, we believe that operators of these stations may be able to offset or mitigate the effects of this change by relocating or redirecting their antennas, or by making other permitted technical adjustments."

Calling this a "cavalier dismissal," the ARRL maintains that it represents "the latest in a series of instances in the past few years in which the Commission has made unwarranted and completely incorrect assumptions about the ability of amateur stations to avoid preclusive interference from an incompatible spectrum use by reorienting or relocating antennas. These assumptions are made without any factual basis at all, in order to justify an allocation decision the Commission desires to make."

ARRL HONORARY VICE PRESIDENT HUGH TURNBULL, W3ABC (SK)

ARRL Honorary Vice President Hugh Turnbull, W3ABC, of Silver Spring, Maryland, died September 14 at age 93. Turnbull served the ARRL as Atlantic Division Vice Director (1980-1982) and Director (1982-1996). The ARRL Board named him Vice President in 1996 and Honorary Vice President in 2000.

Aside from his long and distinguished service to the ARRL, Hugh was actively involved in several DC-area Amateur Radio clubs and organizations, including the Foundation for Amateur Radio, a group of clubs from the Maryland, Washington, DC and Northern Virginia area that awards scholarships to deserving radio amateurs. In 2005, the Quarter Century Wireless Association awarded Turnbull a special plaque recognizing his "exceptional contributions to Amateur Radio in general and for outstanding work in the selection of recipients for the QCWA scholarship awards." He was also a charter member of the Goddard Amateur Radio Club.

An active radio amateur since 1932, Hugh's engineering career included employment with the FCC, the Voice of America and NASA. Upon hearing of his death, ARRL President Kay Craigie, N3KN, who served as Atlantic Division Vice Director during Hugh's tenure as Director, said: "Hugh's life was devoted to serving his country and Amateur Radio. Many times I heard him say that each of us should 'give something back' to ham radio. He was my first mentor in ARRL leadership, and it was my good fortune to have his example to learn from." ARRL Chief Executive Officer David Sumner, K1ZZ, added: "Hugh was an exemplary member of 'The Greatest Generation' who unselfishly took on whatever needed to be done for the common good."

Hugh was predeceased by his wife Betty. He is survived by his son Mark and daughter Karen Shangraw. Turnbull will be buried with full military honors at Arlington National Cemetery. Memorial contributions may be made to the ARRL.

ARRL MEMBERS NOMINATE CANDIDATES FOR DIRECTOR, VICE DIRECTOR

The policies of the ARRL are established by 15 Directors who are elected to the Board on a geographical basis, with elections for three-year terms held in five divisions each year. At the same time, Vice Directors are elected on the same basis. Responding to solicitations in the July and August issues of *QST*, ARRL members in the Pacific, Rocky Mountain, Southeastern, Southwestern and West Gulf Divisions have nominated 16 candidates for the 10 positions of Director and Vice Director.

Five incumbents have been declared elected without opposition, while there will be balloting for the Director position in the Southeastern, Southwestern and West Gulf Divisions, and for the Vice Director position in the Southeastern and West Gulf Divisions. Ballots will be counted on Friday, November 19, 2010, and those elected will serve three-year terms beginning at noon on January 1, 2011.

Pacific Division

As the only nominee for Director in the Pacific Division, Bob Vallio, W6RGG, of Castro Valley, California, was declared re-elected. Vallio has been Pacific Division Director since February 2003 when, as Vice Director, he assumed the position upon the death of Jim Maxwell, W6CF.

Vice Director Jim Tiemstra, K6JAT, of Oakland, California, was also running unopposed and has been declared elected. Tiemstra was appointed Vice Director in June 2009 to fill a vacancy created by a resignation.

Rocky Mountain Division

Current Rocky Mountain Director Division Brian Mileshosky, N5ZGT, of Albuquerque, New Mexico, was unopposed for the position. This will be Mileshosky's second term as Director; he previously served as Rocky Mountain Division Vice Director for one full term, from 2005-2007.

Vice Director Dwayne Allen, WY7FD, of Devils Tower, Wyoming, was also re-elected. This will also be Allen's second term.

Southeastern Division

Incumbent Southeastern Division Director Greg Sarratt, W4OZK, of Huntsville, Alabama, faces two challengers for his position: Sherri Brower, W4STB, of Vero Beach, Florida, and Doug Rehman, K4AC, of Mount Dora, Florida.

Two candidates are running for Vice Director in the Southeastern Division: incumbent Jeff Beals, WA4AW, of Loxahatchee, Florida, and Andrea Hartlage, KG4IUM, of Grayson, Georgia.

Greg Sarratt, W4OZK

Doug Rehman, K4AC

Andrea Hartlage, KG4IUM

Carl Gardenias, WU6D

Larry Essary, K5XG

Michael Reynolds, WØKIE

Sherri Brower, W4STB

Jeff Beals, WA4AW

Dick Norton, N6AA

Dr David Woolweaver, K5RAV

John Robert Stratton, N5AUS

Southwestern Division

Current ARRL Southwestern Division Director Dick Norton, N6AA, of Topanga, California, will face challenger Carl Gardenias, WU6D, of Perris, California.

Having no opponent, incumbent Vice Director Marty Woll, N6VI, of Chatsworth, California, was re-elected.

West Gulf Division

Current ARRL West Gulf Division Director Dr David Woolweaver, K5RAV, of Harlingen, Texas, will face Larry Essary, K5XG, of Lucas, Texas, for that position.

The incumbent Vice Director for the West Gulf Division, John Robert Stratton, N5AUS, of Austin, Texas, will face challenger Michael Reynolds, WØKIE, of Tulsa, Oklahoma. Stratton was appointed Vice Director in August 2010 after the resignation of John Thomason, WB5SYT.

Ballots will be sent to all full members of the League in the Southeastern, Southwestern and West Gulf Divisions who were of good standing as of September 10, 2010 (you must be a licensed radio amateur to be a full member). The ballots will be mailed not later than October 1, 2010 and, to be valid, must be received at ARRL HQ by noon Eastern Time on Friday, November 19, 2010. A committee of tellers will meet on that date to count ballots in the presence of an independent auditor. In each case the candidate with the greatest number of votes will be declared the winner.

ARRL COMMENTS IN FCC REVIEW OF CB RULES

In June the FCC opened a proceeding — WT Docket No. 10-119 — "to simplify, streamline, and update the Part 95 rules to reflect technological advances and changes in the way the American public uses the various Personal Radio Services." The Citizens Band Radio Service is one of several Personal Radio Services regulated by Part 95. Three of the CB-related issues raised in the *Notice of Proposed Rule Making* (*NPRM*) are of interest to the Amateur Radio Service. On September 3, the ARRL filed comments limited to these issues.

In the *NPRM*, the FCC sought to consolidate the rules pertaining to the modification of certificated CB equipment. The Commission noted that CB equipment that has been modified by the CB operator — or persons other than the manufacturer — to operate on unauthorized frequencies or to operate with higher power than authorized often causes interference to other radio services.

While the ARRL certainly supports the Commission's proposal to clarify the

Part 95 rules relative to the prohibition on modification of certificated CB equipment, "much of the problem of misuse of CB equipment is due to the lack of enforcement of equipment authorization and marketing rules, rather than the language of the rules themselves," the ARRL maintains. "CB shops and truck stops, for example, are often found to be actively marketing and selling modified or illegally imported equipment which is actually intended to operate not on CB channels, but on amateur or government frequencies between 27.415 MHz and 28.500 MHz. Often, this equipment is not marketed as CB equipment, but instead is marketed inaccurately as Amateur Radio equipment."

The ARRL supports the Commission's proposal to prohibit the certification of radios that are intended to transmit on both Personal Radio Service channels and on Part 97 frequency allocations. Noting that it is undesirable in general to combine transmit capability in radios intended for use in a licensed radio service with transmit capability in radios intended for use in a service licensed by rule — such as the CB service — the ARRL agreed with the Commission's finding that this invites unauthorized operation on frequencies allocated to the licensed radio service by users in the unlicensed service.

In the *NPRM*, the Commission discussed the current prohibition on CB communications between two stations located more than 250 kilometers apart. The rule, Section 95.413(a)(9), is intended to discourage CB skywave communications. The ARRL supports the existing Part 95 rule against long-distance CB communication. The ARRL put forward the idea that the best path to Section 95.413(a)(9) compliance is a non-regulatory solution: "The Amateur Radio Service provides a convenient, positive and appropriate option for those CB users who are interested in long distance radio communications. The Amateur Radio Service is and always has been the proper radio service for those interested in HF communications using long distance skywave propagation and other techniques. It is suggested, therefore, that the Commission should encourage those who might be tempted to conduct long-distance CB communications to instead obtain an amateur license."

NOMINATIONS FOR ARRL INTERNATIONAL HUMANITARIAN AWARD

Nominations are open for the 2010 ARRL International Humanitarian Award. The award is conferred upon an amateur or amateurs who demonstrate devotion to human welfare, peace and international understanding through Amateur Radio. The League established the annual prize to recognize Amateur Radio operators who have used ham radio to provide extraordinary service to others in times of crisis or disaster.

A committee appointed by the League's President recommends the award recipient(s) to the ARRL Board, which makes the final decision. The committee is now accepting nominations from Amateur Radio, governmental or other organizations that have benefited from extraordinary service rendered by an Amateur Radio operator or group. Amateur Radio is one of the few telecommunication services that allow people throughout the world from all walks of life to meet and talk with each other, thereby spreading goodwill across political boundaries. The ARRL International Humanitarian Award recognizes Amateur Radio's unique role in international communication and the assistance amateurs regularly provide to people in need.

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

All nominations and supporting materials for the 2010 ARRL International Humanitarian Award must be submitted in writing in English to ARRL International Humanitarian Award, 225 Main St, Newington, CT 06111 USA. Nomination submissions are due by December 31, 2010. In the event that no nominations are received, the committee itself may determine a recipient or decide to make no award. The recipient (or recipients) of the ARRL International Humanitarian Award receive an engraved plaque and a profile in *QST* and other ARRL venues.

SECTION MANAGER NOMINATION NOTICE

To all ARRL members in the Arizona, Arkansas, Iowa, Kentucky, Mississippi, Montana, North Texas, Orange and Wyoming sections: You are hereby solicited for nominating petitions pursuant to an election for Section Manager (SM). Incumbents are listed on page 16 of this issue.

To be valid, a petition must contain the signatures of five or more full ARRL members residing in the section concerned. Photocopied signatures are not acceptable. No petition is valid without at least five signatures, and it is advisable to have a few more than five signatures on each petition. Petition forms FSD-129 are available on request from ARRL Headquarters but are not required. A sample nomination form is available on the ARRL Web site at **www.arrl.org/section-terms-nomination-information**.

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 10, 2010. If more than one member is nominated in a single section, ballots will be mailed from Headquarters on or before January 3, 2011, to full members of record as of December 10, 2010, which is the closing date for nominations. Returns will be counted February 22, 2011. Section Managers elected as a result of the above procedure will take office April 1, 2011.

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, 2011. If no petitions are received from a section by the specified closing date, such section will be resolicited in the April 2011 *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*

Amateurs Supply Critical Support to Nuclear Exercise

Ben Givaudan, N4BG/2
n4bg@arrl.net

In one of the few programs in existence, the PEARL (Putnam Emergency and Amateur Repeater League) group adds radiological monitoring to their capabilities. In addition to being ready to help out with disaster relief communications, the Putnam County group (in New York State and the Eastern New York Section) trains regularly to assist county, state and federal agencies should a radiological event take place at the nearby Entergy Nuclear Facility at Indian Point, near Peekskill.

Hams are trained to operate field radiation detection equipment, should an event occur. The group is also trained in decontamination procedures should people become contaminated with radioactive material. Preestablished monitoring points for radiological measurements are scattered in the southwestern part of the county. These points are checked as necessary during an event depending on the wind speed and direction as specified by the Emergency Operations Command staff.

Drills are conducted regularly and observed by Federal Emergency Management Agency (FEMA) evaluators to insure proficiency in operating detection equipment. This data is compiled and transmitted on the local 2 meter repeater to operations personnel at the Emergency Operations Center (EOC) in Carmel, New York. Due to the mountainous terrain where the monitoring points are located, a backup 2 meter repeater is also available.

The field teams are also equipped with APRS (Automatic Packet Reporting System) radios that are connected to a GPS (Global Positioning System) in the vehicles that beacon the team's position every 3 minutes. This way the staff at the EOC via an Internet connection can keep track to within 100 yards of the exact point where radiological samples are taken.

Members also use a 2 meter simplex frequency with handheld portable radios to establish a local network within the confines of the EOC. This allows information to be passed between the radio room and personnel in the operations center.

A text-messaging tree at the EOC notifies PEARL members of the start of the drill followed shortly by the establishment of a resource net to see who is available for assignments during the event. Teams are then assigned to various locations where monitoring of radioactivity is necessary.

Adam Stiebling, the Deputy Commissioner/Public Information Officer for Emergency Services of Putnam County, said the following: "Without the vital dedication of the members of PEARL, Putnam County would not be able to perform the critical functions of Monitoring and Decontamination; with a communications component built-in. The men and women of PEARL are a very valuable resource to our county emergency preparedness capabilities."

This is just another example of the versatility of ham radio operators in providing a service to the public. For more information about the PEARL group, go to their Web site at **www.k2put.org**.

BEN GIVAUDAN, N4BG

Alan Lounsbury, AB2ZL (left), Steve Miller, K2HQ (center), and Jerry O'Connor from the New York State Health Department with radiological monitoring test gear at a check point near Garrison, New York.

BEN GIVAUDAN, N4BG

Steve Miller, K2HQ (left), and Alan Lounsbury, AB2ZL, take sample readings during the nuclear exercise.

BEN GIVAUDAN, N4BG

Alan Lounsbury, AB2ZL, enters data taken from air-sampling readings during the nuclear exercise.

THE NET MANAGER'S ROLE IN EMERGENCY COMMUNICATIONS

The role of the Net Manager is crucial to the success of a net. In an emergency situation, the Net Manager's role in coordinating net control stations and net liaison stations can be even more focused and intense.

Net Manager — Keeping Section Nets in Sync

To get a better idea of what a Net Manager is supposed to do, let's review the description of an ARRL Net Manager's appointment.

For coordinating and supervising traffic handling activities in the section, the Section Manager (SM) may appoint one or more Net Managers (NMs), usually on the recommendation of the Section Traffic Manager (STM). The number of NMs appointed may depend on a section's geographical size, the number of nets operating in the section or other factors having to do with the way the section is organized.

In some cases, there may be only one NM in charge of the one section net or one NM for the phone net and one for the CW net. In larger or more traffic-active sections there may be several, including NMs for the VHF nets, for the RTTY nets, for NTS local nets or packet nodes not controlled by Emergency Coordinators (EC). All ARRL Net Managers should work under the STM in a coordinated section traffic plan.

Some nets cover more than one section, but operate in the National Traffic System (NTS) at the section level. In this case, the NM is selected by agreement among the STMs concerned and the NM appointment conferred by his or her resident SM. Some NMs are system operators of, or sysop-recommended operators active on, participating NTS digital outlets.

Net Mangers may conduct any testing of candidates for Official Relay Station appointment that they consider necessary before making appointment recommendations to the STM. Net Managers also have the function of requiring that all traffic handled through an NTS net or node be in proper message form.

Emergency Net Manager — Maintaining Order in the Chaos

Refer to your section's emergency plan for specific details on how your section has organized itself and its field organization appointees to respond to emergencies. The following information is provided as a general guide.

The emergency NM generally works closely with the EC or the Section Emergency Coordinator (SEC) in cooperation with the STM.

During emergency net operations, the managers of the phone net and the ARES® net often alternate as emergency NMs and each has full authority while on duty. Between them, they cover the full 24 hour period of operation, when necessary. Their job is to arrange their duty periods to suit their mutual convenience. His or her duties include appointment of Net Control Stations (NCS), keeping attendance records and maintaining a work log of net activity while in emergency session. During simultaneous operation on both frequencies, the NM has overall responsibility for both nets and designates an Assistant Net Manager to supervise operations on one of them.

Responsibilities of the emergency NM could include:

- Overall supervision of the net's operation to maintain net discipline and efficiency, intervening as necessary to smooth out procedural problems.
- Arranging relief for NCS operators at reasonable intervals.
- Replacing NCS operators who cannot maintain effective control of the net.
- Notifying the SEC or SM when, and if, the net encounters persistent destructive interference.
- Recommending timely measures to the SEC to improve overall operation of the ARES® system in the existing emergency.

Secondary Nets — Keep the Emergency Net Clear

In general terms, traffic should not be handled on the primary frequency of the emergency net except during periods of slow operation. If the net frequency is continuously busy, it blocks the listing and dispatching of traffic and the conduct of other business. Mobiles, weak stations or those with emergency traffic may have trouble being heard.

The Net Control Station — The Net's Traffic Cop

The Net Control Station (NCS) of a section or district net should not be located in the disaster area where it would be subject to many adverse factors. Rather, it is ideal for the NCS to be located so as to hear stations in the impacted area as well as possible. The NM should select net control operators on the basis of signal quality and strength (taking propagation into account) and operating skills. The NCS will appoint relay stations as necessary.

A 2 hour emergency net control shift is normal, but the NM may adjust this duty cycle as convenience or necessity requires. Gateway stations should not be used as NCS, except during very slow activity hours or when their gateway services are not being utilized.

If destructive interference occurs on an emergency net frequency, the SEC or SM should be notified promptly (but not on the net frequency itself). If the NCS is unable to move the troublesome station by polite request, the SM or SEC may need to ask the Official Observers (OOs) and Official Observer Coordinator (OOC) to monitor the frequency. Should it become necessary, the OOC would contact ARRL Headquarters, which, in turn, would inform the Federal Communications Commission's Enforcement Bureau about the occurrence. The FCC's Enforcement Bureau may choose to monitor the emergency net frequency themselves and to make use of the relevant documentation provided by the OOs to build a case against the malicious operators.

George Hart Distinguished Service Award

Nominations for the 2011 George Hart Distinguished Service Award and any related supporting material and letters of recommendation may be sent to ARRL Headquarters to the attention of Dave Patton, NN1N, ARRL Membership and Volunteer Programs Manager (**nn1n@arrl.org**) or to Steve Ewald, WV1X (**wv1x@arrl.org**). The nomination period continues until November 1, 2010. See October *QST*'s "Public Service" column for further details.

Free Mode Operation

Free Mode is sometimes a preferred method of net control if and when conditions and traffic loads permit. The NCS remains silent except to identify the station and the net at 9 minute intervals and to respond to calls. Whether operating in Free Mode or actively directed, the NCS is always in charge of the frequency. Member stations still address NCS before calling another station but the frequency is allowed to be idle between bursts of activity. Weak stations have a better chance to be heard when the frequency is not continuously occupied. Directed mode is used when necessary to maintain decorum, reduce confusion or to facilitate traffic management. When activity gets brisk enough to require an NCS, directed status resumes.

Net control operators should not maintain a constant drone, even in directed mode. This can interfere with stations trying to contact the net. During free operation, NCS should make a brief announcement about every 9 minutes, identifying themselves and the net. If curious operators ask what's going on, NCS should have a brief "canned" response ready, such as, "We're supporting the National Weather Service in a weather emergency."

The NCS should respond immediately if other stations, not realizing the frequency is occupied, try to begin operation there. A polite but firm request to respect the emergency frequency is usually all that's required. A slight shift in frequency by the emergency net should be made if reasonably necessary.

How to Apply for an Appointment

If you know of an opportunity to serve as an NM or have been asked to consider the appointment and the responsibility of managing a net's activities, you may apply for the ARRL NM appointment online at **www.arrl.org/fsd-187-application-for-station-appointment**. This application form is for all ARRL Field Organization station appointments.

Information about all Field Organization Appointments, including the Section Leadership positions, is found on the ARRL Web site at **www.arrl.org/field-organization**.

EASTERN AREA TRAFFIC HANDLERS PICNIC

The Traffic Handlers Picnic continues to be a summertime tradition for radio amateurs and their families within the ARRL National Traffic System Eastern Area. On August 21, ARRL Connecticut Section Manager Betsey Doane, K1EIC, hosted this year's annual picnic at her home in Shelton, Connecticut, with assistance from Marcia Forde, KW1U, chair of the NTS Eastern Area Staff.

Nearly 40 persons from all across the Northeast, the Mid-Atlantic region, North Carolina and even California were in attendance. This fun occasion was a reunion for some and, in some cases, a chance for radio operators to meet one another in person for the first time after being in contact or corresponding with each other for a long time.

PETE CHAMALIAN, W1RM

All current and former Net Control Stations of the NTS Eastern Area Net that were present at the Eastern Area Traffic Handlers picnic gathered for a group photo. Shown, left to right, are Bud Hippisley, W2RU; Phil Sager, WB4FDT; Anne West, K1STM; Pete Chamalian, W1RM; Dan Brochu, KY1F; John Miller, N1UMJ; Hank Garretson, W6SX; Barbara Lombardi, K1EIR; Dan Clark, N2DC; Marcia Forde, KW1U, and Betsey Doane, K1EIC.

Emergency or Not, Get Involved!

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

Over the last few years, I have heard quite a few new amateurs say that the only reason they got their license was for emergency communications. Most take part in exercises, Field Day and nets and may even be involved with a local club or ARES® group. Every once in a while I've heard of those who only intend to get involved when there is an emergency. This may be a personal choice or it may be part of a response plan (such as public safety responders and hospital employees). This poses a serious problem. If your plan is to only get involved when there is an emergency are you really an asset or a liability?

Let's take a look at a few items that we usually keep on hand for emergencies: a generator, fire extinguisher and first-aid kit. We wouldn't think of having a generator without testing it periodically. Fire extinguishers need to be inspected regularly and recharged after they are used. And first-aid kits, which may sit on a shelf for long periods of time with little use, need to be inspected occasionally to make sure they are adequately stocked. Our skills as emergency communicators are no different.

There are many ways that you can keep your emergency communication skills sharp even if your intention isn't to be Mr or Mrs ham radio. Most areas have daily or weekly nets that operate on local repeaters or on the HF bands. Take the time to check in and get to know the amateurs in your area. You are very likely going to encounter them during an emergency. Volunteer to assist with public service events such as parades, marathons and festivals. These events do more to keep skills sharp than you may think. There are also club meetings, training opportunities, drills and exercises, and Field Day. All these will help keep you ready for an emergency.

Only getting involved when there is an emergency is much like buying a racecar with the expectation to win the Indy 500, but never actually driving it before the race. To be ready requires preparation on your part. Get involved!

WB8IMY

ECLECTIC TECHNOLOGY

The Burgeoning SDR Cottage Industry

I truly enjoy watching how hams (and others) are applying their homebrewing skills to create miniature business ventures built around Software Defined Radios. In a previous column I mentioned the popular SoftRock receivers available from Tony Parks, KB9YIG, at **www.kb9yig.com**. Tony is but one example of how Software Defined Radio has moved well within the Amateur Radio mainstream. Look around and you'll find ham SDR hardware for sale all over the Web. A small sample includes:

- Chris Moulding, G4HYG, selling Software Defined receivers for about $76 US at **www.crosscountrywireless.net**.
- Peter Goodmann, NI9N, aka Lazy Dog Engineering, offering his LD-1A HF receiver at **www.lazydogengineering.com/LD-1A_SDR.html** for $218.
- Kazunori Miura, JA7TDO, selling his Soft66 receivers on eBay and at **zao.jp/radio/soft66ad/** for around $115 US.
- Phil Covington, N8VB, and his QS1R high-performance SDR at **www.srl-llc.com** (reviewed in the September *QST* "Product Review").
- And, of course, FlexRadio at **www.flexradio.com**, which began as a cottage business and has since grown into a major player in the Amateur Radio SDR market.

You'd think that all this SDR "softbrewing" was taking place among the younger segments of the ham population, but I've heard from amateurs at the other end of the age scale as well. One 72-year-old gentleman who asked to remain anonymous sent me an e-mail with the comment, "I retired from a 50 year career in electrical engineering. I cut my teeth on vacuum tubes and transistors, but guess what? I'm designing my own RF front end hardware to work with all the free SDR software out there. It isn't nearly as difficult as I imagined."

Unraveling the "Mystery" of the Smith Chart

Ken Shubert, KØKS, uncovered a very handy Web site that will go a long way toward bettering your understanding of impedance and SWR, among other things. Take a Web journey to **www.fourier-series.com/rf-concepts/smithchart.html** and you'll see what I mean. To quote Ken, "Brent Locher, the site creator, isn't a ham but he sure thinks like one!"

Charge a Battery in Minutes?

No, not as in *480 minutes*. Researcher Ibrahim Abou Hamad from Mississippi State University believes he has developed an ultrafast charging method for lithium-ion batteries.

JA7TDO

The Soft66AD software-defined receiver by Kazunori Miura, JA7TDO.

We're talking about charge times in the range of less than 10 minutes for the types of lithium batteries we commonly encounter.

In the charging process, lithium ions first diffuse within the battery's electrolyte until they reach the graphite anode. At this point the ions are forced to overcome a substantial energy barrier in order to be incorporated into the anode itself. This is one of the key reasons why it takes so long for the battery to reach a full charge.

Hamad and his team found that applying a weak RF signal to the anode caused the ions to easily overcome the barrier. The RF signal is at 25 GHz and the ions respond by almost instantly flooding into the anode. By changing the signal amplitude, the researchers found that they could further improve charging time by lowering the energy barrier and speeding up the process even further. Apparently the relationship between the incorporation rate and the signal amplitude is exponential, meaning that a small increase in amplitude leads to a large increase in rate, which offers the potential for very fast charging times.

Where's My Room Temperature Superconductor?

Remember the promise of room temperature superconductors? Back in the 1980s they said this technology would lead to a proliferation of wonders such as smooth, fast maglev trains. In the RF world, some envisioned super efficient antennas made from these amazing materials.

I don't know about you, but it's been nearly 30 years and there are no maglev trains running through my town and my ham antennas are still constructed of plain old copper and aluminum. Obviously the vision of room temperature superconductivity fell short. The good news is that Dr Peter Hirschfeld, a University of Florida professor, along with a team of five other researchers has learned why the hype turned to disappointment.

His team discovered that ceramic superconductors — the "high temperature" variety — have an odd tendency to form *grain boundaries* separating rows of atoms in the material. High-temperature superconducting ceramic wires are composed of rows of atoms arranged slightly askew to each other, as though one piece of graph paper had been melded atop another with the horizontal and vertical lines at less-than-perfect alignment. They found that lumps of electrical charge build up at the angles where the lines meet, acting like dams to interrupt the flow of electricity. The net result is a strong impediment to current flow.

Unfortunately, the bad news is that their discovery hasn't yielded the means to break down the barriers. Dr Hirschfeld remains optimistic, though. Since they now know why the room temperature superconductors have failed, he believes their discovery will point toward a solution.

So it's back to shiny metal antennas…at least for now. QST

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

This Month in Contesting

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

THE HUNT FOR THE BROOM

When you get bitten by Sweepstakes, it bites hard. The great November tradition of Amateur Radio, "SS" will take place for the 77th time this year. The CW event is on the first weekend, November 6-7, and the SSB event is on the third, November 20-21. This contest, more than any other, is arguably the finest competitive event for hams in the US and Canada. Everyone can participate, even with simple wire antennas and low power, and do reasonably well. The exchange is the most difficult, with more elements to it than any other event — meaning more chances for error. Yet the focal point for all participants, whether wet-behind-the-ears newbie or grizzled veteran, is the Clean Sweep.

It's quite an amazing feat, if you think about it. Many other contests have a virtually unlimited set of multipliers: DXCC countries per band, prefixes, grid squares, islands — these are all as bountiful as can be. The fact that SS has a finite set of multipliers — 80 ARRL/RAC sections — creates an atmosphere of completion in the minds of participants. If you miss one or two, you end up feeling like the jigsaw puzzle you've been working on is missing a couple of pieces. Despite the challenges, a Clean Sweep is an attainable goal for most participants. But like everything else that is worthy, there's work involved.

In 2009, there were 527 Clean Sweeps: 245 in CW, 282 in Phone. Of those, around 60% were in a category that allowed spotting assistance (Single Operator Unlimited, Multioperator or School Club). Appropriately enough, 73 entrants operating Single Operator, Low Power with no spotting assistance won sweeps. Eight lucky QRPers managed to work all 80 Sections.

The Last Pieces of the Puzzle

What are the rare sections in Sweepstakes? It's not the easiest question to answer. Some sections have only two active stations, but together they work 4000 contacts. Others have more entries, but they each work only a couple of hundred stations. There are also differences in activity between CW and Phone SS.

To get some sort of a handle on section rarity, I took a look at submitted logs over the past 4 years to see which sections were indeed the rarest. For my criteria, I only listed sections that had either fewer than five logs submitted or fewer than 1500 contacts in submitted logs.

CW SS — Rarest Sections 2006-2009

Section	*# of Logs*	*# of Contacts*
Newfoundland/Labrador (NL)	13	2,656
Northern Territories (NT)	8	2,773
Alberta (AB)	8	3,002
Puerto Rico (PR)	6	5,449
Virgin Islands (VI)	11	9,303

Phone SS – Rarest Sections 2006-2009

Section	*# of Logs*	*# of Contacts*
Northern Territories (NT)	12	3,904
Manitoba (MB)	12	5,090
Newfoundland/Labrador (NL)	16	6,107
Puerto Rico (PR)	13	7,780
Virgin Islands (VI)	11	11,334

Using a larger data set of combined modes from 2003-2008, the rarity is similar:

SS Section Data — 2003-2008 from Submitted Logs
Both modes combined — 12 Sweepstakes total

Section	*Total Contacts*	*Avg Contacts/Event*
Northern Territories (NT)	7,239	603
Newfoundland/Labrador (NL)	11,942	995
Manitoba (MB)	14,965	1,247
Puerto Rico (PR)	17,158	1,429
Quebec (QC)	17,815	1,484
North Dakota (ND)	19,468	1,622
Alaska (AK)	20,813	1,734
Pacific (PAC)	20,924	1,743
Northern New York (NNY)	21,479	1,790
Virgin Islands (VI)	24,685	2,057
Saskatchewan (SK)	25,360	2,113
Delaware (DE)	27,283	2,273
Wyoming (WY)	27,402	2,283
Alberta (AB)	27,742	2,311
Mississippi (MS)	28,348	2,362
Maritimes (MAR)	29,507	2,459
Santa Barbara (SB)	29,827	2,485
West Texas (WTX)	29,864	2,473
Rhode Island (RI)	34,285	2,857
South Carolina (SC)	34,344	2,862
Illinois (IL) *most common*	317,979	26,498

Some of these numbers are misleading, in a way. Several examples exist of a section with only 2 or 3 stations, but because they enter a high-power category with big antennas and CQ a lot, they're easy to work, which skews the "rarity" factor a bit. The Virgin Islands (VI) is a good example of this, as is the Pacific section (PAC).

So, what can you do to increase your chances of bagging a Clean Sweep mug? The first thing to do is identify your Sweepstakes goals. If your primary goal is to get a sweep and possibly contribute to your contest club's aggregate score in the quest for a Club Competition gavel, then Single Operator Unlimited is the category for you. You can run high power if you're capable, but most importantly, you get access to the spotting networks, like DX Summit or DX Sherlock.

Thousands of spots will be posted during the contest weekend that will give exact frequency information on the last few sections you need, including the perennially rare ones like Northern Territories (NT), Newfoundland/Labrador (NL) and Manitoba (MB). If you'd prefer to share the fun and operating time with your buddies, Multioperator or the School Club categories also allow spotting assistance.

There are still many who enter SS in a category that doesn't allow spotting assistance. Of the 2,049 logs received for SS Phone last year, nearly ⅔ opted to "go it alone" as a Single Operator with High, Low or QRP power. Nine hundred and ninety five entries — nearly 50% — entered in the "Joe Ham" category — Single Operator, Low Power.

In order to snag them all under those circumstances, you still have to ask yourself a fundamental question: Is your goal to do well in the event, or is your goal the Clean Sweep? If you want to compete, strategically the Sweep becomes the secondary goal. This applies whether you want to see your name in the Top Ten box, or if you're just trying to beat other club members so you don't have to buy the pizza at the post-contest celebration.

Finding a good balance between tuning and calling CQ will yield great results. During the first day, you will work far more sections by calling CQ than if you tune around and listen for ones you need. You will also net more contacts in your log, resulting in a better overall score. Of course, none of this is possible if you don't sit in front of the rig, make contacts and dedicate yourself to the goal; more chair time increases your chances of success.

There will be certain places you will always find certain sections: PAC will almost always be on 15 or (if it opens) 10 meters Sunday around midday, or sunrise in Hawaii. VO1 stations in NL frequently show up on 15 or 20 meters Sunday morning. Look for the Caribbean sections (PR and VI) on 40 meters Saturday night or on 20 or 15 meters Sunday morning. And the always sought-after Northern Territories stations are on the highest band possible, hoping to thwart the aurora.

The Clean Sweep is not out of reach for you. Here's hoping to see your call among those who find that elusive broom this year.

CONTEST CORRAL

in association with the *National Contest Journal*

NOVEMBER 2010

Start and Finish	HF	VHF+	Contest Title	Phone	CW	Digital	Exchange	Sponsor's Web Site or Contact
Nov 2, 0200Z - Nov 2, 0400Z	3.5-28		ARS Spartan Sprint		✘		RST, S/P/C, and power	**www.arsqrp.blogspot.com**
Nov 4, 0900Z - See Web site	3.5-28		High Speed Club CW Contest		✘		RST and MSC member nr or "NM"	**www.dl3bzz.de/html/hscconte.html**
Nov 6, 1200Z - Nov 7, 1200Z	1.8-28		Ukranian DX Contest	✘	✘		RST and serial or Ukraine oblast	**www.ucc.zp.ua**
Nov 6, 1700Z - Nov 7, 0500Z	3.5-21		Radio Club of America QSO Party	✘			RST, QTH, name, equipment	**www.radioclubofamerica.org**
Nov 6, 2100Z - Nov 8, 0300Z	**1.8-28**		**ARRL November Sweepstakes**		✘		**Serial, category, call, check, ARRL sec**	**www.arrl.org/contests**
Nov 6, 2100Z - Nov 8, 0300Z	1.8-28		Collegiate ARC Championship		✘		See ARRL Sweepstakes	**www.collegiatechampionship.org**
Nov 7, 1100Z - Nov 7, 1700Z	28		DARC 10-Meter Digital "Corona"			✘	RST and serial	**www.darc.de/referate/ukw-funksport**
Nov 10, 1100Z - See Web site	3.5-14		CWops Mini-CWT Test		✘		Name and member number or S/P/C	**www.cwops.org/onair.html**
Nov 13, 0000Z - Nov 14, 2400Z	3.5-28		Worked All Europe DX Contest			✘	RST and serial (see Web for QTC rules)	**www.waedc.de**
Nov 13, 0700Z - Nov 14, 1300Z	3.5-28		Japan International DX Contest	✘			RST and JA prefecture or CQ Zone	**jidx.org**
Nov 13, 1200Z - Nov 14, 1200Z	1.8-28		OK-OM DX Contest		✘		RST and serial or OK/OM district	**okomdx.crk.cz**
Nov 13, 1400Z - Nov 14, 0200Z	1.8-28	50	Kentucky QSO Party	✘	✘		RST and KY county or S/P/C	**www.wkdxa.com**
Nov 13, 1900Z - Nov 15, 0500Z	1.8-28	50-440	CQ WE (Western Electric)	✘	✘	✘	Call, name, Bell QTH, yrs of svc (see Web)	**cqwe.cboh.org**
Nov 14, 0000Z - Nov 14, 2359Z	3.5-28		Straight Key Weekend Sprint		✘		RST, S/P/C, SKCC nr or power	**www.skccgroup.com/sprint/wes**
Nov 20, 0000Z - Nov 21, 2359Z	1.8-28		Mongolia DX Contest	✘	✘		RS(T) and CQ Zone	
Nov 20, 1200Z - Nov 21, 1200Z	3.5-28		LZ DX Contest	✘	✘		RST and ITU Zone or LZ district	**lzdx.bfra.org**
Nov 20, 1600Z - Nov 21, 0700Z	1.8		All Austria 160 Meter Contest		✘		RST, serial, OE district	**www.oevsv.at**
Nov 20, 2100Z - Nov 22, 0300Z	**1.8-28**		**ARRL November Sweepstakes**	✘			**Serial, category, call, check, ARRL sec**	**www.arrl.org/contests**
Nov 20, 2100Z - Nov 22, 0300Z	1.8-28		Collegiate ARC Championship	✘			See ARRL Sweepstakes	**www.collegiatechampionship.org**
Nov 20, 2100Z - Nov 21, 0100Z	1.8		RSGB 1.8MHz Contest		✘		RST, serial, UK district	**www.vhfcc.org/hfcc**
Nov 21, 1300Z - Nov 21, 1700Z	3.5-7		Homebrew and Oldtime Contest		✘		RST, serial, and category	**www.qrpcc.de/contestrules/hotr.html**
Nov 22, 0200Z - Nov 22, 0400Z	1.8-28		Run For the Bacon		✘		RST, S/P/C, Flying Pig nr or power	**www.fpqrp.com/fpqrprun.php**
Nov 24, 0000Z - Nov 24, 0200Z	1.8-28	50	SKCC Straight Key Sprint		✘		RST, S/P/C, name, SKCC nr or power	**www.skccgroup.com/sprint/sks**
Nov 27, 0000Z - Nov 28, 2400Z	1.8-28		CQ World Wide CW Contest		✘		RST 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.
Refer to the contest Web sites for full rules, scoring information, operating periods or time limits, and log submission information.
No contest activity occurs on 60, 30, 17, 12 meters. Serial = Sequential number of the contact. S/P/C = State, Province, DXCC Entity.
Publication deadline for Contest Corral listings is the first day of the second month prior to publication.

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

Sean's Picks

- **State QSO Parties this month**: Kentucky
- November is one of the hottest months for major contest activity. November 4-6 is the ARRL CW Sweepstakes, November 13-14 features both the Worked All Europe Digital Contest and the Japan International DX Phone Contest. November 20-22 is the ARRL Phone Sweepstakes and November 27-28 is CQ World Wide DX CW Contest. Smaller events on different modes exist the same weekends as the major events. If you can't find a contest in the month of November, you're not trying very hard!

Coming Next Month: A Contest Trifecta!

160 M Contest ↯ 10 M Contest ↯ Rookie Roundup

In the November/December "Contesting 101"

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

November 2010 W1AW QUALIFYING RUNS

W1AW Qualifying Runs are 9 AM EDT (1300Z) Wednesday, November 3 (35-10 WPM) and 7 PM EST Tuesday, November 16 (0000Z November 17). The West Coast Qualifying Run will be transmitted by station K6YR on 3590 kHz at 9 PM PST Wednesday, November 10 (0500Z November 11). Unless indicated otherwise, speeds are from 10-35 WPM.

2010 ARRL 160 Meter Contest

2200 UTC Friday, December 3 – 1559 UTC Sunday, December 5

■ 160 is the place to be in the first of the ARRL's three December competitions. If you don't have an antenna for 160, use a tuner and load your 40 or 80 meter dipole and try your hand on Top Band. Work stations across North America or even snag DX! W/VE stations send a signal report and your ARRL/RAC section; DX stations send a signal report.

■ E-mail Cabrillo-formatted logs to **160meter@arrl.org**. Paper logs go to ARRL 160 Meter Contest, 225 Main St, Newington, CT 06111. All logs must be e-mailed or postmarked no later than 1600 UTC Tuesday, January 4, 2011.

COURTESY JOHN SLUYMER, VE3EJ

John, VE3EJ, at the base of his 160 meter vertical transmitting antenna.

Complete rules for both contests may be found at **www.arrl.org/contests**

2010 ARRL 10 Meter Contest

0000 UTC Saturday, December 11 – 2359 UTC Sunday, December 12

World-class operators Hector Garcia, XE2K, and Ramón Santoyo, XE1KK, lead the charge of Mexican amateurs who will be handing out new multipliers during the 2010 ARRL 10 Meter Contest! Hector's antennas appear below.

COURTESY HECTOR GARCIA, XE2K

■ The highest band in the HF spectrum is the place to make contacts in the second of the ARRL's three December competitions. Solar Cycle 24 has finally begun, and that could mean good openings. Enter only SSB, only CW or a mixture of both.

■ New for 2010 is the addition of the 31 Mexican states and the Federal District as multipliers. This will definitely bring new excitement to this great event!

■ US Technicians have 10 meter SSB privileges from 28.3-28.5 MHz and are encouraged to get in on the fun! W/VE/XE stations (including Alaska and Hawaii) send a signal report and their state or province; DX stations (including Puerto Rico, US Virgin Islands and Pacific territories) send a signal report and sequential serial number.

■ Complete rules and a map of the Mexican states can be found at **www.arrl.org/10-meter**. Cabrillo-formatted logs can be e-mailed to **10meter@arrl.org**. All logs must be submitted or postmarked by 0000 UTC Wednesday, January 12, 2011.

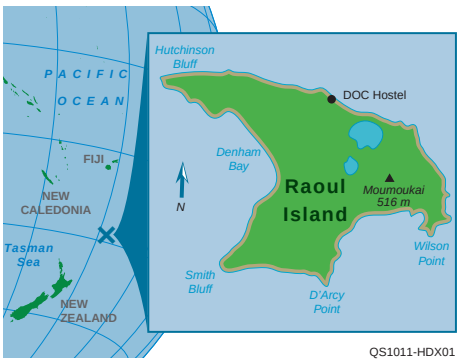
W3UR

HOW'S DX?

ZL8 — Kermadec Islands

After the very successful DXpeditions to Norfolk Island (VK9DNX) in 2007 and Willis Islands (VK9DWX) in 2008, a mostly German team is now about to head to Raoul Island, Kermadec Islands for activity as ZL8X in late November and early December. The team includes Gerd, DJ5IW; Heye, DJ9RR; Franz, DK1II; Chris, DL1MGB; Dietmar, DL3DXX; Andy, DL5CW; Tom, DL5LYM; Felix, DL5XL; Ben, DL6FBL; Andree, DL8LAS; Dieter, DL8OH; Robert, SP5XVY, and Vicky, SV2KBS.

The team is expected to arrive in New Zealand on November 14 and depart via the MV *Claymore II*, the sister ship to the *Braveheart*. Both are owned and operated by the same company. The team is expected to reach their destination on November 18 and will begin setting up their stations the following day with ZL8X activity following. Plans are to have seven high power stations, operating from two locations, running until December 5, with expected activity on CW, SSB and RTTY on 1.8 through 28 MHz.



QS1011-HDX01

The ZL8X team will have a full array of antennas including a 27-meter-high vertical (V160E) for Topband, a 21-meter-high vertical (V80E) and Four Square for 80 meters, two Four Squares for 40 and 30 meters, three element monoband Yagis and four element vertical dipole arrays for 20, 17, 15 and 12 meters. On 10 meters there will be a four element vertical dipole array and five element monoband. Generators will power the seven stations. For more details on the upcoming ZL8X DXpedition to the Kermadec Islands check out their Web site at **www.kermadec.de** or your favorite DX rag.

DX NEWS FROM AROUND THE GLOBE

4U1UN — UNITED NATIONS HEADQUARTERS

The United Nations Headquarters station, 4U1UN, is temporarily off the air due to the renovation of the Secretariat Building, which is expected to take until sometime in 2013. In late March the NCDXF beacon was taken off the air and all antennas were removed from the roof of the 505 foot skyscraper. All of the station equipment and antennas were packed up at that time.

The UNHQ Club is seeking a new location in one of the other UN buildings. A 1 day Field Day operation took place on May 22 in the UN Rose Garden. James, K2QI, is the new president of the club. The past president Mohamed, KA2RTD, plans to retire sometime next year. In May UN club member Johnny, LA5IIA, had a job transfer to Geneva, Switzerland. Andy, RW3AH, has taken up a new job in New York and is expected to be there for a few years. He has spent the last 3 years working for the UN in Geneva.

The UN club is planning a special event to celebrate the 65th anniversary of the United Nations to take place sometime between mid-September and December of this year. Let's hope that the UNARC is able to secure a temporary operating location and then re-establish their wonderful penthouse station once all the construction has been completed.

5R — MADAGASCAR

Eric, F6ICX, is heading back to Madagascar. Look for him to be QRV as 5R8IC from Saint Marie Island (AF-090) from November 15 to December 18. He will be there on holiday and QRV on CW, RTTY and PSK63 running 100 W into a Hex-Beam, ground plane or inverted L in his spare time. QSL via F6ICX.

9L — SIERRA LEONE

Members of the VooDoo Contest Group (**www.voodoocontestgroup.com**) are once again teaming up for the CQ World Wide CW DX Contest (**www.cqww.com**), over the November 27-28 weekend. They will be QRV again from the Bintumani Hotel in Freetown, Sierra Leone. Last year the team placed number two worldwide in the multi-two category from this location. This year they will use the call sign 9L5VT in honor of Dr Vince Thompson, K5VT, who passed away in April of this year. Vince was a founding member of the Voodudes and "had operated with this group almost every one of our 21 years continuous CQWW CW activity," remembers Roger Western, G3SXW. The multiop effort will have five "definite operators" and possibly one or two more. They will enter either the multi-two or multi-multi category. More details are expected closer to the contest.

A2 — BOTSWANA

K5LBU's next big African operation is Botswana for October 21-November 4. Operators K5LBU, K5ZOL, KD5TAN, IØZY, IK1MDF, IZ5MMB and W5SL will have three stations on the air, 160-10 meters and hopefully 6. Their call signs are, respectively, A25CF, A25BI, A25AN, A25ZY, A25DF, A25MB and A25ASL. They expect to be in the CQ World Wide DX SSB Contest with the A25HQ call sign. QSL that one via K5LBU. Other call signs, QSL via the home call. They have a Web page at **www.qsl.net/a25-2010** with more details.

C5 — THE GAMBIA

Call signs C5ØC and C52C in The Gambia from 2007 will be renewed by the OMØC Contest Crew for an operation November 17-30, 2010. The organizers say the operation 3 years ago was "the greatest Slovak expedition of its kind ever." Call sign C5A is being requested for this fall as well. Operators recruited so far are OK8WW/OM2TW, OK1RI, OM5AW, OM6NM, OM2RA, OK1DO, OK1DIX, OK1FFU and OK1NY.

Bernie McClenny, W3UR ♦ 3025 Hobbs Rd, Glenwood, MD 21738-9728 ♦ w3ur@arrl.org

They have a Web page at **www.om0c.com/?Gambia_2010_-_C5A**.

CYØ — SABLE ISLAND

The October 2010 DXpedition to Sable Island team have slightly modified the dates of their trip. Also, one of their team members has withdrawn from the DXpedition due to work commitments. The new dates are expected to be October 21-29 and unfortunately the original organizer Murray, WA4DAN, will not be going. The four man team will be signing using their own calls (CYØ/AA4VK, CYØ/AI5P, CYØ/NØTG and CYØ/VE1RGB). The team's Web site is **www.cy0dxpedition.com** and includes all QSL details.

FJ — ST BARTHÉLEMY

Nikola, FJ/VE3EY, will be on from St Barthélemy again, November 22-30. He will be active on 160-10 meters on CW, SSB and RTTY, including the CQ World Wide DX CW Contest November 27-28, in the single-op all-band category. QSL via VE3EY.

HK and HKØ — COLOMBIA and SAN ANDRÉS

Gerd, DL7VOG, is heading back to two Colombian Islands in the Caribbean starting in mid-November. He plans to start with a DXpedition as HKØGU/1 to the IOTA group SA-040, possibly Isla Pavitos but "this is not confirmed yet." That operation will be from November 17-21. For DXCC purposes this counts as mainland Colombia.

Next stop will be to San Andrés Island (NA-033) as HKØGU. This is a separate DXCC Entity from Colombia. The dates for this one will be from November 21-December 2 or 3rd. Gerd plans to use an IC-706MK2G and an HF9VX as well as a "homebrew Inverted L" on a 15-meter-high fiberglass pole for 160 meters. He prefers CW and RTTY and plans to participate in the CQ World Wide CW DX Contest. Plans are to post his logs on his Web pages — **www.qslnet.de/hk0gu** or **www.qsl.net/hk0gu**. QSL via DL7VOG either via the DARC QSL bureau or direct. You can also request a bureau card via an e-mail request to **qsl@dl7vog.de**.

J2 — DJIBOUTI

Freddy, J28RO; Darko, J28AA, and Vincent, J28JV, are working on a 3 or 4 day operation from Moucha Island, AF-053, sometime by the end of the year. This is Djibouti in East Africa. They will start looking for a site soon, planning for two stations, on CW, SSB and maybe RTTY.

RI1F — FRANZ JOSEF LAND

RI1FJ is now active from Franz Josef Land. Note: This is a new prefix, not a typographical error. This is the former R1FJT station from 2006-2008. Operating is Eugene, UA4RX. He is on a new 1 year tour that started August 24 at the weather station on Heiss Island in FJL. QSL via Eugene Chepur, PO Box 1122, Kaliningrad, 236019 Russia.

TL — CENTRAL AFRICAN REPUBLIC

By the time you read this Christian Saint-Arroman, TLØA, will be back in Bangui, Central African Republic (CAR), where he is expected to stay for about another 2 to 4 months. After leaving CAR Christian believes his next work assignment will be back to Niger (5U), but this is not 100% certain. QSL direct to his *Callbook* address.

V6 — FEDERAL STATES OF MICRONESIA

Takuto Yoshida, JE1SCJ, will be active from Pohnpei (OC-010), Federal States of Micronesia as V63YT from November 24-28. He will be participating in CQ World Wide DX CW Contest. He must sign off around 0900Z on Sunday the 28th due to his flight schedule. Takuto will be QRV on 1.8 through 50 MHz, mostly on CW with some SSB, RTTY and PSK31. Outside of the contest he'll be putting an emphasis on 160, 30, 17 and 12 meters. Suggested frequencies to listen for him are as follows: 1824 (QSX up/down); 3510 (QSX up); 7010; 10,110; 14,010; 18,080; 21,010; 24,900; 28,010 and 50,090 kHz. He'll be running 100 W into wire antennas or a Yagi on 6 meters. QSL via bureau or direct to JE1SCJ.

VKØ — MACQUARIE ISLAND

Kevin, VK4KEV (ex VK4FRAT), expects to be operating as VKØKEV from Macquarie Island sometime between the end of October and beginning of December, for as much as 18 months. He expects to be active mostly on 40 and 20 meter SSB and digital. He is "presently waiting on the shipping schedule firming up. I also require formal approval from the base," he says. Kevin says he will keep us posted. Presently, Kevin is operating as VK4KEV/VK7 in Hobart, Tasmania while undergoing training for the long stay on Macquarie. Watch your favorite DX bulletin for any updates on this semi-rare one.

YJ — VANUATU

YJØHA on Efate Island, OC-035, Vanuatu, will be November 1-15. Operating will be HA5UK and HA5AO. They will operate from the Nirvana Resort at Paradise Cove, planning to be on 160-10 meter CW, SSB, RTTY, PSK and SSTV. Log search will be on **ha5ao.novolab.hu/index.php?option=com_php&Itemid=59&lang=en**. QSL via HA5UK direct and LoTW.

ZK2 AND VK9N — NIUE AND NORFOLK ISLANDS

A multinational team has announced plans to go to Niue Island (ZK2) and then Norfolk Island (VK9N) during late November and early December. First it will be ZK2A from November 20-December 3. Plans are to have four Elecraft rigs with a focus on Europe and an emphasis on 1.8 through 10 MHz, as well as 17 and 24 MHz and CW and RTTY. Next they will be operating from Norfolk, no call mentioned, from December 5-12, with the same focus and emphasis. They are planning to have a Web site (**www.pacificdxpedition.com**). QSL via PA3LEO direct, bureau or LoTW.

ZD9 — TRISTAN DA CUNHA AND GOUGH ISLANDS

ARRL DXCC Entity ZD9 consists of the islands of Tristan da Cunha, Inaccessible, Middle, Nightingale, Stoltenhoff and Gough. Tristan da Cunha has a permanent population (200-300) and over the years several have been active ZD9s. The other islands are uninhabited. During 2009 there was no activity from ZD9.

John, ZS1LF (ex ZR1JON), is headed to Gough Island (AF-030) in September for a 1 year work assignment as the team leader and radio technician. For those who are participating in the *CQ* Magazine's CQ DX Field Award, Gough Island is the only island located in the IE Field. This will be John's second time to the remote island. He has no experience on HF. John plans to be QRV in his spare time as ZD9GI. Activity is not expected until after the SA *Agulhas* drops off the team and their supplies. By the time you read this, John should soon be on the air, if not already.

He will have a TS-480, an amplifier and dipoles. Due to concerns about the birds, Yagi antennas are not permitted. Plans are to operate on frequencies between 1.8 and 28 MHz, usually "after official working hours and weekends." Initially he will be on SSB only and afterward on the digital modes. Johan Sevenster, ZS1A (ex ZS6JHS), will be the QSL manager. His address is 2 Roozeboom Str, de Bron, Bellville 7530, South Africa.

WRAP UP

That's it for this month. Special thanks to DL7VOG, G3SXW, J28RO, JE1SCJ, K5LBU, KA2RTD, KE3Q, NØTG, TLØA, VK4KEV, ZS1A and *The Daily DX* for input for this month's column. Until next month, see you in the pileups! — *Bernie, W3UR*


W3ZZ

THE WORLD ABOVE 50 MHz

The Return of the Buzz

On August 1, 2010 the first of two coronal mass ejections (CMEs) associated most particularly with Sunspot #1092 spread to involve a substantial percentage of the Earthward-facing solar surface. At 1740Z August 3 the first CME reached Earth, causing a G2-class [moderate] geomagnetic storm that resulted in a K index as high as 6 at 0300Z August 4. The result was a moderate visual sighting of aurora (AU) over northern Europe and the northern US. This resulted in the radio AU conditions reported below (see "On the Bands") particularly in the central and western US. This is the first significant AU activity of the new Cycle 24 and many newer VHF+ enthusiasts have probably never experienced AU. So this month I will describe what causes AUs, how they develop and how the VHF+ operator can take advantage of this interesting and effective form of communication.

The Origins of Auroras

All AU are caused by interactions between electrons from the solar surface and molecules in the Earth's ionosphere, most particularly the E layer ~100 km above the Earth's surface. Some electrons from these interactions are raised to a higher energy level. When they return to their normal levels they emit colored light typical of the atoms that are involved (oxygen, nitrogen, etc).This is the basis of the beautiful colors seen in the visual AU. The radio AU is quite different, involving sheets of both positively and negatively charged ions, which can refract radio waves.

The source of the electrons that initiate an AU are magnetic fields on the surface of the Sun that are associated with sunspots. Thus with few or no sunspots there is little or no AU — the case for us since essentially the end of 2006.

Now with the reappearance of Cycle 24 sunspots we can expect AU events to reappear. Sunspots are formed in regions of twisted magnetic field lines via a dynamo effect. The most spectacular auroras are usually caused by solar flares classified by their energy levels as X, M and C flares in order of descending energy. The most powerful aurora-causing flares emanate from the solar corona and are caused by the release of energy from ribbons or magnetic loops found in complex sunspot groups. Equally and even more important are coronal holes, areas of open magnetic field lines. In both cases the solar wind increases and drives material outward from the solar surface. When the direction of such material is Earthward, an AU may occur.

One might expect AU activity to parallel sunspot number, but this is not the case. Since AUs depend on the strength of the solar magnetic field and that field reverses polarity at each sunspot maximum, AUs peak on the rising and falling slopes of the sunspot cycle. In fact, the greatest AU activity occurs on the long and somewhat jagged decline of the sunspot cycle.

Keys to an Auroral Opening

Several factors must combine to produce an AU opening. Conversely, the presence of some factors without the presence of others can prevent the occurrence of an AU opening. These factors include:

■ *Geomagnetic K index*. The best indicator of the size and extent of a geomagnetic storm is the K index, a quasi-logarithmic index of geomagnetic activity calculated every 3 hours relative to an assumed quiet-day curve at that recording site. Index numbers are integers from 0 (quiet) to 9 (severely disturbed). The Kp index indicates worldwide conditions by averaging over the entire globe. Decent AU activity usually requires K≥4; values of K≥6 indicate strong AU.

■ *Time of day*. When the solar plasma strikes Earth is a critical factor. Because of interactions between plasma electrons and the terrestrial geomagnetic field and magnetotail, the optimal times for arrival are 1400-2000 and 2200-0400 local standard time (LST). Just before, during and just after magnetic midnight, 2100 LST, the direction of the electron flow in the magnetotail reverses direction so 2000-2200 LST is usually a poor time for AU.

■ *Time of year*. Geomagnetic activity is highest around the equinoxes and is the least at the solstices.

■ *IMF*. The Interplanetary Magnetic Field couples solar plasma to the terrestrial geomagnetic field lines. The directivity of the IMF is measured by three components, Bx, By and Bz. In general AU will be poor or nonexistent if the Bz is positive. During the best AU, Bz can rapidly turn strongly and sharply negative.

■ *Geomagnetic latitude*. Even with all other factors lined up, whether or not a particular station experiences AU depends on the strength of the AU and that station's geomagnetic latitude. Here the latter means the distance from the geomagnetic North Pole in northern Canada for the Northern Hemisphere.

■ *Auroral oval*. During a geomagnetic storm the area of polar ionization (the auroral oval) in the Northern Hemisphere expands southward. One of the best sites to find pictures of the AU oval and current geomagnetic indices and conditions is **dx.qsl.net/propagation**.

This Month

November 18	Leonids Meteor Shower
*November 28	*Very good* EME conditions

*Moon data from W5LUU

Working the Aurora

Detecting AU conditions. The best clue is turning your beam to a northerly heading and hearing distorted SSB signals or CW signals that hiss, buzz or are musically modulated. Look at geomagnetic conditions at the site just mentioned. Look for entries on the packet cluster, or propagation remailers like OH8X (**www.radioarcala.com**), **dxworld.com** or DX Sherlock (**www.vhfdx.info**) indicating auroral conditions at your location.

Equipment and modes. An average station with ~100 W output to a small boom Yagi with a 4 meter boom or more can readily work AU, especially on 6 and 2 meters. I have worked stations running only 10 W though this is more difficult especially on

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2 meters and above. Six meters may use SSB or CW but 2 meters and above is almost all CW. Like meteor scatter, higher transmitter power is a great advantage. A long boom, sharp patterned antenna like my 5 λ boom 2 meter Yagi requires constant turning to find the hot spots though I have had no problems working AU. Because of spectral spreading from the AU curtain the digital modes are not likely to work well or at all.

Distance. The geometry of backscatter from the curtain produces an auroral "fence" beyond which you normally cannot go. North/South you are limited to a little over 1000 km but East/West distances of 2000 km are possible. EME capable stations can extend those boundaries by a few hundred km. For instance, my ODX N/S is 802 km and E/W 1910 km.

Directivity. From the forgoing one can understand that AU propagation occurs by backscatter off a curtain of highly ionized gas located in a generally poleward (northerly) direction. But exactly what is the best direction to point? Since we are essentially dealing with backscatter we need to seek out regions of high ionization and hope the stations we want to work will point their antennas at the same regions.

The best place to point for a particular station depends on both the degree of ionization at that part of the curtain and a reciprocal path (see Figure 1 for MD to IN). Thus, for any given station there may be and often is more than one optimal point on the curtain. As another example, from the Midatlantic to work a station in IL, given a suitable hot spot, one can point almost due north (350°) if the IL station points at 55°. Similarly if he is pointed at 10° I will have to point at 318°. Which is better depends on the degree of ionization at each of these points.

The normal direction you begin pointing depends on your geographic location. Here in the Midatlantic we normally point almost due north for stations to the geographic north and east of us, somewhat to the east of north for stations south of us (like NC, SC and GA on those rare instances when we can hear stations that far south on AU), more northwesterly for the Midwest and approaching 310° for stations in KS, MO, OK and the like. Each station will have to work out what is the optimal direction to try initially to work stations in a particular geographic direction.

Bands. For all intents and purposes, AU is readily possible on the lower three VHF bands, 50-222 MHz. In general, auroral signals are strongest on the lowest band and decrease in strength as one goes to higher and higher frequencies. 50 MHz is easy, 144 MHz less easy and 222 MHz requires a reasonably good AU to work. Likewise, since we are dealing with backscatter from an undulating curtain of electrons, signals are affected by Doppler and are spectrally spread.

The Doppler and spectral spreading increases with frequency as signal strength decreases. Thus, signals on 6 meters exhibit some spectral spreading but appear almost on frequency and SSB is relatively easy to use. On 2 meters signals spread more, are displaced by several hundred Hertz by Doppler and the CW note is replaced with a buzz or a hiss, sometimes musically modulated. SSB is often very difficult if not impossible and one must speak very slowly to be understood. On 222 MHz spectral spreading is even greater, signals often appear to be calling you ~2 kHz off frequency due to Doppler and at best the note is a hiss or a buzz with no note.

AU on 70 cm is rare except when the K≥7 or more. I have heard 70 cm AU only a very few times because I am too far south at 39°N. Signals sound like they have no note, are modulating the background noise and appear via Doppler ~5 kHz from where you expect them. Only one contact has ever been claimed on 33 cm: between K3HZO (FM18qp) and W3NZL (FM19jg) some 86 km apart. I heard that contact but with only 10 W neither of them could hear me on AU. Of course everyone could hear each other's direct signals but we could also hear the auroral signal some ~2 kHz wide modulating the noise ~10 kHz from the direct signal. With higher power and better equipment if a K=9 AU ever occurs again more 33 cm AU contacts can be expected.

Geographic location. As long as you are south of the auroral oval the farther north you are, the better you will do on AU. But in a strong AU the oval can drop below the northernmost stations. Thus, N1BUG (FN55) at 55°N occasionally says that he is shut out during a strong AU. To the south I have worked stations in FL (EM90) and TX (EM13) on AU when the K=9 but it clearly is not easy.

Aurora is a fun mode that should reappear with increasing sunspots. Give it a try!

ON THE BANDS

Meteor scatter. This year's Perseids was visually unremarkable, peaking sharply at ~1800Z August 12 at a ZHR [Zenithal Hourly Rate, the number of meteors an observer would see in one hour under a clear, dark sky if the radiant of the shower were at the zenith. — *Ed.*] of >100/hr and maintaining a rate of ≥60/hr from 0600-1200Z August 13. E-mail reports indicated a mediocre radio shower at best. I ran one SSB 2 meter schedule with Jon, NØJK (EM18xi), at 1631 km that took most of the half hour to complete. Jon was running 50 W to a 7 el Yagi and I had 1.5 kW to a 5 λ Yagi. Dave, N9HF (EL99), worked N1DZ in RI on FSK441 for state #43 on 2 meters on August 11. Dave found more pings prior to the peak and activity minimal throughout. Rich, K1HTV, worked 31 FSK441 Qs on 6 meters in 27 grids and 15 states. The farthest were EL95 south, EM25 southwest, EN76 northwest and FN75 northeast.

Tropospheric ducting. Slow moving high pressure brought some excellent tropo conditions to the Midwest August 19-24. While distances were not huge, at one time or another tropo extended from west to DM98, south to EM25/64, north to VE4 EN09/19 and east to EM99. August 19 Steve, W5KI (EM36), worked ~750 km to EN51/52 on 144/432 MHz. Sam, K5SW (EM25hr), worked 19 grids north to EN35 north and northeast to EN64 (ODX ~1250 km). John,

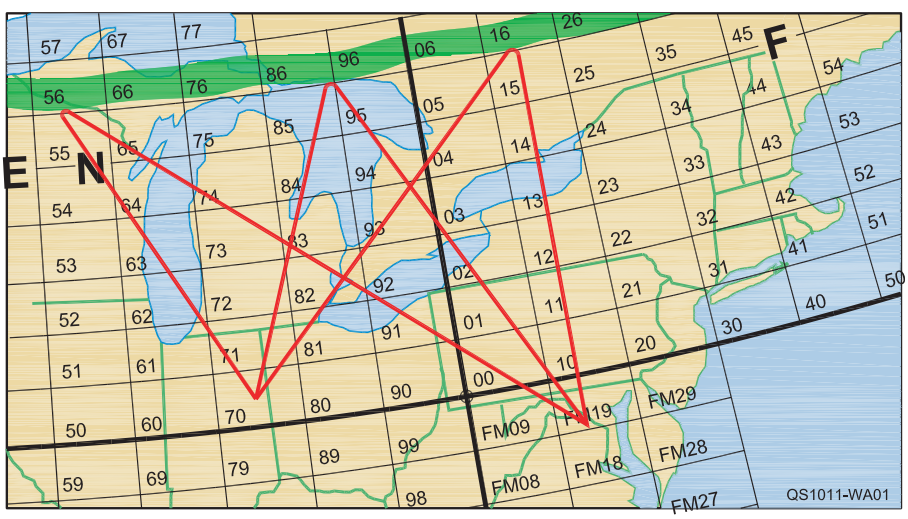


Figure 1 — Three paths to an AU contact. The auroral curtain is the green band near the top. Hot spots are expanded regions of the curtain. Here there will be three peaks between FM19 and EN70: one over EN76, one between EN86 and 96 and one over FN16. Signals will peak when the antennas at both locations are pointed simultaneously at each hot spot. So for me in FM19 I can see peaks at headings of 315, 330 and 0°.

222 MHz Standings

Published 222 MHz standings include call sign district leaders as of September 1, 2010. For a complete listing, check the Standings Boxes on "The World Above 50 MHz" Web pages at **www.arrl.org/wa50-standings**. To ensure that the Standings Boxes reflect current activity, submit reports at least every 2 years by e-mail to **standings@arrl.org**. Printed forms are available by sending a request with an SASE to Sean Kutzko, KX9X, Standings, ARRL, 225 Main St, Newington, CT 06111.

Call Sign	State	States Worked	DXCC Entities Worked	Grids Worked	DX (km)
1					
W1AIM	VT	22	2	59	2,021
K1WVX	CT	10	1	13	691
2					
K1JT	NJ	21	2	60	1,727
3					
W3ZZ	MD	36	2	109	1,871
WA2FGK	PA	28	2	77	—
4					
K4RF	GA	37	2	105	1,968
AA4ZZ	NC	34	2	103	1,987
W4WA	GA	29	2	89	2,143
AA4H	TN	27	2	81	1,737
N4QWZ	TN	26	2	92	—
K4RTS	VA	17	2	65	1,337
KØVXM	FL	11	1	51	1,747
KC4AYX	TN	9	2	—	1,289
W4SW	VA	9	1	23	641
N9HF	FL	9	1	14	1,525
KE4WBO	FL	3	1	8	1,065
5					
W5LUA *	TX	50	—	—	—
K5UR	AR	42	2	220	—
K5SW	OK	33	2	135	2,059
K5QE	TX	27	4	86	1,736
W5UWB	TX	23	2	63	2,197
K5LLL	TX	17	2	70	2,089
K5YY	AR	22	1	78	1,560
WA5VJB	TX	18	—	—	1,830
WD5AGO	OK	12	2	30	1,975
K5YPV	MS	8	1	16	1,198
AA5AM	TX	7	1	24	1,100
6					
KR7O	CA	9	3	40	1,638
KC6ZWT	CA	9	2	52	1,371
K6QXY	CA	4	3	32	3,794
N6ZE	CA	1	1	13	583
7					
W7MEM	ID	7	1	22	1,664
W7EME	MT	—	—	22	—
8					
WA8RJF	OH	28	2	91	1,733
K2YAZ	MI	23	2	76	2,167
K8ROX	OH	12	2	15	1,239
N8PUM	MI	5	2	21	1,390
9					
N9LR	IL	38	2	135	1,808
KA9UVY	IL	28	1	66	1,536
AA9MY	IL	25	2	64	1,751
W9RPM	WI	21	2	89	1,400
Ø					
NØLL	KS	25	2	110	1,900
KØAWU	MN	23	2	75	2,008
WØRT	KS	17	2	21	1,584
KBØPE	MO	21	1	65	1,033
KØFF	MO	18	1	52	1,174
KØRZ	CO	16	2	55	2,002
KØGU	CO	10	1	18	1,913
WØLD	CO	3	1	3	632
Canada					
VE3KH	ON	15	2	51	1,093
VE2PIJ	PQ	9	2	33	694

*Includes EME contacts
— Not given

W9RPM (EN43js), worked six states on 144/222 MHz south to AL and OK. JD, NØIRS (EM29se), worked numerous stations on 144-1296 MHz, north to EN34/44 and east into OH EN81/EM89 and WV EM99 (new state #40). JD worked six new 23 cm grids as far as EN41/50. August 20 JD worked north to EN04 and east to EM89. Larry, NØLL (EM09), worked east to EN81 on 144 and EM89 on 222. Jon, NØJK (EM17), worked EN41 at 748 km. JD found excellent conditions to the Dakotas on the 21st with contacts to EN04/13 along with 222/432 Qs to EN13. August 22 brought JD several 2 meter Qs to the far north including one to VE4KQ/VE4 EN09 and also EN08/14/36/54, EN44 on 432 and EN51 on 222. Chad, NØYK (DM98mg), made 20 Qs including two stations in Kansas City on 1296 and EN82 1517 km on 2 meters. Larry, NØLL, worked EN50/51/61 on 1296 and as far east as EN82 on 432 and EN71 on 222. Sam, K5SW, worked every state on a line to VE4 and WI, MN, IA and IL to the northeast. EN08 and 09 were new 2 meter grids and EN08 a new grid and state #32 on 432. Rick, WØRT (EM27), worked VE4 on 144 and 222 and several stations in SD. John, W9RPM, reports 432 MHz pileups and several new grids on 144 and 432 including EN18. Jon, NØJK/Ø (EM18), worked VE4 EN09 as well as EN04 and EN52. Gedas, W8BYA (EN70), worked west to EN04/10 and heard the VE4s but they were pointed south and did not hear him. On August 23 from EM28 Jon worked EN41/45/58. Bill, KØAWU (EN37), had 61 Qs southwest to EM29, north to EN19 (VE4) and east to EM89 on multiple bands through 1296. His ODX was K8TQK (EM89) at 1225 km on 144 and 222. Brandon, N8PUM (EN66), reports signals on 432 better than 144/222 with contacts as far southwest as EM29/EN10 and south to EN70.

Contests. The big midwestern tropo opening included the first weekend of the ARRL 10 GHz and Up contest. August 21 Bill, KØAWU/R, worked Mike, KMØT (EN13vc), at 319 km and August 22 worked Mike at >400 km distances. Bill reports that VE4MA EN19kv worked W9ZIH, EN51nv (1094 km) and N4PZ/9, EN52gb (1053 km). A large group of portables assembled on both sides of Lake Erie. The most notable contact across the lake was one between Steve, VE3SMA, and Mike, WA3TTS, who was running 3 µW and receiving with a waveguide IN23G mixer. A note from Tony, KC6QHP, indicates that Frank, WB6CWN, worked Gary, AD6FP, on 10 and 24 GHz at 526 km just below the 24 GHz record. Tony worked 412 km on 24 GHz with less ERP. Mark, K1MAP, reports only marginally enhanced conditions on the East Coast. Rain on August 22 yielded a 284 km Q from FN31tw to N1JEZ (FN34om).

Conditions during the UHF contest August 7-8 were generally flat along the East Coast. Vic, WB4SLM (EN82), reports 902/1296 Qs with EM89 and a 1296 contact with EM55. He notes that K4QI (FM06) worked K1WHS (FN43) on 1296.

6 meters. The 6 meter E_s season failed to produce the usual one or two good multihop openings this August. Most of the few spots were ordinary single hop. Jon, NØJK (EM17), reports NP4A strong signals on August 4. Jon notes spots for K6FV/B from E51 and OX3LX from KS7DX (DM26) August 15. The *Daily DX* (**www.dailydx.com**) notes stations in EM70 and EN84 were hearing HC8GR/B on August 24.

Aurora. The previously mentioned CME was the first significant aurora of Cycle 24. Bill, KØAWU, reports short hauls on 144 and 222: west to EN08, south to EN70 on 144; west to EN08 and south to EN52 on 222; and nil in 3 tries on 432. Brandon, N8PUM (EN66), worked south to EN52 on 222. Chuck, N6KW (CN87), worked DN17 on 2 meters. DX Sherlock (**www.vhfdx.info**) indicates rather short, high latitude contacts in the Northeast, Midwest and Pacific Northwest on 2 meters. Steve, K7AWB (DN17), worked 19 Qs in WA, ID, OR, BC and AB on 6 meters.

EME. August 29 John, W5UWB, TX worked Ray, W4NJP, in GA on JT65 with a single Yagi and 1.5 kW on 222. Ray was running 300 W to a 10.5 meter dish, which he says he will keep on 222 for the next several months.

HERE AND THERE

Leonids Meteor Shower. No meteor storm this year. The Leonids, predicted to peak November 18 around 0500Z, is likely to generate only a 10-20 meteor ZHR at that time. Still, these are very fast meteors and support long-range contacts.

VU2 on 6 meters. Peter, VK6KXW, relays news from Prasad, VU2PTT, that VU2 has been allocated privileges on 6 meters.

W6FZA SK. Owen, K3CB, relays the sad news of the passing of Alan Margot, W6FZA. Alan was a record setting pioneer on 432 MHz and held 6 meter WAS #4. Farewell Alan! QST

K2TQN

VINTAGE RADIO

The CQD and Rescue

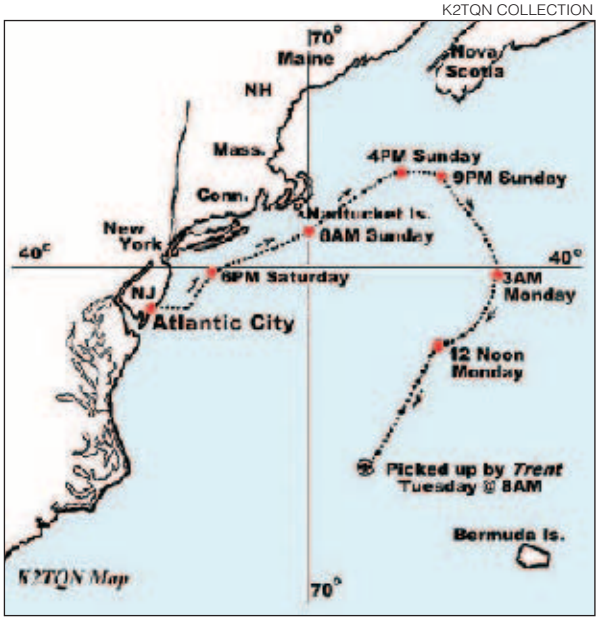
This month I present the final episode of Jack Irwin's adventure on the Airship USS *America*. Last month we left Jack and the *America* lost in the fog over the Atlantic with only one engine running, operating his rig only on batteries. Jack's report continues:

"At 5:05 AM on the 16th, my log shows that the engines had stopped and that I was listening to all stations talking about us and calling W. I heard the Sagaponack (Long Island) station inform Siasconset that we were 60 miles South of Scotland Light at 6:50 PM the previous night when we had been sighted by a steamer and reported by radio. All this time the wind was steadily increasing but was in our favor and we made such good time that we decided to allow our remaining engine to cool off. I waited until Siasconset station was very strong before I attempted to communicate. At 10:35 AM I established communication with SC (Siasconset, Nantucket Island) sending him several messages. We were very close to that island during the day, so close, indeed, and so strong our signals, that I afterwards learned that the boys at the stations ran outdoors to try to sight us.

"Our expedition had been financed by several newspapers and Mr. Wellman, a newspaperman himself, commenced to file voluminous messages to them. I sent the short ones, but as they became lengthier I protested that the batteries were running down and that we should conserve our power in case we needed help. He promptly agreed with me.

"The wind now increased to a gale and began to bear us southeast. When night fell we again experienced trouble in remaining in the air. We were compelled constantly to throw supplies overboard."

K2TQN COLLECTION



The flight of the *America* from its liftoff from Atlantic City, New Jersey to the crew's rescue at sea by the SS *Trent*.

LIBRARY OF CONGRESS

Louis Ginsberg, wireless operator on the Royal Mail Steampacket Line's SS *Trent* who received the "CQD" from Jack Irwin, operator of Walter Wellman's airship *America* on October 18, 1910.

C Q D

"That night I attempted to obtain assistance, calling C Q D, which at that time was the signal of distress. Our engines were now useless. The voyage had failed and our one concern was to get away with our lives. I early realized that there was no hope of assistance while we were in the air and that we would have to take to the lifeboat. However, with the sea then running and the gale blowing, we simply had to stay in the air. Engineers Loud and Aubert commenced to take the large motor apart and throw it overboard, to lighten the ship. At daybreak on Monday, the third day out, I find I made a note reading, '7 AM All ready during the night to leave in the boat, but the breeze too strong for launching. Listened-in and heard the *SS Main* (German) very strong. Now hear Cape Sable sending a message to some ship for us. Copy it. It is from the *New York Times* and is about the weather.'

"At 7:20 that morning our navigator took his first sight for position and made us in Longitude 65.51 West. This was 210 miles east of Nantucket. We were steadily drifting south in a beautiful sunny morning.

"From that time on, we drifted in a southeasterly direction. From my log I find that I listened in all day and into the evening. The last note made in the air in the radio log reads: '7 PM Hear wireless stations working from Cape Sable to the Southern States.' In that early day, that meant that I heard just about every station in North America.

"The following, taken from my log, tells the remainder of the story:

'October 18th, 1910. Notes made after arrival on board the Royal Mail S S *Trent*, made from memory and the log of the *Trent's* wireless operator.

'Remained on watch until 3 AM, 18th, listening to various stations working, static very bad. Unable to read Cape Cod but hear him working. I turned in at 3 AM, but was awakened about an hour later by calls of a ship in sight. Descended into the lifeboat and called C Q D. Nothing doing. Then got an electric torch and commenced calling in Morse lamp fashion. Was eventually answered by the *Trent* and signaled him that we were in trouble and required help. Also conveyed to him that we were equipped with wireless. The *Trent's* operator was awakened, and he called us.'

John Dilks, K2TQN ♦ 125 Wharf Rd, Egg Harbor Township, NJ 08234-8501 ♦ k2tqn@arrl.org

When Wireless Stepped in to Rescue

"As I had my head phones on all this time, I answered him and instant radio communication was established. I am indebted to Mr. Louis Ginsberg (the *Trent's* operator) for copies of the following messages which were copied and sent by him; I did not do so, merely reading out his messages to Mr. Wellman as he sent them.

"*Trent*: Do you want our assistance?

"*America*: Yes. Come at once, in distress, we are drifting, not under control.

"*Trent*: What do you want us to do?

"*America*: Come ahead full speed, but keep astern, we have a heavy tail dragging.

"*Trent*: OK. Am standing by wireless in case of trouble.

"*America*: You will pick us up at daybreak, you will be better able to see us then.

"*Trent*: OK.

"*America*: Come in close and put your bow under us, we will drop you a line but do not stop your ship as you will capsize us.

"*Trent*: OK.

"*America*: Who are you and where bound?

"*Trent*: SS *Trent* bound for New York.

"*America*: Have one of your boats ready to launch, as we will probably capsize when we launch our boat.

"*Trent*: OK boat manned.

"*America*: We are going to launch the boat, stand by to pick us up.

"Wireless communication then ceased. I cut the antenna and ground wires, put the water-tight doors on the wireless cupboard, and stood by. The boat was successfully launched, a most hazardous operation. We were drifting fifteen miles an hour, with the boat swinging beam on to the sea and behind us the ton-and-a-half trailer. At the signal to 'let go' both clutches holding the boat to the car were jerked. The boat fell into the water, lurched gunwale under, then righted. The trailing equilibrator hit us, stove a hole in the boat above the water line, and bruised Loud and myself. The *Trent*, ploughing along at 16 knots, almost ran us down. We fell astern and waited for the steamer to come about and pick us up. After considerable maneuvering she came alongside, and with her derricks, lifted the lifeboat aboard. Thus was I able to save the entire wireless equipment.

K2TQN COLLECTION

***America's* crew after dropping the lifeboat into the sea.**

K2TQN COLLECTION

***America* drifting away after crew drops lifeboat.**

LIBRARY OF CONGRESS

Wellman tipping his hat upon arrival at New York, surrounded by his wife and daughters. A smiling Jack Irwin is seen on the extreme left.

"The *America*, with the weight of the lifeboat and crew released from it, shot up in the air several thousand feet and soon drifted out of sight. Before leaving her we opened the gas valves so that, eventually she would come down on the sea and not cause damage by landing or dragging over a city. We never heard of her again.

"Nobody but those who have experienced it, can imagine the feeling we had upon arriving on the *Trent*. We were overwhelmed with kindness. Two days later we arrived in New York where we found that our attempt to reach Europe in an airship had attracted extraordinary interest. We had occupied the front pages of the press of the world for several days. We failed, but in later years I had the gratification of knowing that other Americans accomplished what we had attempted."

First Radio Distress Call from Aircraft

In a 1950 letter, early flight and wireless pioneer Elmo N. Pickerill, said, "Louis Ginsberg of 218 Main Street, Hackensack, NJ, who was the retired operator on the Royal Mail Steampacket Line's SS *Trent* and received the 'CQD' from Jack Irwin, operator of Walter Wellman's airship *America* on October 18, 1910. He sent the story of the rescue of the six-man crew to me at the 'WA' Waldorf-Astoria hotel in New York for the Associated Press and the United Press. The *Trent* picked them up and brought them back to New York. The airship travelled 1008 miles after taking off from Atlantic City enroute to Europe and was caught in a tropical hurricane off the coast of Nova Scotia and blown down to a point midway between New York and Bermuda when they were sighted and rescued. No doubt that was the first radio distress call ever handled from any type of aircraft and one which proved successful."

More photos posted at **www.k2tqn.com**. — *K2TQN*

AT THE FOUNDATION

Two New Scholarships Approved!

Androscoggin ARC Scholarship

Earlier this fall the ARRL Foundation Board of Directors approved a new scholarship — the Androscoggin Amateur Radio Club Scholarship. The addition of this new $1000 award brings the total amount of ARRL Foundation Scholarships to more than $73,000 a year. The Androscoggin Scholarship will be awarded for the first time in 2011. Its main focus will be candidates from Maine, but candidates from elsewhere in the New England Division are also eligible. The award is aimed at students who will study computer science, television and radio electronics or electrical engineering.

Winscott Memorial Scholarship

The ARRL Foundation Board also approved the William C. Winscott, N6CHA Memorial Scholarship. This new annual $1000 award will be funded almost entirely by the proceeds of Mr Winscott's estate and will be awarded for the first time in the year following the receipt of funds from the William C. Winscott Trust. With no geographic criteria and no restrictions as to the field of study at a 4 year college or university, this award promises to be among the most popular of the ARRL Foundation Scholarships.

Complete information about the ARRL Foundation's Scholarship program can be found only on the Web at **www.arrl.org/scholarship-program**. There you will find descriptions of all the scholarships, application forms and instructions. The scholarship application period for the 2011 awards opened October 1, 2010 and closes on February 1, 2011.

The ARRL Foundation's Scholarship Program has gone green! For the first time applications must be submitted electronically using the application form on the ARRL Web site. Applicants must submit electronically a current transcript to **foundation@arrl.org**. Paper applications and transcripts will not be accepted. QST

Mary M. Hobart, K1MMH ♦ Secretary, ARRL Foundation Inc ♦ mhobart@arrl.org

CONVENTION AND HAMFEST CALENDAR

Abbreviations
Spr = Sponsor
TI = Talk-in frequency
Adm = Admission

ALABAMA SECTION CONVENTION

November 13, Montgomery

D F H R S T V

The Alabama Section Convention, sponsored by the Montgomery ARC, will be held at the Garrett Coliseum, 1555 Federal Dr. Doors are open for setup Friday 3-9 PM, Saturday 7-8:50 AM; public 9 AM-3 PM. Features include Hamfest and Computer Show, flea market, tailgating ($5 per space), new equipment vendors, forums, VE sessions (8 AM), RV overnight camping (334-242-5598), handicapped accessible. Talk-in on 146.84, D-Star 146.92. Admission is $7 (under 16 free). Tables are $15 each. Contact Rik Doll, KU4PY, 142 Oldfield Dr, Montgomery, AL 36117; 334-277-0864 (phone and fax); **ku4py@arrl.net**; **www.w4ap.org**.

Arizona (Kingman) — Nov 5-6
D F H R S T V

Friday 7 AM-7 PM, Saturday 7 AM-5 PM. *Spr:* Mohave ARC. Centennial Park, 3333 Harrison St. *TI:* 448.65 (151.4 Hz). *Adm:* Free. Tables: $5. Bill Smith, KD7MIA, 3975 E Snavely Ave, Kingman, AZ 86409; 928-565-1136; **bill1021@npgcable.com**; **www.kingmanhamfest.com**.

Florida (Cocoa) — Nov 20 F H T

8 AM-2 PM. *Spr:* Brevard Emergency AR Services. Florida Solar Energy Center, 1679 Clearlake Rd. *TI:* 147.135 (107.3 Hz). *Adm:* $3. Tables: $10. Mike Stallings, K4RVR, 121 Rosewood Dr, Cocoa, FL 32926; 321-636-3619; **mike@stallings.com**; **bears.homelinux.net/**.

Florida (Coral Gables) — Nov 20. Bill Moore, WA4TEJ, 305-264-4465; **wa4tej@juno.com**; **www.FlamingoNet.8m.net**.

Florida (Oakland Park) — Nov 13
F H Q R T V

7 AM-noon. *Spr:* Broward ARC. Collins Community Center, 3900 NE 3rd Ave. "Cy Harris W4MAQ Memorial Free Flea." *TI:* 146.91 (110.9 Hz). *Adm:* Free (free tailgate area). Robin Terrill, N4HHP, 4240 SW 20th St, Ft Lauderdale, FL 33317; 954-249-5343; **n4hhp@comcast.net**; **www.eagle3.net/barc/events/Cy_Harris_Free_Flea/freeflea.htm**.

Florida (Okeechobee) — Nov 27
D F H R T V

7 AM-5 PM. *Spr:* Okeechobee ARC. Freedom Ranch, 11655 Hwy 441 SE. "Hamfest in the Woods." *TI:* 147.195 (100 Hz). *Adm:* $5. Tables: Bring your own. Charles Whipple, W4PHD, 32801 Hwy 441 N, #48, Okeechobee, FL 34972; 863-467-2487; **charles.whipple4@gmail.com**; **www.k4oke.com**.

Coming ARRL Conventions

October 15-17
Pacific Division, San Ramon, CA*

October 16
Ohio Section and ARES, Columbus*

November 6-7
Georgia State, Lawrenceville*

November 13
Alabama Section, Montgomery

November 13-14
Indiana State, Fort Wayne

December 4-5
West Central Florida Section, Palmetto

*See October *QST* for details.

WEST CENTRAL FLORIDA SECTION CONVENTION

December 4-5, Palmetto

D F H Q R S T V

The West Central Florida Section Convention (35th Annual Tampa Bay Hamfest), sponsored

D = DEALERS / VENDORS
F = FLEA MARKET
H = HANDICAP ACCESS
Q = FIELD CHECKING OF QSL CARDS
R = REFRESHMENTS
S = SEMINARS / PRESENTATIONS
T = TAILGATING
V = VE SESSIONS

Gail Iannone ♦ Convention and Hamfest Program Manager ♦ giannone@arrl.org

by the Florida Gulf Coast AR Council, will be held at the Manatee Civic Center, US-301 and Haben Blvd. Doors are open Saturday 8 AM-5 PM, Sunday 9 AM-2 PM. Features include large electronics flea market, paved tailgating ($20 per space plus admission for the entire weekend; opens Saturday for setup at 6 AM, public 7 AM, Sunday at 8 AM; **tailgate@fgcarc.org**), commercial exhibit booths ($175 each; **commercial_booths@fgcarc.org**), vendors, forums and programs, VE sessions (Saturday, 10 AM-2 PM; **testing@fgcarc.org**), ARECC Testing (Saturday 2-3 PM; $14 fee), card checking (DXCC, WAS, VUCC, IARU; both days), handicapped accessible. Talk-in on 145.43 (100 Hz). Admission is $7 in advance, $8 at the door (good all weekend; **tickets@fgcarc.org**). Tables are $25 each for the weekend, plus admission (electricity available for $32 per outlet for the weekend; **tables@fgcarc.org**). Contact Keating Floyd, KC4HSI, c/o FGCARC, Box 22042, Tampa, FL 33622-2042; 813-765-8916; **kc4hsi@arrl.net**; **www.tampabayhamfest.org**.

Illinois (Litchfield) — Nov 14. Scott Millick, K9SM, 217-324-2412; **smillick@wamusa.com**. (Banquet/Swap)

Indiana (Evansville) — Nov 27 D F H R T V
8 AM-1 PM. *Sprs:* Electronic Applications Radio Service (EARS) and The Ham Station. Vanderburgh County 4-H Fairgrounds Auditorium, 201 E Boonville-New Harmony Rd. 18th Annual Hamfest. *TI:* 145.15, 146.925, 443.925 (107.2 Hz on all frequencies). *Adm:* $8. Tables: $15. Neil Rapp, WB9VPG, 2744 Pinehurst Dr, Bloomington, IN 47403; 812-333-4116; **ears@w9ear.org**; **w9ear.org/hamfest.htm**.

INDIANA STATE CONVENTION

November 13-14, Fort Wayne
D F H Q R S V

The Indiana State Convention (38th Annual Fort Wayne Hamfest and Computer Expo), sponsored by the Allen County AR Technical Society, will be held at the Allen County War Memorial Coliseum, 4000 Parnell Ave (corner of Indiana 930/Coliseum Blvd). Doors are open for setup on Friday evening and Saturday morning; public Saturday 9 AM-4 PM, Sunday 9 AM-3 PM. Features include over 750 commercial and flea market tables; new and used radio, computer, and general electronics items; vendors; several international ham equipment manufacturers; many forums and meetings; VE sessions (Saturday); parking ($4). Talk-in on 146.88. Admission is $6 for both days or $4 for just Sunday (at the door only); under 12 free when accompanied by an adult. Flea market tables are $25, premium tables are $50; $27.50 for electricity (advance reservations required; no table sales at the door). Send inquiries to AC-ARTS/Fort Wayne Hamfest, Box 10342, Fort Wayne, IN 46851-0342; or contact James Boyer, KB9IH, 260-579-2196; **chairman@fortwaynehamfest.com**; **www.fortwaynehamfest.com**.

Massachusetts (Bourne) — Nov 13
D F H R T V
Set up 7 AM; public 9 AM-noon. *Spr:* Falmouth ARA. Upper Cape Cod Regional Vocational School, 220 Sandwich Rd. Displays. *TI:* 146.655 (88.5 Hz). *Adm:* $5. Tables: advance $9 (by Nov 1), door $10. Ralph Swenson, N1YHS, 99 Fox Run Ln, E Falmouth, MA 02536; 508-548-0422 (phone and fax); **depsher911@comcast.net**; **www.falara.org**.

Massachusetts (Rockport) — Nov 20
D F H R
Set up 8 AM; public 9 AM. *Spr:* Cape Ann ARA. Pigeon Cove Circle Center, 6 Breakwater Ave. *TI:* 145.13. *Adm:* $5. Tables: advance $10, door $15. Richard Copithorne, KR1G, 25 Main St, West Paris, ME 04289; 508-269-4941; **dickc911@yahoo.com**; **caara.net**.

Michigan (Sterling Heights) — Oct 24 D H V
8 AM-1 PM. *Spr:* Utica Shelby Emergency Communication Association. American Polish Century Club, 33204 Maple Ln. 25th Annual Swap. *TI:* 147.18 (100 Hz). *Adm:* $5. Tables: $12. Jeff Johnson, KD8CIA, 28527 Adler Dr, Warren, MI 48088; 586-873-9198; **kd8cia@gmail.com**; **www.usecaarc.com**.

Mississippi (Ocean Springs) — Nov 12-13
D F H R S V
Friday 5-8 PM, Saturday 8 AM-3 PM. *Spr:* Jackson County ARA. St Martin Community Center, 15008 Lemoyne Blvd. *TI:* 145.11 (123 Hz). *Adm:* $4. Tables: $10. Chris Swift, K5MOZ, 21328 Old River Rd, Vancleave, MS 39565; 228-826-4116; **k5moz@arrl.net**; **www.jcmsara.org**.

North Carolina (Benson) — Nov 21
D F H R T V
8 AM-4 PM. *Spr:* Johnston ARS. American Legion Complex, Hwy 301 N. 23rd Annual "JARSFEST." *TI:* 147.27. *Adm:* advance $5, door $6. Tables: $10. Bill Lambert, AK4H, Box 302, Benson, NC 27504; 919-894-3352; **blambert1@mindspring.com**; **www.jars.net**.

Oklahoma (Enid) — Nov 6 D F H R S V
8 AM-5 PM. *Spr:* Enid ARC. Garfield County Fairgrounds Hoover Bldg, 302 E Oxford. *TI:* 145.29. *Adm:* $2. Tables: $2. Tom Worth, N5LWT, 2302 Eucalyptus Ave, Enid, OK 73701; 580-542-5410, **enidhamfest@yahoo.com**; **enidhamfest.com**.

Texas (Azle) — Nov 13 D F H R S T V
7 AM-noon. *Spr:* Tri-County ARC. Azle Community Center, 404 W Main St. NCTECH 2010. *TI:* 147.16 (110.9 Hz). *Adm:* $5. Tables: $10. David Johnson, KB5YLG, 820 Wood Ln, Azle, TX 76020; 817-444-5165; **kb5ylg@yahoo.com**; **www.wc5c.org**.

Texas (Corpus Christi) — Nov 6
D F H R S V
8 AM-2 PM. *Spr:* South Texas ARC. First Presbyterian Church Meeting Hall, 430 S Carancahua St. 12th Annual Coastal Bend Hamfest. *TI:* 146.82 (107.2 Hz). *Adm:* $5. James Ermis, AD5TC, 5054 Merganser Dr, Corpus Christi, TX 78413; 361-906-0297; **ad5tc@arrl.net**; **n5crp.org**.

Wisconsin (Appleton) — Nov 7 D F H R V
Set up 6 AM; public 8 AM. *Spr:* Fox Cities ARC. The Wave Ballroom, 2350 N Casaloma Dr. *TI:* 146.76 (100 Hz). *Adm:* advance $5, door $6. Tables: advance $10, door $14 (if available). Anthony Mach, AB9IO, 773 Yorkshire Rd, Neenah, WI 54956; 920-722-0482; **hamfest@fcarc.us**; **www.fcarc.us/hamfest.php**.

Wisconsin (Milwaukee) — Nov 6 D F H R
8 AM-2 PM. *Spr:* Milwaukee Repeater Club. Elk's Lodge #46, 5555 W Good Hope Rd. *TI:* 146.91 (127.3 Hz). *Adm:* $6. Tables: $10 (electricity $5 extra). Ken Jaeger, KC9MXZ, PO Box 2123, Milwaukee, WI 53201; 414-491-0686; **kc9mxz@arrl.net**; **www.mrc91.org**.

To All Event Sponsors

Before making a final decision on a date for your event, you are encouraged to check the Hamfest and Convention Database (**www.arrl.org/hamfests-and-conventions-calendar**) for events that may already be scheduled in your area on that date. You are also encouraged to register your event with HQ as far in advance as your planning permits. See **www.arrl.org/hamfest-convention-application** for an online registration form. Dates may be recorded up to two years in advance.

Events that are sanctioned by the ARRL receive special benefits, including an announcement in these listings and online, donated ARRL prize certificates and handouts.

For hamfests: Once the form has been submitted, your ARRL director will decide whether to approve the date and provide ARRL sanction. *For conventions:* Approval must come from your director and the ARRL executive committee.

The deadline for receipt of items for this column is the **1st of the second month preceding publication date**. For example, your information must arrive at HQ by **November 1** to be listed in the **January** issue. Information in this column is accurate as of our deadline; contact the sponsor or check the sponsor's Web site for possible late changes, for driving directions and for other event details. Please note that postal regulations prohibit mention in *QST* of prizes or any kind of games of chance such as raffles or bingo.

Promoting your event is guaranteed to increase attendance. As an approved event sponsor, you are entitled to special discounted rates on *QST* display advertising and *ARRLWeb* banner advertising. Call the ARRL Advertising Desk at 860-594-0207, or e-mail **ads@arrl.org**.

Strays

QST congratulates…

♢ARRL member Timothy J. Duffy, K3LR, of W Middlesex, Pennsylvania, who will receive the Radio Club of America's Barry Goldwater Award at the RCA Annual Awards Banquet in New York City November 19. Duffy has also been named a 2010 RCA Fellow. In addition, Donald C. Cox, WØREL, of Stanford, California, will be awarded the Armstrong Medal; Andrew M. Seybold, W6AMS, of Santa Barbara, California, will receive the Sarnoff Citation, and Richard G. Somers, W6NSV, of Pacific Palisades, California, will receive a Special Recognition Award.

♢ "Vintage Radio" conductor John Dilks, K2TQN, of Egg Harbor Township, New Jersey, who was awarded the Houck Award for Documentation by the Antique Wireless Association at their 2010 World Convention in August in Rochester, New York. John has written the column for *QST* since 2000.

75, 50 AND 25 YEARS AGO

November 1935

- The cover photo shows "A new-type ultra-high frequency receiver" for 56 Mc.
- The editorial urges League members to vote in their forthcoming elections, stressing that "The next two years will be a critical period in our League's history."
- Ross Hull presents Part 1 of his two-part article, "A New Receiving System for the Ultra-High Frequencies," combining the characteristics of superhet receivers and super-regenerative receivers.
- "A Consistent Antipodal Experimental Circuit," by S. L. Seaton and J. S. Lacey, W3AMS, tells how VK6MIO and W3AMS make daily contact — halfway around the Earth.
- "28-Mc. Communication Continues" reports that all continents are on the air, with ZS1H and W7AMX having worked five continents! "FLASH!!" — a boxed insert reports that ZS1H completed his WAC by working J2HJ.
- James Millen, W1HRX, describes "A Quick-Switch 'Phone Transmitter for Two-Band Operation" on 75 and 20 meters. The rack-mounted rig features crystal control, suppressor-modulated high-power pentodes, and an oscilloscope monitor.
- Ted McElroy reports on his winning the "World Championship Radio Code Speed Tournament." Ted copied 69 wpm with only one mistake (typing "inefficient" when it should have been "ineffective").
- Glen Browning presents "A Novel Dual-Tuner Superhet" that uses separate coil-switching units for ham-band and all-wave coverage.
- Communications Manager Ed Handy, W1BDI, announces the "Sixth A.R.R.L. Sweepstakes Contest."

November 1960

- The cover photo shows the Field Day setup of W1PX/1.
- The editorial discusses the many League members who recruit other members. With annual dues of only $5 per year, it's a good investment in the future of ham radio.
- In "More Beef for the 'Imp,'" Joe Galeski, W4IMP, tells how he added a 100-watt 6DQ5 amplifier to beef up the output of his popular homebrew exciter.
- Benson Boss, K2GHM/W3DAZ, discusses "The Gamma-Matched Ground Plane," using simplified matching and construction for that popular antenna.
- In "The Fox Vox Adapter," Grady Fox, W2VVC, describes his time-sequenced transmitter/receiver changeover system.
- H. W. Kasper, K2GAL, tells us how to get the most from stacked antenna arrays, in "Array Design with Optimum Spacing."
- In "A V. H. F. Variable-Frequency Crystal Exciter," Henry Saborsky, W3KXI, adapts the VXO idea for V.H.F. use.
- Lew McCoy, W1ICP, explains how to uses crystal-controlled converters with a BC-455 receiver as a tunable I.F., in "50- and 144-Mc. Reception at Low Cost."
- "Recent Equipment" tells about the new Hallicrafters HA-1 electronic keyer, which uses the famed W9TO circuit. It also reports on the tiny new Heathkit GW-30 10-meter transceiver.
- In "Strays," W1NSE tells about using this sentence to practice sending with his new bug: "She is 55 es she is his sister."

November 1985

- The cover photo shows two young people's groups receiving photos from WØORE — mobile on the space shuttle *Challenger*.
- The editorial reports that the FCC had adopted a declaration of limited preemption of local and state regulation of ham radio.
- Paul Courson, WA3VJB, reports on "WØORE: The Call Kids Saw 'Round the World."
- Doug DeMaw, W1FB, presents Part 3 of "The Principles and Building of SSB Gear."
- Dave Fischer, WØMHS, tells us about "The Loop Skywire," an all-band HF antenna that's easy to construct, very inexpensive, and works great DX.
- "An Inexpensive Spectrum Analyzer for the Radio Amateur," by Al Helfrick, K2BLA, gives us a window on the world of RF.
- Don Hilliard, WØPW, tells us how to build "A 902-MHz Loop Yagi Antenna."
- Robert Cowan, K5QIN, and Thomas Beery, WD5CAW, discuss "Direction Finding with the Interferometer."
- In "A CW Receive Program for Atari Computers," Stephen Stuntz, NØBF, tells us how to use this popular home computer to decode Morse.

Al Brogdon, W1AB ♦ Contributing Editor

Field Organization Reports

AUGUST 2010

Public Service Honor Roll

This listing recognizes radio amateurs whose public service performance during the month indicated 70 or more points in six categories. Details on the program are at this Web page: **www.arrl.org/public-service-honor-roll**.

520
W7TVA

410
KØIBS

402
K8OLY

365
KA2ZNZ

340
W5KAV

336
KI4KWR

335
KT2D

331
W4CAC

265
KB2ETO

295
KB2RTZ

255
K2DYB

253
K2HAT

250
K9LGU
N7CM

240
K7EAJ

229
WB8RCR

224
N2LTC

220
N1UMJ

210
AK2Z
NC4VA

205
AC6C

200
WA2BSS

194
K2ABX

190
KE5HYW

186
K6HTN

175
W7GB

KC2SFU
KC2UVQ

171
K7BC

170
K2HJ

165
KK3F

164
N4EJF

160
W2DWR
KGØGG

155
W5DY
WB2KNS
KA8ZGY
WM2C

151
N4HUB
W4LHQ

150
WD9FLJ
KB2BAA
KB8GT

145
NA9L
K7OAH
K8RDN

144
KØLQB

142
KF7GC

140
K7BFL
AG9G
NX8A

138
W3CB

135
K4DND
W3YVQ
WØLAW
W4DNA

134
W8CPG

130
K6JT
KA3OCS
WB2FTX
K4IWW

125
NN7H
N3RB

120
KI4JQB
N2GS
KB5SDU
W1GMF
KW1U
N1LKJ
WB8WKQ

119
W7JSW

117
N2VC

115
KCØM
N1IQI
KK7TN
K2GW
WD8BCS

113
KK5NU

111
AD4BL

110
N9MN
W7QM
N4ABM
W4OTN
N2GJ
WI2G
K1HEJ
KB1NMO
N5NVP
K1YCQ
K4BEH
K4GK
WA4UJC
N7XG
N7YSS
W9LW
N8NMA
K2TV
WE2G
W2EAG

106
KK7DEB

105
KC2UMX
N1QLN
W4TTO

104
W7ELI
KC5MMH

103
K8DD

102
KJ7NO

101
W2CC
N9DVL

100
NR2F
W1SGC
N7EIE
W6WW
K4SCL
N5OUJ
N1JX
K2WRC
K2AN
WØCLS
NØMEA
WAØVKC
N3SW
W3TWV
AA3SB
WB6OTS
W1PLW
WB6UZX
K4BG

99
KE5YTA

97
N7IE

96
KBØDTI

95
KB5PGY
W5GKH
N2YJZ

94
K9EOH

93
WØSJS
KC5OZT
WC5M

92
KS3Z
W2DSX

90
W3GQJ
KA1EHR
W8IM
K1JPG
NU8K
KZ8Q
NX9K
N9VC
K4MSG
N9VT
K5GLS
NIØI
KB3LNM
K3IN
N3ZOC
WB4BIK
W4WNE
W9MBT
N3KB
WA2CUW
KØBXF

87
K5MC

85
KD8CYK

84
WDØGUF
N9WLW

83
WB4GHU
KB3LFG

81
N2DW
KB9KEG
W4QAT

80
N4ELI
KJ4HGH
K7MQF
W3LQV
KF5CRX
KCØZDA
K8KV

79
N2VQA
W5ESE

78
W5XX
N5ASU

77
KD8LZB

76
N9WS

75
AC5W
W9WXN
KB1KRS
W8QZ
KD8AAD

73
AL7N
KE1ML
N5EEO
NØZIZ

71
W4AVD

70
KT5SR
KØDEU
NØDLK
NØDUW
NØDUX
NUØF
KAØFUI
KBØJKO
NØMHJ
N3NTV
KØPTK
KØOR
KØRXC
NØUKO
KD7ZUP

The following stations qualified for PSHR in previous months, but were not properly recognized in this column: (June) KBØDTI 100, KØBXF 88. (May) W2MTA 224.

Section Traffic Manager Reports

The following Section Traffic Managers reported: AK, AL, AZ, CO, CT, EB, EMA, ENY, EWA, GA, IL, IN, KS, LA, LAX, MDC, ME, MI, MN, MO, MS, NC, NFL, NLI, NNJ, NNY, NTX, OK, OR, ORG, SD, SFL, SNJ, STX, TN, UT, VA, WCF, WMA, WPA, WI, WNY, WV, WY.

Section Emergency Coordinator Reports

The following ARRL Section Emergency Coordinators reported: AZ, EWA, GA, IA, IN, KS, MDC, ME, MI, MN, MO, MS, MT, NC, NTX, NLI, OH, SD, SFL, STX, SV, TN, WTX, WV.

Brass Pounders League

The BPL is open to all amateurs in the US, Canada and US possessions who report to their SMs a total of 500 or more points or a sum of 100 or more origination and delivery points for any calendar month. Messages must be handled on amateur radio frequencies within 48 hours of receipt in standard ARRL radiogram format. Call signs of qualifiers and their monthly BPL total points follow.N1IQI 2445, WB5NKD 2123, W1GMF 1545, KA9EKG 1422, KK3F 1021, WB5NKC 1010, KW1U 977, WB8WKQ 819, W4WNE 753, WB9JSR 712, K6JT 673, N1UMJ 613, KZ8Q 588, K7IFG 584, N1LKJ 558, K1YCQ 513.

Stations earning BPL by Originations plus Deliveries: NM1K 134.

The following station qualified for BPL in June, but was not recognized in this column last month: K6JT 598.

SILENT KEYS

It is with deep regret that we record the passing of these amateurs:

KA1DIN **Bacon**, Earl G., Lynn, MA
KA1INC **Brendle**, Edward F. Jr, Ocala, FL
WA1JKP **Chadwick**, Ernest W., Saugus, MA
KB1KZX **Foster**, Barbara, Taunton, MA
K1LXQ **Fairhurst**, Earl R., Attleboro, MA
KA1NS **Kendrick**, Edmund H., Sunset, ME
W1RAL **Sutherland**, William J. Jr, Danvers, MA
K1VTX **Szretter Federico**, Loretta H., Natick, MA
♦WA2DPM **Jackman**, Kenneth "Van" MD, Saranac Lake, NY
N2JTZ **Larsen**, Kenneth A., Corfu, NY
KA2MIG **Saska**, Ronald P., Anniston, AL
W2OBJ **Roehm**, Albert A., Cranford, NJ
K2QJV **Stiffey**, Arthur V., Slidell, LA
KA2VYX **Minotti**, Louis A., Elmira Heights, NY
♦W3ABC **Turnbull**, Hugh A., Silver Spring, MD
♦K3BV **Ertman**, Robert J., Rockville, MD
AA3II **Seidl**, Gerald J., Erie, PA
W3KKN **Kenas**, Ernest L., Jenkintown, PA
W3NDH **Walkuski**, Stanley, McKees Rocks, PA
KA3QNO **Whitlock**, James R. Sr, Parkville, MD
W3UC **Chance**, Henry M. II, Kennett Square, PA
KA3WZO **Fincher**, Donald Milton, Pittsburgh, PA
W4AYF **Pease**, William C. "Bill" IV, Marietta, GA
WD4CRB **Keith**, Richard H., West Palm Beach, FL
W4FMI **Adams**, James W. "Red," Anniston, AL
K4IUD **Grove**, Dr Robert B., Brentwood, TN
K4IZO **Baines**, Leonard Jr, Rockmart, GA
♦WA4JDI **Stickrod**, Robert D., Orlando, FL
♦W4JO **Olson**, James E., Douglasville, GA
NW4K **Blanchard**, Bonner O., Hopkinsville, KY
KG4KFR **Fisher**, Leon H., Spruce Pine, NC
WB4NBI **Gibson**, Stephen W., Burke, VA
KC4OM **Lyon**, Arthur B. Jr, Atlantic Beach, FL
♦KE4OPB **Utter**, L. Owen, Kissimmee, FL
K4OZF **Bradbury**, Paul Thomas "Tom," Marietta, GA
♦K4OZX **Perry**, Charles K., Kingsport, TN
N4TUU **Wheatley**, Robert W., Kingsport, TN
W4UNT **Henry**, Talmage H., Chattanooga, TN
AF4YK **Johnson**, Walter H. Jr, North Port, FL
W4ZJU **Carswell**, Michael J., Mount Pleasant, SC
KK5BE **Hughes**, Kenneth Jerry, Nacogdoches, TX
♦N5BV **Wyatt**, Wayne W., Dallas, TX
K5GWR **Rush**, George W., Baton Rouge, LA
NA5J **Easley**, Thomas H., Terry, MS
KD5JKS **Cain**, John D., Durant, MS
♦K5VGI **Takle**, Carl E. N., Plano, TX
K5VM **Wallace**, Andy, Dallas, TX
KI6AD **Grace**, Harry D., Sonora, CA
KB6ANH **Ebury**, Astrid, Coalinga, CA
W6DAC **Cortell**, David, Camino, CA
K6DNC **Wulstein**, Lauren R., Kernville, CA
KD6DYH **Diel**, Fred H., Prather, CA
K6ERL **LaPointe**, Ernest R., Upland, CA
K6GKU **Rose**, Robert B., Rockwall, TX
♦W6HLC **Lauer**, Albert C., Williamsburg, VA
K6JFW **Snyder**, Harlan C., Saratoga, CA
W6LZB **Sundberg**, Glenn G., Covina, CA
KI6LZZ **Lathe**, John M., Magalia, CA
N6OYA **Ruiz**, Raymond, Los Angeles, CA
WB6TFU **Hoff**, Donald L., Fresno, CA
W6UIU **Berry**, James "Jim," Coalinga, CA
N6VIF **Watson**, Edgel L. "Sam," El Sobrante, CA
N6WNL **Soutar**, James M., Barstow, CA
♦N6XH **Hanna**, David D., Ashland, OR
♦WA6YCG **Hojaboom**, Richard L., Long Beach, CA
KA6YEZ **Straughter**, Melvin A. Sr, Rancho Cucamonga, CA
K6ZL **Smith**, Ronald, Fresno, CA
KD7IBN **Walker**, Ronald Bruce, Kaysville, UT
W7JIM **Hohl**, Jerrold M., Bellingham, WA
K7JS **Shurtliff**, Jack L., Ogden, UT
N7KGS **Brown**, Lawrence E. "Larry," Ellensburg, WA
WA7MVA **Sanders**, Glen E. "Sandy" Jr, Madison, IN
KD7OCU **Lukasavich**, William P. Jr, Reno, NV
N7OWQ **Dessens**, John J., Chehalis, WA
W7ZCA **Eisenbarth**, Paul J. Jr, Reno, NV
N8AGF **Sherman**, Philip D., Holland, MI
W8BEP **Gregg**, David, Sault Sainte Marie, MI
♦WA8IXD **Mackey**, John W. "Bill" Sr, Sault Ste Marie, MI
KC8JKS **McKinney**, Thomas F., Clintonville, WI
N8MRS **Heinrich**, John C., North Olmsted, OH
K8NKZ **Marr**, James D., Alpena, MI
W8QHG **Hall**, Harold R. "Bob," Barboursville, WV
KA8REX **Hoey**, William B. "Bill" Jr, Lewes, DE
K8YJN **Reuter**, Arthur M., Southgate, MI
W9ATH **Perkins**, Robert W., Palatine, IL
W9HUT **Dietzler**, Raymond, Eau Claire, WI
WB9MMG **Kiehl**, John P., Elgin, IL
KC9OWM **Howard**, John M., Indianapolis, IN
NV9P **Link**, Victor G., Madison, WI
KHØAC **Kaufer**, Leonard J. "Dr Len," Saipan, MP
KAØAMA **Green**, William F., Saint Charles, MO
NØAOM **Herbsman**, Joel L., Independence, MO
KBØECI **Clyburn**, Leland E., Fort Scott, KS
KDØHKC **Michael**, Robert L., Overland Park, KS
WØKXJ **Froelich**, Donald M., Emporia, KS
KDØOA **Webb**, Richard C. "Dick," Estes Park, CO
NØWAN **Seneker**, Douglas D., Mount Vernon, MO
NØYTC **Derr**, Roger A., Grand Island, NE
♦VE7AKE **Wilson**, Vernon M., Burnaby, BC, Canada
VE7GW **Bailey**, Fred C., Vancouver, BC, Canada

♦ Life Member, ARRL

Note: Silent Key reports must confirm the death by one of the following means: a letter or note from a family member, a copy of a newspaper obituary notice, a copy of the death certificate, or a letter from the family lawyer or the executor. Please be sure to include the amateur's name, address and call sign. Allow several months for the listing to appear in this column.

Many hams remember a Silent Key with a memorial contribution to the ARRL Foundation or to ARRL. If you wish to make a contribution in a friend or relative's memory, you can designate it for an existing youth scholarship, the Jesse A. Bieberman Meritorious Membership Fund, the Victor C. Clark Youth Incentive Program Fund, or the General Fund. Contributions to the Foundation are tax-deductible to the extent permitted under current tax law. Our address is: The ARRL Foundation Inc, 225 Main St, Newington, CT 06111. QST

Gail Iannone ♦ Silent Keys Administrator ♦ sk@arrl.org

Strays

DEVOTIONAL EVENT

◊The 5017 DXers Radio and Blues Club are sponsoring a Devotional Amateur Radio Event/Contest November 25, 2010-January 1, 2011. For complete details, go to **w2blu.wordpress.com/**. — *Jim Brown, NY4JB*

I would like to get in touch with…

◊hams interested in joining a group of German-speaking hams in Southern California that meet Wednesdays at 2000 Pacific Time on 3925 kHz plus or minus QRM. — *Harry Hinz, KE6RJ*

◊hams interested in the Network 105 Yahoo/Facebook group at **groups.yahoo.com/group/network105/**. See "Eclectic Technology," Sep 2010 *QST*, p 91, for information about Network 105. — *Tony Bombardiere, K2MO*

JOHN ORTON, W5JBO

Great plate: **John Orton, W5JBO, of Converse, Texas wants the world (and his motorcycle buddies) to know that, as he puts it, he's "a devoted League member."**

ED ENGLEMAN, KG8CX

Two of the young hams who took part in the Lighthouse special event station during the Menominee (WI) Waterfront Festival in early August. A group of ops made 90 contacts on HF and 2 meters. Many visitors, hams and non-hams alike, stopped by during our 7 hours of operating. — ***Ed Engleman, KG8CX, M&M Amateur Radio Club, Menominee DAR Radio Club K8DAR, Y.A.C.H.T. K8KDZ (Young Amateurs Contest Ham Team)***

SPECIAL EVENTS

Contact these stations and help commemorate history. Many provide a special QSL card or certificate!

Oct 11-Oct 17, 0000Z-2359Z, N1A-NØA, Kittanning, PA. North American QRP Club. 6th Anniversary Special Event. 14.060 10.120 7.040 3.560. Certificate & QSL. Tom Mitchell, WY3H, 210 Garretts Run Rd, Kittanning, PA 06210. **home.windstream.net/yoel**

Oct 16, 1300Z-2000Z, K4NPT, Port Charlotte, FL. North Port Amateur Radio Club. JOTA 53 and 100 Years of Scouting Operating on or near World Scout frequencies. QSL. NPARC, PO Box 7716, North Port, FL 34290. **www.qsl.net/k4npt**

Oct 16-Oct 17, 0001Z-2359Z, WA7JHQ, Albuquerque, NM. Boy Scouts of America Great Southwest Council Troop 337 and Cub Pack 337. Jamboree on the Air. 18.140 14.290 7.190 3.940. QSL. Sterling Whitaker, 4615 Cumberland Rd NW, Albuquerque, NM 87120.

Oct 16-Oct 17, 1600Z-1600Z, KX4BSA, Knoxville, TN. GSMC Toqua District. BSA 100th Anniversary JOTA. 146.550 14.285 7.185 3.935. QSL. AJ4NO, 9937 Coward Mill Rd, Knoxville, TN 37931. Great Smoky Mountain Council Toqua District Communicaroo. Radio and Signaling merit badges, Ham education for Scouts.

Oct 17, 1200Z-1900Z, KC1TAC, Kingston, MA. Taunton Area Communications Group. JOTA Camp Norse. 147.225 node 484193 14.290 7.090 7.190 18.140. QSL. Taunton Area Communications Group, 81 Fremont St, Taunton, MA 02780-23. 53rd Jamboree On The Air during Annawon Council's Covered Wagon Derby. We will also be operating on or near the World Scout frequencies. **kc1tac.webs.com**

Oct 19-Oct 21, 1230Z-2000Z, KØW, Moultrie, GA. Colquitt County Ham Radio Society. Sunbelt Ag-Expo. 146.79 28.400 14.225 7.250. QSL. Dale Culp, 1148 Paul Murphy Rd, Moultrie, GA 31768. **www.wd4kow.org**

Oct 23, 1200Z-1600Z, W2K, New York, NY. United States Coast Guard Auxiliary. 71st Anniversary of the Coast Guard Auxiliary. 4.280 7.260. QSL via **eqsl.cc** or direct, John Kierman, KE2UN, 110 Cabrini Blvd, Apt A, New York, NY 10033.

Oct 23, 1330Z-1700Z, NC4AR, Randleman, NC. Tri County Amateur Radio Club. 22nd NASCAR Day Festival. 14.270 7.208. Certificate. NC4AR, PO Box 747, Trinity, NC 27370.

Oct 23, 1400Z-2300Z, K4A, Jacksboro, TN. US Coast Guard Auxiliary. Commemorate 71st Anniversary of USCG Auxiliary. 14.344 7.258 146.94. QSL. P. R. DeWitt, 393 Clover Cir, Jacksboro, TN 37757.

Oct 23, 1300Z-2200Z, K1G, Swampscott, MA. US Coast Guard Auxiliary, District 1 Northern Region. 71st Anniversary of the United States Coast Guard Auxiliary. 14.241. QSL. Dr Gary G. Young, 1 Sutton Pl, Swampscott, MA 01907. **gyoung@worcester.edu**

Oct 23-Oct 24, 0000Z-0600Z, K5H, Fredericksburg, TX. Central Texas Motorcycle Charities. Harvest Classic Vintage Motorcycle Rally. 14.250 7.225. QSL. Tom Tackett, 212 Oregon Tr, Argyle, TX 76226. For the Candlelighters Childhood Cancer Foundation.* **harvestclassic.org**

Oct 23-Oct 24, 1100Z-0100Z, K2BSA/4, Cherryville, NC. Piedmont Council, Boy Scouts of America, North Carolina, in conjunction with local ham radio clubs. Rendezvous 2010: Celebrating 100 Years of Scouting. 14.255. Certificate & QSL. Cleveland County Amateur Radio Service, PO Box 864, Shelby, NC 28151. From the Cleveland County Fairgrounds, Shelby NC, where an estimated 5000 scouts will be celebrating the 100 Year Anniversary of the BSA. **www.ccarsnc.org**

Oct 23, 1200Z-2200Z, N4Q, Lexington, NC. KG4ZOI. Lexington NC Barbeque Festival. 14.250 14.050. QSL. Mark Swing, KG4ZOI, 105 Azalea Ct, Mebane, NC 27302. **mark_swing@yahoo.com**

Oct 23, 1400Z-2300Z, W1H, Owl's Head, ME. Coast Guard Auxiliary. Coast Guard Auxiliary 71st Anniversary. 28.370 21.387 14.325 7.220. QSL. Bill Hopwood, PO Box 272, Elkins, NH 03233.

Oct 30, 1200Z-2000Z, W4OLB, Maryville, TN. Smoky Mt Amateur Radio Club. Fall in the Smokies. 14.070 7.250 146.655. QSL. Smoky Mt ARC, 2054 Independence Dr, Maryville, TN 37803. **smokymountainarc.org**

Oct 30, 1500Z-2100Z, W9CWA, Centralia, IL. Centralia Wireless Association. Centralia's Fall Festival. 28.375 14.271 14.270 7.225. QSL. Centralia Wireless Assn, PO Box 1166, Centralia, IL 62801. **w9cwa.net**

Nov 1-Nov 30, 0000Z-2359Z, CG3MUG, Thunder Bay, ON. Thunder Bay CGRS ARC. (VE3VBA) VBA Thunder Bay Coast Guard Radio Celebrates 100 Years of Radio Service! 14.260 14.060 7.260 7.060. Certificate & QSL. MUG-VBA 100th Anniversary, 400-100 Main St, Thunder Bay, ON P7B 6R9, Canada. Electronic QSL via eQSL.cc and Logster. QSL card & certificate sent via email request. Mail requests for US/Canadian hams should include SASE sized for 4x6 QSL card (only); DX requests handled via BURO. **my.tbaytel.net/va3rom**

Nov 5-Nov 7, 1700Z-1700Z, N8F & K8F, Whitefish Point, MI. Stu Rockafellow Amateur Radio Society. Remembering the Edmund Fitzgerald. 18.160 14.260 7.240 3.860. Certificate. Richard A. Barker, W8VS, 264 N East St, Brighton, MI 48116. **www.qsl.net/w8njh/index.html**

Nov 6-Nov 8, 1600Z-0200Z, WØJH, Stillwater, MN. Stillwater Amateur Radio Association. "Remembering the Edmund Fitzgerald" Split Rock Lighthouse. 21.360 14.260 7.260 3.860. QSL. WØJH, see below. QSL certificates will *only* be sent via e-mail. Send your request with required QSO info (call sign, date, time, freq, RST report, etc) to **w0jh@arrl.net** or complete QSL Request Form at: **www.radioham.org** (you do *not* have to send a printed QSL card). A file suitable for printing will be sent to you via e-mail.

Nov 6-Nov 11, 0800Z-1200Z, VA3IF, Guelph, ON. Guelph Amateur Radio Club. Remembrance Day. 10 15 20 40 80 m IRLP VE3OVQ 147.540 node 2260. Certificate. GARC, 11 Waxwing Cres, Guelph, ON N1C 1E1, Canada. From the McCrae House, birthplace of Col John McCrae, author of "In Flanders Fields." *Nov 6-7 1 AM-5 PM EST; Nov 7-10 10 AM-5 PM EST*. **www.garc.ca**

Nov 9-Nov 12, 1300Z-2359Z, W5M, Spiro, OK. Marine Corps Birthday. 14.315 7.262. QSL. Don Greenwood, K5DLO, 19299 Greenwood Rd, Spiro, OK 74959.

Nov 10-Nov 12, 1800Z-1800Z, K8V, Iron Mountain, MI. Mich-A-Con ARC. Veterans Day at the UP Veterans Memorial. 14.280 14.090 14.060 7.230. Certificate & QSL. Thomas Martin, 812 West B St, Iron Mountain, MI 49801. **w8jwn@arrl.net**

Nov 10-Nov 14, 1500Z-2200Z, KA9NLX, Arlington Heights, IL. Armored Force Amateur Radio Net. Veterans Day. 14.325 10.133 MT63 7.283 7.065. Certificate. John Paskevicz, 1423 N Ridge Ave, Arlington Heights, IL 60004. Honoring members of all military services. AFAR members will operate from their home stations and will also operate 146.52 in their local communities.

Nov 11, 1200Z-1800Z, N1S, Stratford, CT. Greater Bridgeport Amateur Radio Club. Military Appreciation Day at Sikorsky Aircraft. 28.350 21.360 14.260 7.250. Certificate. John Russo, 104 Woodside Ave, Waterbury, CT 06708. Also sponsored by Derby Office of Emergency Management and Sikorsky Aircraft's Veteran's Association to honor all Vets and servicemen presently deployed. **www.gbarc.net**

Nov 11, 1200Z-2300Z, W4V, Evans, GA. Columbia County Amateur Radio Club. Honoring America's Veterans. 14.260 7.260 3.860. Certificate. Richard McKnight, 125 Pond View Rd, Evans, GA 30809. Augusta, GA, VA Medical Center. Logged QSL/certificate will be available online shortly after contact, at **www.slsrc.org/slsrc-ses.html**. **www.slsrc.org**

Nov 11, 1400Z-2000Z, WØEM, Colorado Springs, CO. Veterans Day Special Event Station. 14.255. QSL. Jim Harris, WØEM, 2306 Zane Pl, Colorado Springs, CO 80909.

Nov 11, 1500Z-2245Z, W5KID, Baton Rouge, LA. Baton Rouge and USS *Kidd* Amateur Radio Clubs. Veterans Day. Gen bands CW in QRP bands. QSL. W5KID, 305 S River Rd, Baton Rouge, LA 70802. Primary frequency is 20 meters. **www.lsu.edu/brarc/uss_kidd.htm**

Nov 11, 1500Z-2359Z, W4NPT, Warm Springs, FL. North Port Amateur Radio Club. Veterans Day at AMVETS 2000 Club. 14.270 14.052 7.190 7.052. QSL. NPARC, PO Box 7716, North Port, FL 34290. Operating from the AMVETS 2000 Club in Warm Mineral Springs, Florida to honor all vets and service members. **k4npt@qsl.net**

Nov 11-Nov 13, 1200Z-1159Z, K4NYC, Pompano Beach, FL. K4NYC. Veterans Day Special Event. SSB 21.300 14.250 7.185 3.825 PSK 21.070 14.070 7.035 3.825. QSL. Edgardo Ramos, 11200-B NW 39th St, Pompano Beach, FL 33065. **www.qrz.com/db/k4nyc** *or* **www.k4nyc.com**

Nov 11-Nov 14, 1800Z-2300Z, K7PIR, Phoenix International Raceway, AZ. Team PIR. NASCAR/Kobalt Tools 500. 14.255 7.255. QSL. Team PIR, 1211 W Wood Dr, Phoenix, AZ 85029. No LoTW or E-QSLs. **www.kg9jp.com/k7pir**

Nov 13, 0800Z-2000Z, KMØSI, Tampa, FL. Museum of Science and Industry Amateur

Maty Weinberg, KB1EIB ♦ Special Events ♦ events@arrl.org

Radio Club. MOSI/Boy Scout Camporee. 14.346 14.250 7.275 3.855. Certificate & QSL. MOSI Amateur Radio Club, 4801 E Fowler Ave, Tampa, FL 33617. 100th year Gulf Ridge Council Boy Scouts of America Camporee. **www.mosihamradio.org**

Nov 13, 1700Z-2359Z, NI6IW, San Diego, CA. USS *Midway* (CV41) Museum Radio Operations Room. United States Veterans Day; Marine Corps Birthday 1775; Cdr Richard Byrd made first flight over South Pole 1929. SSB 14.320 7.250 D-STAR 012C 2 m/70 cm SOCAL rptrs. QSL. USS *Midway* Museum Radio Room, 910 N Harbor Dr, San Diego, CA 92101. **kk6fz@arrl.net**

Nov 13-Nov 14, 1200Z-2359Z, Various calls. Various cities. NA and CA SOTA Organizations. 14.342 14.060 7.255 7.040. QSL. QSL to participants, per operator's instructions, or QRZ.com. **groups.yahoo.com/group/nasota**

Nov 13-Nov 14, 1500Z-2200Z, WØFSB, Waterloo, IA. Five Sullivan Brothers Amateur Radio Club. Triple Event — Veterans Day Nov 11, Marine Corps Birthday Nov 10, Loss of the Five Sullivan Brothers Nov 13. 14.240 7.240. Certificate & QSL. Vernon Mc Nulty, KØEFV, 4015 Independence Ave, Waterloo, IA 50703.

Nov 13-Nov 14, 1400Z-2200Z, W5SGL, Biloxi, MS. Mississippi Coast Amateur Radio Association. Highlands and Islands 25th Silver Anniversary Scottish Highland Games and Celtic Music Festival. 14.290 14.250 7.250 3.850. Certificate. Terry Hull, 318 Joyce Ave, Long Beach, MS 39560. For more info on the event **www.highlandsandislands.org**. **www.qsl.net/w5sgl**

Nov 15, 1330Z-2200Z, W8V, Brecksville, OH. Samuel M. Hevener, W8KBF. 65th Anniversary of the Reopening of Amateur Radio in the US and Canada following the shutdown for the duration of WWII. 18.145 (if open) 7.245. Certificate. Sam Hevener, W8KBF, 3583 Everett Rd, Richfield, OH 44286.

Nov 17, 1500Z-2300Z, K7NRA, Paulden, AZ. Yavapai Amateur Radio Club. Celebration of the NRA's 139th Birthday. 21.335 14.250 7.250. Certificate. Mike Campbell, K7NRA, 404 Lampliter Village, Clarkdale, AZ 86324. Operating from Gunsite Academy. **www.w7yrc.org/nra_birthday.htm**

Nov 26-Nov 27, 1500Z-2000, KF5CZR, Stuttgart, AR. Grand Prairie Amateur Radio Club. World Championship Duck Calling Contest. 14.265. QSL. Grand Prairie ARC, 510 West 14th St, Almyra, AR 72003.

Nov 27-Nov 28, 1400Z-2000Z daily, WA1NPO, Plymouth, MA. Whitman Amateur Radio Club. First Pilgrim Landing at Plymouth, MA. 18.140 14.280 7.250 3.860. Certificate & QSL. Whitman ARC, PO Box 48, Whitman, MA 02382. **www.wa1npo.org**

Certificates and QSL cards: To obtain a certificate from any of the special-event stations offering them, send your QSO information along with a 9 ×12 inch self-addressed, stamped envelope to the address listed in the announcement. To receive a special event QSL card (when offered), be sure to include a self-addressed, stamped business envelope along with your QSL card and QSO information.

*Note: Some clubs may ask for a nominal fee to cover the cost of the certificate or QSL. Request will be made on air during the event or on the club's Web site.

Special Events Announcements: For items to be listed in this column, use the ARRL Special Events Listing Form, at **www.arrl.org/special-events**. A plain text version of the form is also available at that site. You can also request a copy by e-mail or send a self-addressed, stamped envelope (SASE) (Special Requests, ARRL, 225 Main St, Newington, CT 06111; write "Special Events Form" in the lower left-hand corner.) Off-line completed forms can be mailed, faxed (Attn: Special Events) or e-mailed.

Submissions must be received by ARRL HQ no later than the 1st of the second month preceding the publication date; a special event listing for **Jan** *QST* would have to be received by **Nov 1**. In addition to being listed in *QST*, your event will be listed on the *ARRLWeb* Special Events page. Note: All received events are acknowledged. If you do not receive an acknowledgment within a few days, please contact us.

Special Events listed in this issue include current events received through Sept 10. You can view all received Special Events at **www.arrl.org/special-events**. QST

HAMSPEAK

The following are brief descriptions of Amateur Radio related terms found in this month's issue of *QST*. More information can be found in *The ARRL Handbook*, or other specialized ARRL publications.[1] See also **www.arrl.org/ham-radio-glossary**.

Antenna Gain Specs — What do They Really Mean?

Azimuth pattern — Graphical representation of signal strength from an antenna as a function of horizontal angle around the antenna center. It is made at a particular elevation angle, often the angle with the maximum response.

Elevation pattern — Plot of the radiation intensity of an antenna at different elevation angles. For an omnidirectional antenna, the elevation pattern is the same at every azimuth angle. Other antennas will have elevation patterns that are different at each azimuth angle, so usually the plot at the most significant azimuth is shown. Elevation patterns with large signals near the horizon are generally preferred for line of site operations, such as in VHF mobile communication. Low elevation angles also provide for the longest distance communication via ionospheric propagation.

[1]*The ARRL Handbook for Radio Communications*, 2010 Edition. Available from your ARRL dealer or the ARRL Bookstore, ARRL order no. 1448 (Hardcover 1462). Telephone 860-594-0355, or toll-free in the US 888-277-5289; **www.arrl.org/shop/**; **pubsales@arrl.org**.

The Doctor is IN

Beverage antenna — Long (typically greater than a wavelength) horizontal receiving antenna situated around 6 feet above the ground. Named after the inventor, this antenna is directive, receiving vertically polarized signals that travel along the antenna. Signals are weak, but the noise is even weaker, resulting in an improved signal to noise ratio compared to most more efficient antennas.

Decibel — Logarithmic expression of a power or voltage ratio. Useful in systems definitions since gains and losses expressed in decibels (dB) can be added and subtracted directly if all at the same impedance level. See J. Hallas, W1ZR, "Making Sense of Decibels," *QST*, Apr 2007, pp 61-62 for more information.

Dipole — An antenna often, but not always, center fed with two halves along the same line. Often refers to an antenna with a length equal to half an electrical wavelength. Often a reference antenna and also used as an element of multielement arrays. See **www.arrl.org/files/file/Technology/tis/info/pdf/9304064.pdf**.

G5RV antenna — Form of dipole antenna in which a 100 foot center fed antenna is fed with about 30 feet of balanced high impedance transmission line. The line section acts as a transformer intended to match the system to 70 Ω at the bottom on multiple bands. The antenna was developed by Louis Varney, G5RV (SK), near the end of WW2 as a multiband antenna with a particular pattern he wanted on 20 meters.

PEP (peak envelope power) — The average power supplied to the antenna transmission line by a transmitter during one RF cycle at the crest of the modulation envelope taken under normal operating conditions.

Signal-to-noise ratio (S/N) — The ratio of the strength of the desired signal to that of the unwanted signal (noise).

S-unit — Unit of measure on S-meter. Each S-unit is intended to represent a factor of 2 (6 dB) in input voltage at the receiver antenna terminals.

TV type standoff insulators — Screw-in or strap-on device originally intended to space TV type 300 Ω twinlead away from masts of wood siding.

An Expanded Voltmeter for 120 or 240 V ac — With a Bonus

Digital voltmeter (DVM) — Basic test instrument that can be switched to measure the electrical voltage, resistance or current in different ranges.

Filament — One element of a vacuum tube. The filament is electrically heated, as in the filament of a light bulb, to allow the release of electrons that are controlled by and flow towards other tube elements.

PC board — Thin board, generally phenolic resin or fiberglass, clad on one or both sides with copper. Copper is etched away leaving paths that form connections for electrical components on the board. See **en.wikipedia.org/wiki/Printed_circuit_board**.

Potentiometer — Variable resistor with three terminals, two of which are attached to a fixed resistance element and the third can be mechanically moved along the element, presenting a different resistance to each of the fixed terminals.

Power tube — Generic name applied to vacuum tubes that can handle the high power needed to be used in radio transmitting applications.

Triode — A three-element vacuum tube with a cathode, a grid, and a plate. The grid allows a signal to vary the current between plate and cathode, allowing amplification.

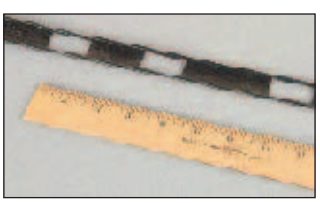
Variac — Trade name of a kind of variable autotransformer that can provide voltage between 0 and typically 150 V ac from a nominal 120 V line.

An Improved Center Insulator for Wire Antennas Fed with Window Line

Eye bolt — Threaded machine bolt with a circular section in place of the usual bolt head. Can be used to secure rope, pulleys, shackles or other devices.

SK — Silent key. Euphemism for a deceased Amateur Radio operator.

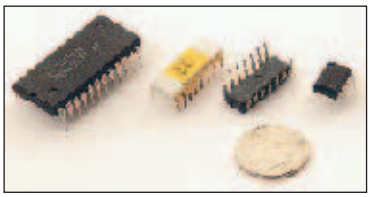
Window transmission line — Balanced, parallel conductor transmission line with a plastic web between the conductors to provide insulation and maintain constant separation between the conductors. Rectangular holes punched in the plastic web to reduce loss give the appearance of windows.



Infrared Radio Control for Your HF Transceiver

BASIC — A computer programming language (*Beginner's All-purpose Symbolic Instruction Code*) designed (c 1964) to be used by persons unfamiliar with computer programming and popular with early personal computer users. See **www.fys.ruu.nl/~bergmann/history.html**.

Baud — A unit of signaling speed equal to the number of discrete conditions or events per second. (If the duration of a pulse is 20 ms,



the signaling rate is 50 bauds or the reciprocal of 0.02, abbreviated Bd).

Integrated circuit (IC) — A semiconductor device in which many components, such as diodes, bipolar transistors, field-effect transistors, resistors and capacitors are fabricated to make an entire circuit.

Infrared — Electromagnetic radiation below the frequencies of visible light, but above the microwave radio frequencies.

LED, light emitting diode — Semiconductor device from which light is emitted when current flows. These were originally used in place of incandescent bulbs as indicator lights. They now can be used in place of larger light bulbs and form the basis of some display screens. See **hyperphysics.phy-astr.gsu.edu/hbase/electronic/leds.html**.

Mini DIN-8 connector — Small multipin connector series with the numeral indicating the number of pins. DIN stands for *Deutsches Institut fur Normung*, the German national standards body, similar to the IEEE for electronic standards in the US.

TTL — Transistor-transistor logic. Family of solid state logic circuit elements in which the active gates are multiple lead transistor terminals.

Receiver Noise Figure — What's It All About?

Dynamic range — Ratio of the strongest signal to the weakest signal that a system can respond to within a specified level of distortion. The weakest signal is typically just stronger than the system's internal noise. Generally, a high dynamic range is a desirable attribute of a system, such as a radio receiver, indicating how well it can respond to weak signals in the presence of strong signals on adjacent channels.

External noise — Undesired signals that are generated outside of the system of interest. In radio, typically noise signals that are received along with desired signals via the antenna connection.

HF — High frequency. That portion of the radio spectrum between 3 and 30 MHz. Often called *short waves*, these frequencies are characterized by long range propagation via ionospheric refraction.

Internal receiver noise — Undesired noise signals generated within the electronic circuitry in a receiver. Such noise generally sets the receiver *noise floor*, the level of the lowest desirable signal that can be received.

Sensitivity — Measure of a receiver's ability to detect and reproduce weak signals. This is generally related to the receiver internal noise level and is generally expressed as a level of received signal required to provide at least a specified signal to noise ratio (S/N). Because the noise level is proportional to bandwidth, the value only has meaning if the bandwidth is also stated.

VHF (very high frequency) — Radio frequencies from 30 to 300 MHz.

Revisiting a 10 and 6 Meter Mobile Antenna

Coil form — Structure upon which an inductor, usually for radio frequency use, is wound. These were commonly available as commercial products in the early days of radio, but are now frequently adapted from other materials such as PVC pipe or pill bottles. Many early forms were on plug-in bases, such as those of vacuum tubes so that they could be exchanged to change tuning ranges.

Grid dip meter — Test instrument designed to measure the resonant frequency of a inductance/capacitance tuned circuit. It does this by observing the feedback current of an oscillator that will be reduced if coupled into a resonant circuit. In this vacuum tube implementation, the indication was a reduction in measured grid current.

Loading inductor — An inductor inserted into an antenna to make it act as if it were electrically longer.

Resonance — Condition in an ac circuit containing both capacitive and inductive reactance. At some frequency, the capacitive and inductive reactance will be of equal magnitude. A resonant series RLC circuit will have an impedance equal to the resistor alone, while a parallel circuit will have a very high impedance. Resonant circuits are often used for frequency selection in radio equipment.

Surface mount device — Kind of electronic component, passive or complex integrated circuits, that mount to printed circuit boards through adhesive and direct solder connections rather than the earlier technology of wires mounting through holes in the board. They are well suited to precision automated assembly and are much more compact than earlier technology. See **www.dprg.org/tutorials/1999-07a/**.

The Tape Measure Vertical

Alligator clip — Small clamp-like device that is often on the end of a wire test lead. The clamp action allows a secure temporary connection for measurement or other purposes.

ARRL Field Day — An ARRL operating event in June of each year in which hams typically operate for 24 hours from temporary locations using emergency power and portable equipment to simulate emergency conditions and have fun. See **www.arrl.org/field-day** for details.

Ground plane antenna — A kind of antenna in which the primary element is a quarter wave vertical monopole located above an artificial ground of typically three or four quarter wave *radials*.

Guy ring — Device that fits over a mast, secured at a particular height such that the ring can rotate on the mast, allowing the mast to turn while still being supported by attached guy wires.

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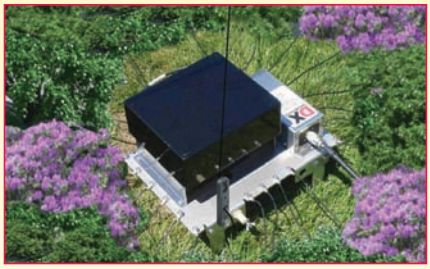

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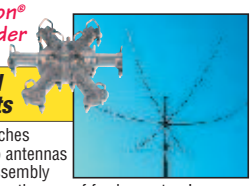

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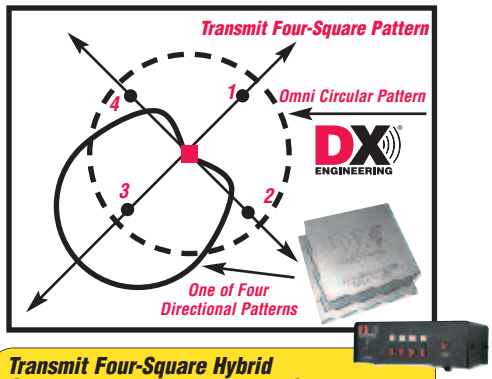

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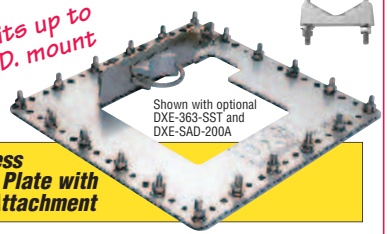

Stainless Radial Plate with Coax Attachment

NOT CHEAP ALUMINUM!
GUARANTEES BEST RADIAL SYSTEM CONDUCTIVITY OVER TIME

New!

Makes radial attachment a snap!
- Fits 3" pipe, 4x4 and 6x6 posts
- 0.125" thick 304 stainless steel
- Accommodates up to 120 radials
- Patented high current coax connection to radials

DXE-RADP-3	Complete with 20 stainless bolt sets	$54.50
DXE-RADP-1HWK	20 sets of 1/4" stainless hardware	$7.50
DXE-SSVC-2P	Stainless Saddle Clamp for attachment to round tube 1" to 2" O.D.	$11.95
DXE-SSVC-3P	Stainless Saddle Clamp for attachment to round tube 2" to 3" O.D.	$14.95
DXE-363-SST	Silver/Teflon® bulkhead connector	$6.95
DXE-VFCC-H05-A	Vertical Feedline Current Choke	$134.95
DXE-RADW-500K	Radial Wire Kit, 500 feet of wire, 20 lugs, 100 steel anchor pins	$61.90
DXE-RADW-1000K	Radial Wire Kit, 1,000 feet of wire, 40 lugs, 200 steel anchor pins	$123.95
DXE-STPL-100P	Steel Radial Wire Anchor Pins, 100 pack	$16.00

Biodegradable Anchor Pins Also Available

hy-gain

Antenna Rotors

HYG-AR-35	Light Beam/TV	$89.95
HYG-CD-45II	8.5 Sq. Ft. Rating	$419.95
HYG-HAM-IV	15 Sq. Ft. Rating	$594.95
HAM-HAM-V	15 Sq. Ft. Digital Control	$919.95
HYG-T-2X	20 Sq. Ft. Rating	$689.95
HYG-HDR-300A	25 Sq. Ft. Rating, Heavy Duty	$1,339.95

Rotor Accessories

DXE-CW8	8-Wire Rotor Cable	$0.39/ft.
DXE-CW8-HD	8-Wire Heavy Duty Rotor Cable	$0.89/ft.

Heavy Duty Tripod Roof Mount

- Ideal for medium size antennas like the DX Engineering HEXX Beam or small HF and VHF Yagi or tri-band antennas
- 1 1/2" O.D. heavy-duty steel legs, 10" long mounting feet with tar strips
- 30 lag bolts included
- 5 ft. tall, 2" O.D. steel antenna/rotor mounting mast

RON-1011 ..... $149.95

Heavy Duty Chimney Roof Mount

- Ideal for medium size antennas with rotors like the DX Engineering HEXX Beam or small HF and VHF Yagi or tri-band antennas
- 24 ft. long stainless steel straps
- Rotor-ready 24" upper and 42" lower masts
- Fits multiple-flue residential and commercial chimneys
- Four 1 1/2" wide, 11 gauge steel corner brackets
- Shipped partially assembled

RON-3324 ..... $149.95

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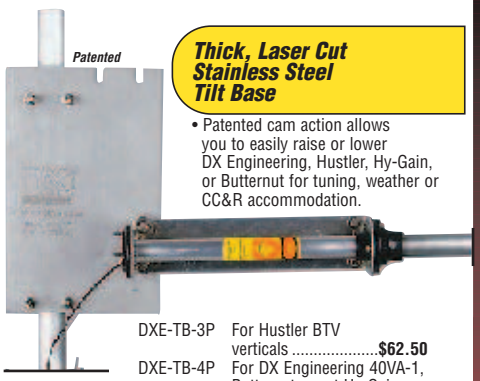
Complete Receive Four-Square Package with DXE-ARAV2-4P Active Antenna Kit

- TVSU Sequencer
- 4 Active Vertical Antennas
- RFS-2 Four Square Directional Switch
- CC-8 Controller
- 1,000 ft. of direct-bury F6, 75 Ω CATV Coax
- 25 Snap-N-Seal Coax Connectors
- Snap-N-Seal Connector Crimp Tool
- Coax Prep Tool

DXE-RFS-TS3P	Complete Receive Four-Square Package	$1,650.00

ONE MAN TILT OVER



Thick, Laser Cut Stainless Steel Tilt Base

- Patented cam action allows you to easily raise or lower DX Engineering, Hustler, Hy-Gain, or Butternut for tuning, weather or CC&R accommodation.

DXE-TB-3P	For Hustler BTV verticals	$62.50
DXE-TB-4P	For DX Engineering 40VA-1, Butternut, most Hy-Gain 1/4-wave verticals	$87.50

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- Precision, two-step operation
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- For foam or solid dielectric cable preparation

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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
DXE-CNL-911	Coax Cable Cutters	$23.75
DXE-170M	Precision Shear Side Cutters	$7.95

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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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NEW! YT-450

LDG's newest tuner is specially designed for Yaesu's newest 100 watt radios. The YT-450 interfaces directly with the Yaesu FT-450 and FT-950 radios, making integration easier than ever. Simply connect the tuner to the radio with the supplied cables and you are ready to operate. DC power and all control is done through the interface cable. Just press the tune button on the tuner and the rest happens automatically: mode and power are set, a tune cycle runs and the radio is returned to its original settings. It will quickly match nearly any kind of coax fed antenna with an SWR of up to 10:1. 2000 memories recall settings in an instant! An extra CAT port on the back allows seamless connection to a PC. You have the newest radio, now get the newest tuner to go with it! ***Suggested Price $249.99***

Z-11ProII

Meet the Z-11ProII, everything you always wanted in a small, portable tuner. Designed from the ground up for battery operation. Only 5" x 7.7" x 1.5", and weighing only 1.5 pounds, it handles 0.1 to 125 watts, making it ideal for both QRP and standard 100 watt transceivers from 160 - 6 meters. The Z-11ProII uses LDG's state-of-the-art processor-controlled Switched-L tuning network. It will match dipoles, verticals, inverted-Vs or virtually any coax-fed antenna. With an optional LDG balun, it will also match longwires or antennas fed with ladder-line. Includes Icom interface cable, DC power cable and coax jumper.
Suggested Price $179.99

radio not included

Z-817

The ultimate autotuner for QRP radios including the Yaesu FT-817(D). Tuning is simple; one button push on the tuner is all that is needed - the Z-817 takes care of the rest. It will switch to PKT mode, transmit a carrier, tune the tuner, then restore the radio to the previous mode! 2000 memories cover 160 through 6 meters. The Z-817 will also function as a general purpose antenna tuner with other QRP radios. Just transmit a carrier and press the tune button on the tuner. Powered by four AA internal Alkaline batteries (not included), so there are no additional cables required. A coax jumper cable is also induced for fast hook up.
Suggested Price $129.99.

radio not included

AT-897Plus for the Yaesu FT-897

If you own a Yaesu FT-897 and want a broad range automatic antenna tuner, look no further! The AT-897Plus Autotuner mounts on the side of your FT-897 just like the original equipment and takes power directly from the CAT port of the FT-897 and provides a second CAT port on the back of the tuner so hooking up another CAT device couldn't be easier. ***Suggested Price$199.99***

- ***RF Sensing***
- ***Tunes Automatically***
- ***No Interface Cables Needed***

AT-100ProII

This desktop tuner covers all frequencies from 1.8 – 54 MHz (including 6 meters), and will automatically match your antenna in no time. It features a two-position antenna switch with LEDs, allowing you to switch instantly between two antennas. The AT-100ProII requires just 1 watt for operation, but will handle up to 125 watts. Includes Icom interface cable, DC power cable and coax jumper. ***Suggested Price $229.99***

Z-100Plus

Small and simple to use, the Z-100Plus sports 2000 memories that store both frequency and tuning parameters. It will run on any voltage source from 7 to 18 volts; six AA batteries will run it for a year of normal use. Current draw while tuning is less than 100ma. The Z-100Plus now includes an internal frequency counter so the operating frequency is stored with tuning parameters to make memory tunes a blazingly fast 0.1 seconds; full tunes take an average of only 6 seconds. Includes Icom interface cable, DC power cable and coax jumper.
Suggested Price $159.99

LDG Electronics, Inc. 1445 Parran Road, St. Leonard, MD 20685 ***Phone 410-586-2177 • Fax 410-586-8475***

AT-1000Pro

The AT-1000Pro has an Automode that automatically starts a tuning cycle when the SWR exceeds a limit you set. Operates at any power level between 5 and 1,000 watts peak. RF Relay protection software prevents tuning at greater than 125 watts. Tunes from 1.8 to 54.0 MHz (inc. 6 meters), with tuning time usually under 4 seconds, transmitting near a frequency with stored tuning parameters, under 0.2 seconds. 2000 memories. 2 Antenna connections. Includes Icom interface cable, DC power cable and coax jumper. ***Suggested Price $599***

NEW! AT-600Pro

The LDG AT-600Pro will handle up to 600 watts SSB and CW, 300 on RTTY (1.8 – 30 MHz), and 250 watts on 54 MHz. It will match virtually any kind of coax-fed antenna and will typically match a 10:1 SWR down to 1.5:1 in just a few seconds. You can also use the AT-600Pro with longwires, random wires and antennas fed with ladder line just by adding a balun. It has two antenna ports with a front-panel indicator, and separate memory banks for each antenna. Easy to read LED bar-graph meters showing RF power, SWR and tuner status, tactile feedback control buttons and an LED bypass indicator. Operates from 11 – 16 volts DC at 750 mA. Includes Icom interface cable, DC power cable and coax jumper. ***Suggested Price $359.99***

- ***RF Sensing***
- ***Tunes Automatically***
- ***No Interface Cables Needed***

AT-200Pro

The AT-200Pro features LDG's new "3-D memory system" allowing up to eight antenna settings to be stored for each frequency. Handles up to 250 watts SSB or CW on 1.8 – 30 MHz, and 100 watts on 54 MHz (including 6 meters). Rugged and easy-to-read LED bar graphs show power and SWR, and a function key on the front panel allows you to access data such as mode and status. Includes Icom interface cable, DC power cable and coax jumper. ***Suggested Price $249***

IT-100

Matched in size to the IC-7000 and IC-706, the new IT-100 sports a front panel push-button for either manual or automatic tunes, and status LEDs so you'll know what's going on inside. You can control the IT-100 and its 2000 memories from either its own button or the Tune button on your IC-7000 or other Icom rigs. It's the perfect complement to your Icom radio that is AH3 or AH-4 compatible.
Suggested Price $179.99

KT-100

LDG's first dedicated autotuner for Kenwood Amateur transceivers. Easy to use - just right for an AT-300 compatible Kenwood transceiver (except TS-480HX). The KT-100 actually allows you to use the Tune button on the radio. The LEDs on the front panel indicate tuning status, and will show a match in seconds, or even less of you've tuned on or near that frequency before. Has 2,000 memories for instant recall of the tuning parameters for your favorite bands and frequencies. If you have an AT-300 compatible Kenwood radio, you can simply plug the KT-100 into your transceiver with the provided cable; the interface powers the tuner, and the Tune button on the radio begins a tuning cycle. The supplied interface cable makes the KT-100 a dedicated tuner for most modern Kenwood transceivers.
Suggested Price $199.99

YT-100

An autotuner for several popular Yaesu Radios. An included cable interfaces with your FT-857, FT-897 and FT-100 (and all D models) making it an integrated tuner, powered by the interface. Just press the tune button on the tuner, and everything else happens automatically: mode and power are set, a tune cycle runs, and the radio is returned to its original settings. It's the perfect complement to your Yaesu radio.
Suggested Price $199.99

Meters!

FT Meter 2.5" face with calibrated scales for signal strength, discriminator reading on receive, and power output, SWR, modulation, ALC action and supply voltage on transmit, all selectable from the radio's menu. ***Still Only $49***

FTL Meter For Yaesu FT-857(D) and FT-897(D). 4.5" face with calibrated scales for signal strength, discriminator reading on receive, and power output, SWR, modulation, ALC action and supply voltage on transmit, all selectable from the radio's menu. ***Suggested Price $79.99***

NEW! M-7600 For IC-7600. It will display S-meter on receive, or power out, SWR, ALC level or supply voltages, all selectable from the radio's menu. What's more, the M-7700 and the virtual meter on your radio can work together.
Suggested Price $79.99

M-7700 For IC-7700. It will display S-meter on receive, or power out, SWR, ALC level or supply voltages, all selectable from the radio's menu. What's more, the M-7700 and the virtual meter on your radio can work together.
Suggested Price $79.99

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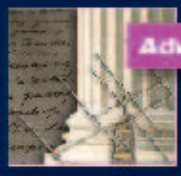

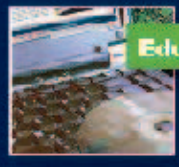

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Source Code: QST 1/2010

IC-V80/SPORT

IC-T70A

IC-V80 2M FM Handheld

- TX: 144-148 MHz • RX: 136-174 MHz
- Power: 5.5/2.5/0.5W • Memories: 207
- Comes with NiMH Battery and Wall Charger

IC-V80 SPORT 2M FM Handheld

- No NiMH Battery and Charger • Has AA Battery Case

IC-T70A 2M/440 FM Handheld

- TX: 144-148, 430-450 MHz • RX: 136-174, 400-479 MHz
- Power: 5/2.5/0.5W • Memories: 302
- Comes with NiMH Battery and Wall Charger

IC-208H 2M/440 FM Mobile

- TX: 144-148, 430-450 MHz • Memories: 512
- RX: 118-173, 230-549, 810-999 MHz (cell blk)
- Power: 55/15/5W (2M), 50/15/5W (440 MHz)

IC-V8000 2M FM Mobile

- TX: 144-148 MHz • RX: 136-174 MHz
- Power: 75/25/10/5W • Memories: 207

IC-2820H 2M/440 FM Mobile

- TX: 144-148, 430-450 MHz • RX: 118-549.95, 810-999.990 MHz (cell blkd) • Power: 50/15/5W
- Packet ready (9600 BPS – 6-pin DIN) • Upgradable D-Star DV (digital voice) & GPS capabilities w/optional UT-123

IC-703 PLUS HF/6M QRP Portable

- TX: HF/6M • RX: 0.03-60 MHz • Power: 10W @ 13.8VDC, 5W @ 9.6VDC • Memories: 105 • Built in HF automatic antenna tuner • AH-703 optional antenna makes this radio perfect for field day operation

IC-706 MK II-G Multimode Mobile

- TX: HF/6M/2M/440 MHz • RX: 0.03-199, 400-470 MHz
- Power: 100W (HF/6M), 50W (2M), 20W (440 MHz)
- Memories: 107 • AF-DSP • IF Shift • Preamp/attenuator
- RMK-706 included • Quantities are limited!

IC-7200 HF/6M Rugged 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 and Audio In/Out

IC-7600 Multimode HF/6M Base

- TX: HF/6M • RX: 0.03-60 MHz • Power: 2-100W
- Memories: 101 • 5.8 inch color screen
- High-resolution real time spectrum scope using a dedicated DSP unit • Automatic antenna tuner
- Dual DSP units • 3, 6 & 15 kHz 1st (roofing) filters

IC-7700 Multimode HF/6M Base

- TX: HF/6M • RX: 0.03-60 MHz • Power: 5-200W
- Memories: 101 • 7 inch color screen
- Two 32-bit floating DSPs • Power supply built-in
- Three roofing filters • External VGA connector
- Automatic antenna tuner • USB memory drive socket

ARRL Spectrum Defense Matters

The Spectrum Defense Fund goal is $197,788 before December 31!

Each year the **Spectrum Defense Fund** reaches out to ARRL members for voluntary contributions to support ARRL efforts to protect Amateur Radio frequencies and operating privileges.

In July we launched an electronic newsletter, **Spectrum Defense Matters** to keep you informed on issues related to Amateur Radio, both domestic and international. And we will continue that newsletter and archive each issue on the web.

Because spectrum defense is vital to every ham, **please make the most generous contribution you can manage today**—by mail, by phone or on the web at **www.arrl.org/arrl-donation-form**.

For more information, contact

Mary Hobart, **K1MMH**
Chief Development Officer
ARRL
225 Main Street
Newington CT 06111-1494
Telephone: 860-594-0397
Email:mhobart@arrl.org

FT-270R 2M FM Handheld

- TX: 144-148 • RX: 136-174
- Power: 5/2/0.5W • Memories: 200
- Extra large LCD display & speaker
- Increased audio output & added "Memory Only" mode

VX-8R Quad-band FM Handheld

- TX: 50-54, 144-148, 222-225, 430-450 MHz
- RX: 0.5-999 MHz (cell blocked) • Memories: 1200+
- Power: 5/2.5/1/0.05W (1.5/1/0.5/0.05W on 220)
- Optional Bluetooth® kit BTK4 allows hands free operation
- Optional GPS Unit FGPS-2 with either CT-136 adapter or MH-74A7A hand mic provides you with APRS® data

FT-897D 100W HF/VHF/UHF Portable

• TX: HF/VHF/UHF • RX: 0.1-56, 76-108, 118-164, 420-470 MHz • Power: 5-100W (HF/6M), 5-50W (2M), 5-20W (440 MHz) • Memories: 200 • Can also operate using optional FNB-78 13.2V @ 4.5 Ah NiMH battery packs

FT-950 100W HF/6M Base

- TX: HF/6M • RX: 0.03-56 MHz • Power: 10-100W
- Memories: 100 • Auto Antenna Tuner
- 32-bit Floating Point DSP • Built-in high stability TCXO
- Optional DMU-2000 Data Management Unit displays various operational conditions
- Optional MTU tune units for 160M, 80/40M and 30/20M bands allowing you to pull through weak signals

FT-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-2000 100W HF/6M Base

• TX: HF/6M • RX: 0.03-60 MHz • Power: 10-100W • Memories: 99 • Auto Antenna Tuner • 32-bit Floating Point DSP • Dual In-Band Receive • Internal Power Supply • Optional DMU-2000 Data Management Unit displays various operational conditions • Optional MTU tune units for 160M, 80/40M and 30/20M bands allowing you to pull through weak signals

FT-2000D 200W HF/6M Base

• FT-2000 except RF output is 200W and the supplied power supply is external

FT-450AT

100W HF/6M Compact Portable

- TX: HF/6M • RX: 0.03-56 MHz • Power: 10-100W
- Memories: 500 • IF DSP Technology
- Selectable AGC, IF width & shift, contour, digital noise reduction, manual notch filter and clarifier
- Includes Auto Antenna Tuner

FT-450 100W HF/6M Compact Portable

- Same but without the Auto Antenna Tuner
- Special Order Only

FTDX-5000MP

FTDX-5000 Series – Covers HF and 6M;

Three different configurations all running 10-200W on CW, SSB, FM, RTTY & PKT and 5-50W on AM • RX: 0.03-60 MHz • Memories: 99 • The "D" and "MP" model comes with SM-5000 Station Monitor that features an excellent bandscope • The "MP" comes with high stability ±0.05ppm OCXO & 300 Hz roofing filter

FTDX-5000 *Basic Model & ±0.5ppm TCXO*
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Welcome to Gordo's classroom! Technician audio theory course recorded by Gordo talks you through the Element 2 question pool. Follows the order of his ***Technician Class*** book, and is full of the sounds of ham radio operating excitement! An excellent study aid if you spend a lot of time in your car or pick-up! On 4 audio CDs. **GWTW $27.95**

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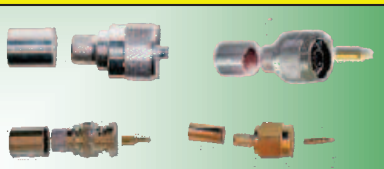

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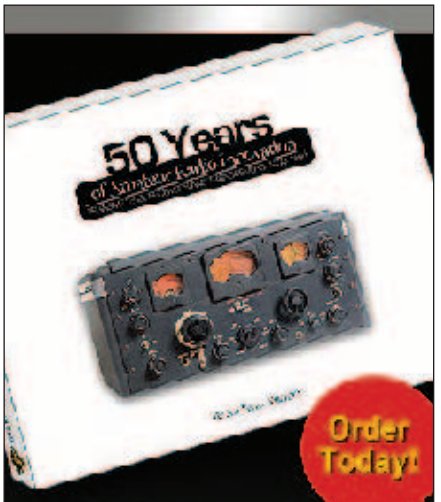

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sta·tis·tics (st-tstks) n.
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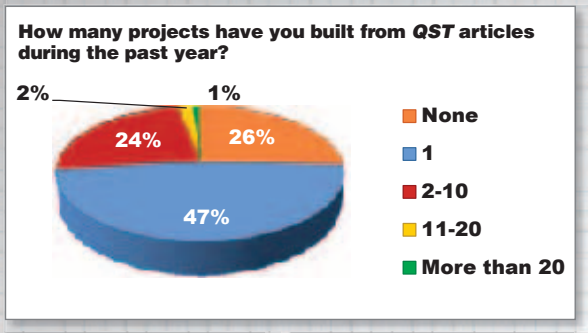

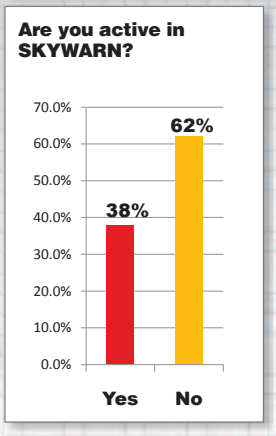

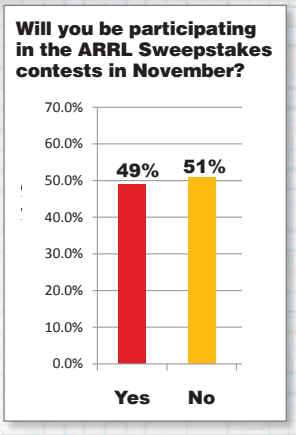

DX Century Club Applications Processed: 1991-2010

Year	Applications Processed
2010	4619*
2009	7675
2008	8417
2007	5887
2006	5641
2005	5497
2004	5437
2003	6651
2002	6339
2001	7426
2000	5782
1999	5215
1998	3081
1997	5046
1996	5357
1995	6028
1994	8151
1993	11,692
1992	5982
1991	9534

*As of September 13

Simulated Emergency Test (SET) Report Submissions by Year

2009	=	297
2008	=	260
2007	=	254
2006	=	244
2005	=	181
2004	=	208

ARRL Membership by Division

Atlantic	13,366
Central	10,971
Dakota	3284
Delta	6930
Great Lakes	12,484
Hudson	6367
Midwest	6739
New England	9069
Northwestern	11,116
Pacific	10,180
Roanoke	11,519
Rocky Mountain	6573
Southeastern	14,517
Southwestern	12,231
West Gulf	11,551
International	9106
Total	**156,003**

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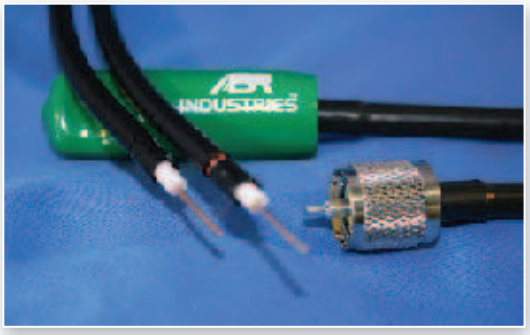

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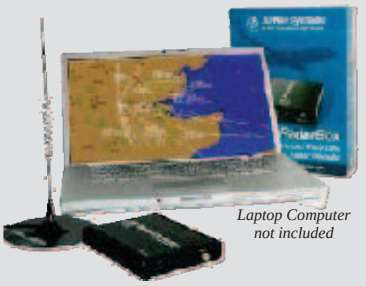

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B-5018-G	--	2	15	25	40	50	70	100	130	160
Watts In	.25	.5	3	5	8	10	15	25	35	50

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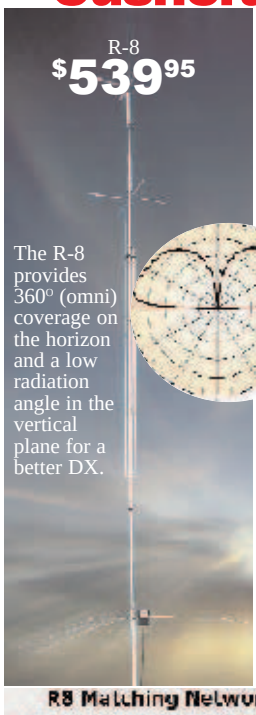
Cushcraft R8 *8-Band Vertical*



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

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

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

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

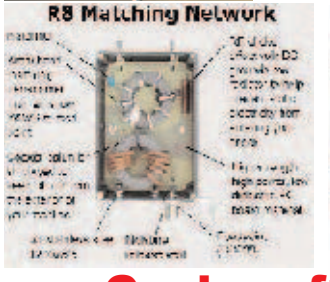
Rugged Construction: Thick fiberglass insulators, all-stainless hardware, and 6063 aircraft-aluminum tubing that is double or triple walled at key stress points handle anything Mother Nature can dish out.

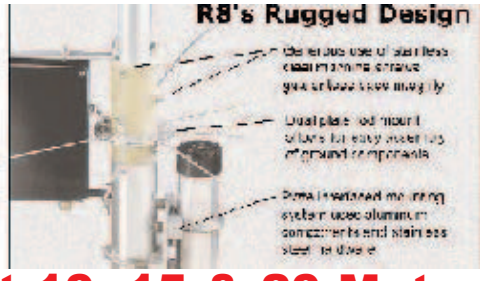
Compact Footprint: Installs in an area about the size of a child's sandbox -- no ground radials to bury and all RF-energized surfaces safely out of reach.

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

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

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





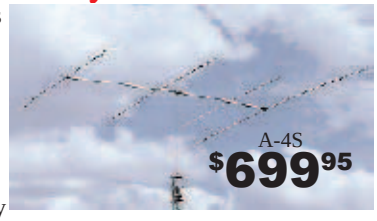
MA-5B *5-Band* Beam

Small Footprint -- Big Signal

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

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

Cushcraft 10, 15 & 20 Meter Tribander Beams



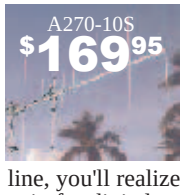
Only the best tri-band antennas become DX classics, which is why the Cushcraft World-Ranger A4S, A3S, and A3WS go to the head of the class. For more than 30 years, these pace-setting performers have taken on the world's most demanding operating conditions and proven themselves every time. The key to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

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

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

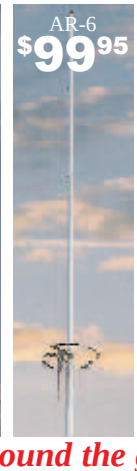
Cushcraft Dual Band Yagis

One Yagi for Dual-Band FM Radios



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

Cushcraft Famous *Ringo* Compact FM Verticals



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

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You can read SWR, return loss, reflection coefficient and match efficiency at any frequency simultaneously at a single glance.

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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!*

Coax Analyzer

You can determine velocity factor, coax loss in dB, length of coax and *distance to short or open in feet (it's like a built-in TDR).*

CoaxCalculator™ lets you calculate coax line length in feet given electrical degrees and vice versa for any frequency and any velocity factor -- *an MFJ-269 exclusive!*

Use any Characteristic Impedance

You can measure SWR and loss of coax 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!*

Inductance/Capacitance Meter

Measures inductance in uH and capacitance in pF at RF frequencies, 1.8-170 MHz.

Frequency Counter/Signal Source

You can also use it as a handy frequency counter up to 170 MHz and as a signal source for testing and alignment.

Digital and Analog displays

MFJ-269
$389.95

A high contrast LCD gives precision readings and two side-by-side analog meters make antenna adjustments smooth and easy.

415 to 470 MHz Range features

Just plug in your UHF antenna coax, set frequency and read SWR, return loss and reflection coefficient simultaneously. You can read coax cable loss in dB and match efficiency.

You can adjust UHF dipoles, verticals, yagis, quads and others and determine their SWR, resonant frequency and bandwidth.

You can test and tune stubs and coax lines. You can manually determine velocity factor and impedances of transmission lines.

You can adjust/test RF matching networks and RF amplifiers without applying power.

Has easy-to-read LCD *logarithmic* SWR bargraph and SWR meter for quick tuning.

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!*

Super Easy-to-Use

Select a band and mode. Set frequency. Your measurements are instantly displayed! Smooth reduction drive tuning makes setting frequency easy.

Take it anywhere

Take it anywhere - to remote sites, up towers, in cramp places. Fully portable -- battery operated, compact 4Wx2Dx6¾ in., weighs 2 lbs. *Free* "N" to SO-239 adapter.

Has battery saver, low battery warning and built-in charging circuit for rechargeables.

Use 10 AA Ni-MH or Ni-Cad or alkaline batteries (not incl.) or 110VAC with MFJ-1312D, $15.95.

MFJ SWR Analyzer Accessories

MFJ-39C, $24.95.

Tote your MFJ-269 anywhere with this *genuine* MFJ custom carrying case. Has back pocket with security cover for carrying dip coils, adaptors and accessories. Made of special foam-filled fabric, the MFJ-39C cushions blows, deflects scrapes, and protects knobs, meters and displays from harm. Wear it around your waist, over your shoulder, or clip it onto the tower while you work -- the fully-adjustable webbed-fabric carrying strap has snap hooks on both ends. Has clear protective window for frequency display and cutouts for knobs and connectors.

MFJ-66, $24.95.

Plug these MFJ dip meter coupling coils into your MFJ *SWR Analyzer*™ and turn it into a sensitive and accurate *band switched* dip meter. Set of two coils cover 1.8-170 MHz depending on your MFJ-269 *SWR Analyzer*™.

MFJ-99C, $40.90.

SWR** Analyzer Power Pack.* 10 Pack MFJ *SuperCell*™ Ni-MH batteries, and power supply for SWR analyzers. ***Save $5!

MFJ-98, $60.85.

MFJ-269** Accessory Pack.* MFJ-39C *custom* Carrying Pouch, MFJ-66 dip coils, power supply for MFJ-269. ***Save $5!

MFJ-98B, $88.90.

MFJ-269** Deluxe Accessory Pack.* Complete accessory pack! MFJ-39C Pouch, 10 Ni-MH batteries, dip coils, power supply. ***Save $7!

MFJ-269*PRO*™ Analyzer

MFJ-269*PRO*
$419.95

Like MFJ-269, but has extended coverage in UHF range ***(430 to 520 MHz)*** and ruggedized cabinet that protects LCD display, knobs, meters and connectors from damage.

MFJ-259B HF/VHF Antenna *SWRAnalyzer*™

MFJ-259B
$289.95

The world's most popular antenna analyzer gives you a complete picture of your antenna performance 1.8 to 170 MHz.

It's Super easy-to-use -- makes tuning your antennas quick, painless and easy.

Read antenna SWR, complex impedance, return loss, reflection coefficient. Determine velocity factor, coax cable loss in dB, length of coax and distance to short or open in feet. Read inductance in uH and capacitance in pF at RF frequencies.

Large easy-to-read two line LCD screen and side-by-side meters clearly display your information. Built-in frequency counter, Ni-Cad charger circuit, battery saver, low battery warning and smooth reduction drive tuning.

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MFJ *IntelliTuner*™ Automatic Tuners

More hams use MFJ tuners than all other tuners in the world!

World's most advanced Automatic Antenna Tuners feature world renowned MFJ AdaptiveSearch™ and AutomaticRecall™ algorithms -- world's fastest ultra-wide range tuning. Nine World Class models! Choose your features: Digital/Analog/Audio SWR-Wattmeter, Antenna Switch, Balun, Radio Interface, Digital frequency readout, Remoteable, Coax/Balanced Lines/Wire Tuning, Field Upgradeable . . .

MFJ-993B 300 Watt *IntelliTuner*™

The World's Best Selling Automatic Antenna Tuner!

The MFJ-993B *IntelliTuner*™ lets you tune any antenna -- balanced or unbalanced -- *automatically* and *ultra fast*.

It's a comprehensive automatic *antenna tuning center* complete with SWR/Wattmeter, antenna switch for two antennas and 4:1 current balun for balanced lines.

MFJ's exclusive *IntelliTuner*™, *Adaptive Search*™ and *Instant Recall*™ algorithms give you *ultra fast* automatic tuning with over 20,000 *VirtualAntenna*™ Memories.

Select 300 Watt SSB/CW power level and match 6-1600 Ohm antennas ***Or . . .*** select **150 Watt** SSB/CW power level and match *extra wide-range* 6-3200 Ohms!

You get a highly efficient L-network, 1.8-30 MHz coverage, Cross-Needle *and* digital meters, audio SWR meter, *backlit* LCD, remote control port, radio interface, heavy-duty 16 amp/1000V relays.

MFJ-993B $259.95

The MFJ-993B automatically tunes for minimum SWR and remembers your frequency and tuner settings. The next time you operate on that frequency and antenna, these tuner settings are instantly restored and *you're ready to operate in milliseconds!* 10W x2¾ Hx9D". Use 12-15 VDC/1 amp or 110 VAC with **MFJ-1316, $21.95**. Radio interface cables, remote control available. See ***www.mfjenterprises.com***

for 600 Watt amps

AL-811/ALS-600/ALS-500

For 600 Watt amps like Ameritron AL-811/ALS-600/ALS-500M. Matches 12-800 Ohms. 10,000 *Virtual Antenna*™ memories. Cross-Needle SWR/Wattmeter. 10Wx2¾Hx9D inches.

MFJ-994B $359.95

No Matter What™ Warranty

Every MFJ tuner is protected by MFJ's famous one year *No Matter What*™ limited warranty. We will repair or replace your MFJ tuner (at our option) for a full year.

1500 Watt *Legal Limit*

for Ameritron AL-1500/1200/82 amps

Roam the entire HF spectrum 1.8-30 MHz *hands-free* with full *1500 Watt* legal limit on SSB/CW and near-perfect SWR! Lighted LCD/Cross-Needle Meter.

MFJ-998 $699.95

300 Watt...*Extra* Wide Range

SWR/Wattmeter, 10000 VA Memories

Extra *wide matching range at less cost.* Exclusive dual power level: 300 Watts/6-1600 Ohms; 150W/6-3200 Ohms. Cross-Needle SWR/Wattmeter.

MFJ-991B $219.95

200 Watt...Compact

Digital Meter, Ant Switch, Wide Range

World's fastest compact auto tuner uses MFJ *Adaptive Search*™ and *InstantRecall*™ algorithms. 132,072 tuning solutions instantly match virtually any antenna with near perfect SWR.

MFJ-929 $219.95

200 Watt ...Econo

Small, Ant Switch, 20K VA Memories

High-speed, wide matching range and compactness at low cost! Leave in-line and forget it -- your antenna is *always* automatically tuned! 2-position antenna switch.

MFJ-928 $199.95

200 Watt *MightyMite*™

Matches IC-706, FT-857D, TS-50S

No *extra space needed!* Just set your IC-706/7000, FT-857D, TS-50S on top of this matching low-profile automatic tuner -- it's all you need for a completely automated station using *any* antenna! Just tune and talk!

MFJ-925 $179.95

G5RV Antenna

MFJ-1778 $44.95

Covers all bands, 160-10 Meters with antenna tuner. 102 ft. long. Can use as inverted vee or sloper. Use on 160 Meters as Marconi.1500 Watts. Super-strong fiberglass center/feedpoint insulators. *Glazed ceramic* end insulators. All hand-soldered connections. Add coax, some rope and you're *on the air!*

MFJ-1778M, $39.95. G5RV Junior. Half-size, 52 ft. 40-10M with tuner, 1500 Watts.

200W...Weather-sealed

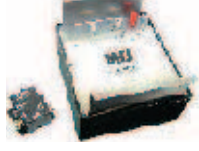
for Remote/Outdoor/Marine

MFJ-926 $399.95

Fully *weather-sealed for remote Outdoor/Marine use*! Tough, durable, built-to-last the elements for years.

200 Watt...Remote

Coax/Wire Ant, No pwr cable needed



MFJ-927 $259.95

Weather protected fully automatic *remote* auto tuner for wire ***and*** *coax* antennas -- an MFJ exclusive. Powers through coax -- No separate power cable needed.

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MFJ TUNERS

Ham Radio's ***Most Popular*** 300 Watt Antenna Tuner

More hams use MFJ-949s than any other antenna tuner in the world!

Why? Because the world's leading tuner has earned a world-wide reputation for being able to match just about anything.

Full 1.8-30 MHz Operation

Tune your antenna for minimum SWR! Works 1.8-30 MHz on dipoles, verticals, inverted vees, random wires, beams, mobile whips, shortwave receiving antennas . . . Use coax, random wire, balanced lines. Has heavy duty 4:1 balun for balanced lines.

Custom inductor switch

Custom designed inductor switch, 1000 volt tuning capacitors, *Teflon*(R) insulating washers and proper L/C ratio gives you *arc-free* no worries operation

MFJ-949E $179.95

up to 300 Watts PEP transceiver input power.

The MFJ-949E inductor switch was *custom* designed to withstand the extremely high RF voltages and currents that are developed in your tuner.

8-Position Antenna switch

Antenna switch lets you select two coax fed antennas, random wire/balanced line or dummy load through your MFJ-949E or direct to your transceiver.

Lighted Cross-Needle Meter

Full *size* 3-inch lighted Cross-Needle Meter. Lets you easily read SWR, *peak* or average forward and reflected power simultaneously. Has 300 Watt or 30 Watt ranges.

QRM-Free PreTune™

MFJ's *QRM-Free PreTune™* lets you pre-tune your MFJ-949E *off-the-air* into its built-in dummy load! Makes tuning your actual antenna faster and easier.

Plus Much More!

Full *size* built-in non-inductive 50 Ohm dummy load, scratch-proof Lexan multi-colored front panel, $10^{5}/_{8}$x$3^{1}/_{2}$x7 inches. Superior cabinet construction and more!

MFJ-948, $159.95. Econo version MFJ-949E. Has all features except for dummy load.

***No Matter What™* Warranty**

Every MFJ tuner is protected by MFJ's famous one year *No Matter What™* limited warranty. We will repair or replace your MFJ tuner (at our option) for a full year.

More hams use MFJ tuners than all other tuners in the world!

MFJ-989D ***Legal Limit*** Tuner

MFJ-989D $389.95

New, improved MFJ-989D *legal limit* antenna tuner gives you better efficiency, lower losses and a new *true* peak reading meter. Easily handles *full* 1500 Watts SSB/CW, 1.8-30 MHz, including MARS/WARC bands. Six position antenna switch, dummy load. *New* 500 pF air variable capacitors. *New* improved *AirCore™* Roller Inductor. *New* high voltage current balun. *New* crank knob. $12^{7}/_{8}$Wx6Hx$11^{5}/_{8}$D".

MFJ-986 Two knob ***Differential-T™***

MFJ-986 $349.95

Two knob tuning (differential capacitor and *AirCore™* roller inductor) makes tuning foolproof and easier than ever. Gives minimum SWR at only one setting. Handles 3 KW PEP SSB amplifier input power (1.5 KW output). Gear-driven turns counter, lighted peak/average Cross-Needle SWR/Wattmeter, antenna switch, balun. 1.8 to 30 MHz. $10^{3}/_{4}$Wx$4^{1}/_{2}$Hx15 in.

MFJ-962D ***compact*** kW Tuner

MFJ-962D $299.95

A few more dollars steps you up to a KW tuner for an amp later. Handles 1.5 KW PEP SSB amplifier input power (800W output). Ideal for Ameritron's AL-811H! *AirCore™* roller inductor, gear-driven turns counter, pk/avg lighted Cross-Needle SWR/Wattmeter, antenna switch, balun, Lexan front, 1.8-30MHz. $10^{3}/_{4}$x$4^{1}/_{2}$ x$10^{7}/_{8}$ in.

MFJ-969 300W ***Roller Inductor*** Tuner

MFJ-969 $219.95

Superb *AirCore™* Roller Inductor tuning. Covers *6 Meters* thru 160 Meters! 300 Watts PEP SSB. *Active* true peak reading lighted Cross-Needle SWR Wattmeter, *QRM-Free PreTune™*, antenna switch, dummy load, 4:1 balun, Lexan front panel. $10^{1}/_{2}$Wx$3^{1}/_{2}$Hx$9^{1}/_{2}$D inches.

MFJ-941E ***super value*** Tuner

MFJ-941E $139.95

The *most for your money!* Handles 300 Watts PEP, covers 1.8-30 MHz, *lighted* Cross-Needle SWR/Wattmeter, 8 position antenna switch, 4:1 balun, 1000 volt capacitors, Lexan front panel. Sleek $10^{1}/_{2}$Wx$2^{1}/_{2}$Hx7D in.

MFJ-945E HF/6M ***mobile*** Tuner

MFJ-945E $129.95

Extends your mobile antenna bandwidth so you don't have to stop, go outside and adjust your antenna. Tiny 8x2x6 in. *Lighted* Cross-Needle SWR/Wattmeter. Lamp and bypass switches. Covers 1.8-30 MHz *and* 6 Meters. 300 Watts PEP. **MFJ-20, $6.95,** mobile mount.

MFJ-971 ***portable/QRP*** Tuner

MFJ-971 $119.95

Tunes coax, balanced lines, random wire 1.8-30 MHz. Cross-Needle Meter. SWR, 30/300 or 6 Watt QRP ranges. Matches popular MFJ transceivers. Tiny 6x$6^{1}/_{2}$x$2^{1}/_{2}$ in.

MFJ-901B ***smallest*** Versa Tuner

MFJ-901B $99.95

MFJ's smallest (5x2x6 in.) and most affordable wide range 200 Watt PEP Versa tuner. Covers 1.8 to 30 MHz. Great for matching solid state rigs to linear amps.

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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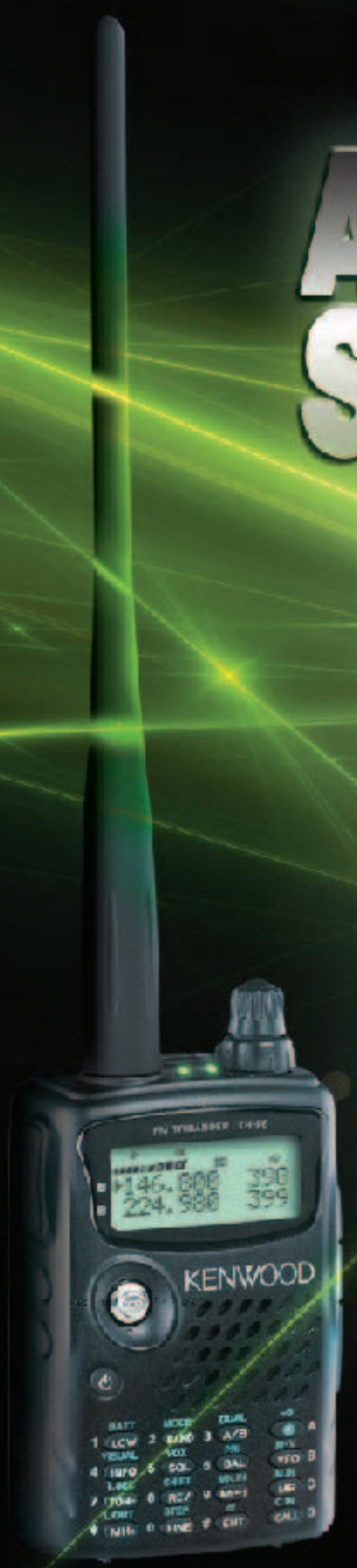
Listen to the Future

AIRWAVE SUPERIORITY

Never before has a compact HT offered as many features, and such high powered performance as the TH-F6A. Arm yourself with one today and gain your own airwave superiority.

- **Triband 144/220/440 MHz all at 5W**
- **Receives 2 frequencies simultaneously even on the same band**
- **0.1~1300MHz high-frequency range RX (B band)[1]**
- **FM/FM-W/FM-N/AM plus SSB/CW receive**
- **Bar antenna for receiving AM broadcasts**
- **Special weather channel RX mode**
- **435 memory channels, multiple scan functions**
- **7.4V 2000mAh lithium-ion battery (std.) for high output[2] and extended operation**
- **16-key pad plus multi-scroll key for easy operation**
- **Built-in charging circuitry for battery recharge while the unit operates from a DC supply**
- **Tough construction: meets MIL-STD 810 C/D/E standards for resistance to vibration, shock, humidity and light rain**
- **Large frequency display for single-band use**
- **Automatic simplex checker**
- **Wireless remote control function**
- **Battery indicator • Internal VOX • MCP software**

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



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ADS#06309

MFJ tiny Travel Tuner

Tiny 4½x2¼x3 inch tuner handles full 150 Watts! Covers 80-10 Meters, has tuner bypass switch, tunes nearly anything!

MFJ brings you the *world's smallest* full power 150 Watt 80-10 Meter Antenna Tuner. Extra wide matching range lets you tune nearly any antenna.

It's no toy, its got guts! Built with real *air* variable capacitors (600 Volt, 322 pF) and *three* stacked powder iron toroids to handle real power -- not just QRP. Bypass switch lets you bypass tuner when you don't need it.

You can use nearly any transceiver at full power with nearly any coax fed or random wire antenna for portable, home or mobile operation.

It's perfect for compact rigs like Icom IC-706MKIIG, Yaesu FT-100D, Kenwood TS-50, QRP rigs and others with a built-in SWR meter.

Operate anywhere, anytime with a quick easy set-up! Tune out SWR on your mobile whip from inside your car. Operate in your apartment with a wall-to-wall antenna or from a motel room with a wire dropped from a window or from a mountain top with a wire over a tree limb. Great for DXpeditions or field day. Be prepared for emergencies.

MFJ-902 is so small and handy, you'll rely on it wherever you go! It's easy to pack away in your briefcase, suitcase, backpack, glove compartment or desk drawer. It's tiny enough to slide in your back hip pocket! 4½Wx2¼Hx3D inches.

MFJ-902
$99.95

Tiny Travel Tuner with 4:1 Balun

MFJ-902H
$119.95

MFJ-902H, same as MFJ-902 *Tiny Travel Tuner* but has *4:1 balun* for balanced lines and 5-way binding posts for balanced lines and random wire. 5¾Wx2¼Hx 2¾D in.

Tiny Travel Tuner with Cross-Needle SWR/Wattmeter

MFJ-904
$129.95

MFJ-904, same as MFJ-902 *Tiny Travel Tuner* but has *Cross-Needle SWR/Wattmeter.* Read SWR, forward and re-flected power all at a glance in 300/60 and 30/6 Watt ranges. 7¼Hx2¼Hx2¾D inches.

ALL-in-one *Tiny Travel Tuner* with 4:1 Balun *and* SWR/Wattmeter

MFJ-904H
$149.95

ALL-in-one! MFJ-904H, same as MFJ-902 *Tiny Travel Tuner* but has *4:1 balun for balanced lines* and Cross-Needle SWR Wattmeter. Read SWR, forward and reflected power all at a glance in 300/60 and 30/6 Watt ranges. Has 5-way binding posts for balanced lines and random wire. 7¼Hx2¼Hx2¾D inches.

Long 10/12 foot Telescoping Whips

MFJ-1954
$29.95
10 Feet

MFJ-1956
$34.95
12 Feet

10 foot extended, 19 inches collapsed, MFJ-1954, $22.95. 12 foot extended, 22.5 inches collapsed. MFJ-1956, $29.95. Standard 3/8 inch by 24 threaded stud for use with all standard mounts. Durable 1/2 inch diameter plated brass. Telescopes for full 1/4 wave operation 2 to 12/15 Meters. Cover 17, 20, 30, 40, 60, 80, 160 Meters with loading coil. Use two for multi-band dipoles. Replace screwdriver antenna whip for highly efficient *fixed* mobile operation.

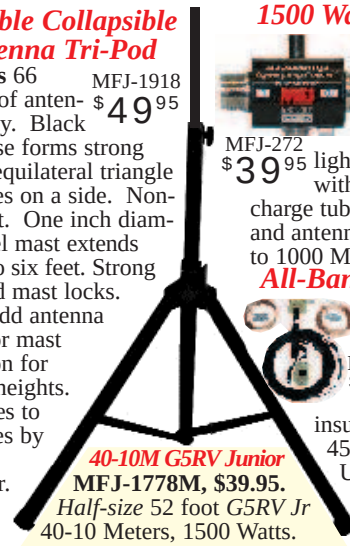
MFJ RF Isolator

MFJ-915 *RF Isolator*

MFJ-915
$29.95

prevents unwanted RF from traveling on the outside of your coax shield into your transceiver. This unwanted stray RF can cause painful RF "bites" when you touch your microphone or volume control, cause your display or settings to go crazy, lock up your transceiver or turn off your power supply. In mobile installations, stray RF could cause your car to do funny things even blow your car computer. Clear up these problems, plug an MFJ-915 between your antenna and transceiver. *Don't operate without one!* 5x1½ inches. For 1.8 to 30 MHz.

Portable Collapsible Antenna Tri-Pod



MFJ-1918
$49.95

Holds 66 pounds of antenna steady. Black *steel* base forms strong braced equilateral triangle 40 inches on a side. Non-skid feet. One inch diameter steel mast extends height to six feet. Strong base and mast locks. Easily add antenna mount or mast extension for greater heights. Collapses to 38 inches by 4 inch diameter. 6¾ pounds.

40-10M G5RV Junior
MFJ-1778M, $39.95.
Half-size 52 foot *G5RV Jr* 40-10 Meters, 1500 Watts.

1500 Watt Lightning Surge Protector

MFJ-272
$39.95

Protect your expensive transceiver from static electricity and lightning induced surges with an ultra-fast gas discharge tube. Plug between rig and antenna, attach ground. DC to 1000 MHz. SO-239s.

All-Band G5RV Antenna

MFJ-1778
$44.95

Cover all bands, 160-10M with tuner. 102 ft. long, 1.5kW. Custom fiberglass insulator stress relieves 450 Ohm ladder line. Use horizontally, as inverted vee or sloper. Marconi on 160M.

Glazed Ceramic Antenna Insulator

MFJ-16C06
6-Pack
$4.56
(79 cents each)

Authentic *glazed ceramic* antenna insulator. Extra-strong -- will not break with long antennas and will not arc over or melt even under full legal power. Molded ridges give extra-long high voltage path to prevent high-voltage breakdown. Smooth wire holes prevent wire damage. Use as center or end insulator for dipoles, doublets, G5RVs, guy wires and others.

Current Balun/Center Insulator

MFJ-918
$24.95

True *1:1 Current Balun/Center Insulator* forces equal currents into dipole halves to reduce coax feedline radiation and field pattern distortion. Reduces TVI, RFI and RF hot spots in your shack. 50 ferrite beads on *Teflon*(R)coax. 1.5kW, 1.8-30 MHz. Stainless steel hardware. *Direct* antenna connection. 5x1½ in.

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- Use your favorite rig control program
- Great for field day
- Operate from your easy chair
- Use any cell phone headset

Use a standard cellphone Bluetooth® headset to keep your hands free for driving and operating.

Kill the Noise with the ANC-4 and DSP-599zx!

- DSP-599zx Audio Signal Processor*

Noise Reduction & filtering for Audio, CW & data

- ANC-4 Antenna Noise Canceller

Kill noise before it gets to your receiver!

Optimize Your Antenna with the Field-Proven AntennaSmith™

Patented - portable - battery powered

Check Antennas and Transmission Lines

Once you use the TZ-900 - you'll never want to use any other!

TZ-900 AntennaSmith™

Antenna Impedance Analyzer -

- Graphic display - full color in bright sunlight!
- Stand-alone operation - no computer required
- Before & After color graphic overlays - instant comparison
- Handheld - take it to the antenna - measure where it counts!
- Store complete sweeps in permanent memory - download to your PC via USB when it's convenient
- Hours of portable operation, fast recharging
- Complete with software, charger, coax adapters and more!

25th Aniversary Edition of the Legendary PK-232/USB!

- PK-232/USB Multimode Data Controller*

Sound card interface, USB, Pactor, RTTY, Packet & more!

100,000 sold - All-time top selling data controller!

- DSP-232+ Multimode Data Controller*

Sound card interface, USB, Pactor, 1200/9600 Packet

- PK-96/100 TNC - 1200/9600 Packet*

HamLink™ USB Remote Control & Audio

- HamLinkUSB™ Rig Control Plus

Logic Level plus PTT

- U232™ RS-232-to-USB Adapter

Universal Conversion Module
Replaces PCB-mount DB-9 & DB-25

- HLUSB-RS232x2 USB to RS-232 Dual Port

Adapter Cable with 1 USB to 2 RS-232 DB9

- HamLinkUSB™ Audio Adapter

USB Sound Card Interface
No software drivers! Just plug it in.

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MFJ All-Band G5RV Antennas

Operate all bands through 10 Meters, even 160 Meters, with a single wire antenna!

MFJ-1778
$44.95

The famous G5RV antenna is the most popular ham radio antenna in the world! You hear strong signals from G5RVs day and night, 24/7.

And it's no wonder . . . it's an efficient, *all band* antenna that's only 102 feet long -- shorter than an 80 Meter dipole. Has 32.5 foot ladder line matching section ending in SO-239 connector for your coax feedline.

Use as Inverted Vee or Sloper, and it's even more compact and needs just one support.

With an antenna tuner, you can operate all bands 80 Meters through 10 Meters and even 160 Meters with an antenna tuner and a ground.

MFJ's fully assembled G5RV handles 1500 Watts. *Hang and Play™* -- add coax, some rope to hang and you're on the air!

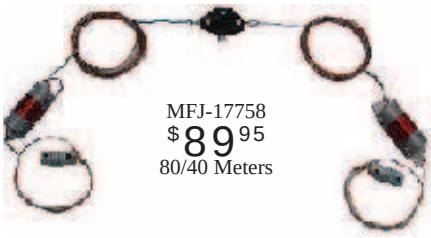
MFJ-1778M, $39.95. *Half-size*, 52 foot *G5RV JUNIOR* covers 40-10 Meters with tuner. Handles full 1500 Watts.

MFJ All Band Doublet

MFJ-1777
$59.95

MFJ-1777 is a 102 foot *all band* doublet antenna that covers 160 through 6 Meters with a balanced line tuner. Super strong custom fiberglass center insulator provides stress relief for ladder line (100 ft. included). Authentic *glazed ceramic* end insulators. Handles full 1500 Watts.

MFJ *Dual Band* 80/40 *or* 40/20M Dipoles



MFJ-17758
$89.95
80/40 Meters

MFJ-17758 is a short 85 foot long *dual band* 80/40 Meter dipole antenna. It's *full-size* on 40 Meters and has ultra-efficient end-loading on 80 Meters. Handles full 1500 Watts. Super-strong injection-molded center insulator with built-in SO-239 connector and hang hole. Solderless, crimped construction. 7-strand, #14 gauge hard copper wire. Connect your coax feedline directly, no tuner needed.

MFJ-17754, $59.95. Short coax fed 42 foot long *dual band* 40/20 Meter dipole antenna. *Full-size* on 20 Meters, ultra-efficient end-loading on 40 Meters. Same construction as MFJ-17758.

MFJ *Single Band* Dipole Antennas

Ultra high quality center fed dipoles will give you trouble-free operation for years. Custom injection-molded UV-resistant center insulator has built-in coax connector and hanging hole. Heavy duty 7-strand, 14-gauge hard copper antenna wire. Extremely strong solderless crimped construction. Authentic *glazed ceramic* end insulators. Use as horizontal or sloping dipole or inverted vee. Handles full 1500 Watts. Simply cut to length for your favorite frequency with cutting chart provided.

MFJ-1779A $69.95 160M, 265 ft.
MFJ-1779B $49.95 80-40M, 135 ft.
MFJ-1779C $29.95 20-6M, 35 ft.

True 1:1 Current *Balun & Center Insulator*

MFJ-918
$24.95

True *1:1 Current Balun/ Center Insulator* forces equal antenna currents in dipoles for superior performance. Reduces coax feedline radiation and field pattern distortion -- your signal goes where *you* want it. Reduces TVI, RFI and RF hot spots in your shack. *Don't build a dipole without one!* 50 hi-permeability ferrite beads on high quality RG-303 *Teflon*(R) coax and *Teflon*(R) coax connector. Handles full 1.5kW 1.8-30 MHz. Stainless steel hardware with *direct* 14 gauge stranded copper wire connection to antenna. 5x2 inches. Heavy duty weather housing.

RF Isolator

MFJ-915
$29.95

MFJ-915 *RF Isolator* prevents unwanted RF from traveling on the outside of your coax shield into your transceiver. This unwanted stray RF can cause painful RF "bites" when you touch your microphone or volume control, cause your display or settings to go crazy, lock up your transceiver or turn off your power supply. In mobile installations, stray RF could cause your car to do funny things even blow your car computer. Clear up these problems, plug an MFJ-915 between your antenna and transceiver. 5x2 in. Handles full 1500 Watts. Covers 1.8-30 MHz.

MFJ-919, $59.95. 4:1 current balun,1.5 kW.
MFJ-913, $29.95. 4:1 balun, 300 Watts.

Antenna Switches

MFJ-1704
$79.95
4-Positions

MFJ-1704 heavy duty *antenna switch* lets you select 4 antennas or ground them for static and lightning protection. Unused antennas automatically grounded. Replaceable lightning surge protection. Good to 500 MHz. 60 dB isolation at 30 MHz. 2.5 kW PEP. Less than .2 dB insertion loss, SWR below 1.2:1. SO-239 connectors. Handy mounting holes. $6^1/_4$Wx$4^1/_4$Hx$1^1/_4$D in.

MFJ-1702C
$39.95
2-Positions

MFJ-1702C Like MFJ-1704, but for 2 antennas. 3Wx2Hx2D"

MFJ-1700C
$99.95

MFJ-1700C *Antenna/ Transceiver Switch* lets you select one of six antennas and one of six transceivers in any combination. Plug in an antenna tuner or SWR wattmeter and it's always in-line for any antenna/transceiver combination. Has lightning surge protection. Handles 2 kW PEP SSB, 1 kW CW, 50-75 Ohm loads. Unused terminals are automatically grounded. 1.8 to 30 MHz. SO-239 connectors. $4^3/_4$W$6^1/_2$Hx3D inches.

MFJ-1701
$69.95

MFJ-1701 *Antenna Switch* like MFJ-1700C but lets you select one of six antennas only. 10Wx3Hx$1^1/_2$D inches.

33 ft. Telescoping fiberglass Mast

3.8 feet collapsed, 3.3 lbs.

MFJ-1910
$79.95

Super strong fiberglass mast has huge $1^3/_4$ inch bottom section. Flexes to resist breaking. Resists UV. Put up *full size* inverted Vee dipole/vertical antenna in minutes and get *full size performance!*

Make your own antennas

Dipoles, G5RV, Random Wire, Doublets, Beverage Antennas, etc.

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MFJ-16B01, $19.95. Custom injection-molded UV-resistant center insulator has built-in coax connector and hanging hole.
MFJ-18G100, $24.95. 100 ft. of flexible, 7-strand, 14-gauge solid copper antenna wire.
MFJ-58100X, $49.95. 100 ft. 50-Ohm RG-8X with PL-259s on each end.
MFJ-18H100, $34.95. 100 feet, 450 Ohm ladder line, 18 gauge copper covered steel.

Lightning Surge Protectors

Ultra-fast gas discharge tube shunts 5000 amps peak. Less than 0.1 dB loss. Up to 1000 MHz. SO-239s. **MFJ-270, $29.95.** 400W PEP. **MFJ-272, $39.95.** 1500W PEP.

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MFJ high-accuracy *Digital* SWR/Wattmeter

MFJ's high-accuracy digital SWR/Wattmeter gives you three 10-bit frequency compensated power ranges!

MFJ-826B
$179.95

New!

An optimum power range is automatically selected. Each range has full 10-bit resolution. A low range (25 Watt full scale), a mid-range (250 Watt full scale) and a high-range (1500 Watts full scale) covers the entire amateur power spectrum with high accuracy.

A built-in frequency counter selects the appropriate frequency compensated data set to insure highest accuracy for each band. It also displays your transmitted frequency and provides digital frequency readout for older rigs and QRP rigs such as MFJ-9420/9040/9340.

True peak or average forward and reflected power, SWR and frequency are *simultaneously* displayed.

Bargraphs makes tuning antenna tuners, amplifiers and transmitters easy. You can select bargraphs to display forward and reflected power *or* forward power and SWR *or* SWR only.

MFJ's PeakHold™ freezes high-est forward power displayed (bar segment also) for 1, 2 or 3 seconds.

MFJ's *TrueActive*™ peak reading circuit gives you *true* peak or average power.

When SWR is greater than 1.5 to 3 (selectable) an alarm LED lights and buzzer sounds.

Has large high-contrast *backlit* LCD display.

Use 12 VDC or 110 VAC with optional MFJ-1312D, $15.95. 6½Wx2⅝Hx6D inches.

MFJ *giant* 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.

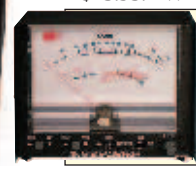
MFJ's exclusive *TrueActive*™ peak reading circuit captures *true* peak or average forward and reflected power readings.

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. 7Wx5½Hx5D in. SO-239 connectors.



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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. 7¾Wx4Hx2⅛D inches.

100 Watts SSB from cigarette lighter socket!

MFJ-4403
$119.95

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 AC Line RFI Filter

Eliminate obnoxious power line and computer hash and noise by 6 S-units!

MFJ-1164B
$79.95

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.

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-655B
$219.95

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.

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Power your HF transceiver, 2 meter/440 MHz mobile/base and accessories with these highly reliable 15, 22, 30, 40 or 75 Amp MFJ Switching Power Supplies!

No RF hash . . . Super lightweight . . . Super small . . . Volt/Amp Meters . . .

MFJ's adjustable voltage switching power supplies do it all! Power your HF or 2M/440 MHz radio and accessories.

MFJ's *MightyLites*™ are so light and small you can carry them with one hand! Take them with you anywhere.

No more picking up and hauling around heavy, bulky supplies that can give you a painful backache, pulled muscle or hernia.

These babies are clean . . . Your buddies won't hear *any* RF hash on your signal! *None* in your receiver either! These super clean *MightyLites*™ meet all FCC Class B regulations.

Less than 35 mV peak-to-peak ripple under 25 or 45 amp full load. Load regulation is better than 1.5% under full load.

You won't burn up our power supplies!

MFJ Power supplies are *fully protected* with Over Voltage, Over-temperature and Over Current protection circuits.

MFJ *MightyLites*™ can be used anywhere in the world! They have switchable AC input voltage and work from 85 to 135 VAC or 170 to 260 VAC. Replaceable fuse.

A whisper quiet internal fan efficiently cools your power supply for long life.

22 Amp Continuous

MFJ-4125

Ham Radio's smallest and lightest 22 Amp continuous power supply is also its best selling!

$84.95

22 Amps continuous/25 Amps max at 13.8VDC. 5-way binding posts on front, 5A quick connects on back. 85-135/170-260 VAC input. 2.9 lbs. 5¾Wx3Hx5¾D".

MFJ-4125P, $94.95. Adds 2-pairs *Anderson PowerPoles*™.

22 Amp Continuous

MFJ-4225MV

22 Amps continuous, 25 Amps maximum. Like MFJ-4125 but adds Volt/Amp meters, cigarette lighter plug. Adjustable 9-15 VDC Output. 5¼Wx 4½Hx6D in. Weighs 3.7 lbs. Use 85-135 VAC or 170-260 VAC input. Replaceable fuse.

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40 Amp Continuous

MFJ-4245MV

40 Amps continuous, 45 Amps max. Adjustable 9-15 VDC output. Volt/Amp meters, cigarette lighter plug, front 5-way binding posts, two rear quick connects. 5.5 lbs. 7½Wx 4¾Hx9D inches. Use 85-135 VAC or 170-260 VAC input. Replaceable fuse.

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75 Amp Continuous

MFJ-4175

75 Amps continuous. Adjustable 13.8-14.2 VDC output. Reverse polarity, over-current/temperature, brown-out input protection, 7.8 lbs. 6½Wx3½Hx10D in. 108-132 VAC. Great for Ameritron's ALS-500M mobile amplifier!

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Power multiple Transceivers/accessories from a* single *DC power supply . . . Keeps you neat, organized and safe . . .Prevents fire hazard . . . Keeps wires from tangling up and shorting . . . Fused and RF bypassed . . . 6 foot, 8 gauge color coded cable . . .

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MFJ-1116, $59.95. 8 pairs binding posts, 15A total.Voltmeter, on/off switch.

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All PowerPoles™

MFJ-1128, $104.95. 3 high-current outlets for transceivers. 9 *switched* outlets for accessories. Mix & match included fuses as needed (one-40A, one-25A, four-10A, four-5A, three-1A fuses installed). 0-25 VDC *Voltmeter*. *Extra* contacts, fuses. 12Wx1¼Hx2¾D".

MFJ-1126, $84.95. 8 outlets, each fused, 40 Amps total. Factory installed fuses: two 1A, three 5A, two 10A, one 25A, one 40A. *0-25 VDC Voltmeter*. Includes *extra PowerPoles®*, *extra* fuses -- *no extra cost*. 9Wx1¼Hx2¾ inches.

PowerPoles™ AND 5-Way Binding Posts

MFJ-1129, $114.95. 10 outlets each fused, 40 Amp total. 3 high-current outlets for rigs -- 2 *PowerPoles®* and one 5-way binding post. 7 *switched* outlets for accessories (20A max) -- 5 *PowerPoles®* and 2 binding posts. Fuses include (1- 40A, 2-25A, 3-10A, 3-5A, 2-1A installed). *0-25 VDC Voltmeter*. Includes extra *PowerPoles®* and fuses, 12½Wx1¼Hx2¾D inches.

MFJ-1124, $64.95. 6 outlets each fused, 40 Amps total. 4 *PowerPoles®*, 2 high-current binding posts, Installed fuses: 1-40A, 2-25A, 2-10A, 1-5A, 1-1A. Includes extra *PowerPoles®* & fuses -- *no extra cost*.

MFJ-1118 $84.95

MFJ-1116 $59.95

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15 Amp Continuous

MFJ-4115

15 Amps continuous, 17 Amps max at 13.8 VDC. Over-voltage, over-current protection. 5-way binding posts. Load fault indicator and automatic shutdown. 90-130 VAC input. 1½ lbs. Tiny 3¾Wx2¼Hx3¾D inches fits easily in an overnight bag.

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30 Amps Continuous

Linear with 19.2 lb.Transformer

MFJ-4035MV

This heavy-duty linearly regulated MFJ-4035MV has *abolutely no RF Hash*. It delivers 30 Amps continuous, 35 Amps maximum from its massive 19.2 lb. transformer. Front panel adjustable 1-14 VDC output with convenient detent at 13.8 VDC. Volt/Amp Meters. 1% load regulation, 30 mV ripple. Over-voltage/current/temperature protection, 5-way binding posts, 2 pairs of quick-connects and a covered cigarette lighter socket for mobile accessories. Front panel replaceable fuse. 110 VAC input. 9½Wx6Hx9¾D in.

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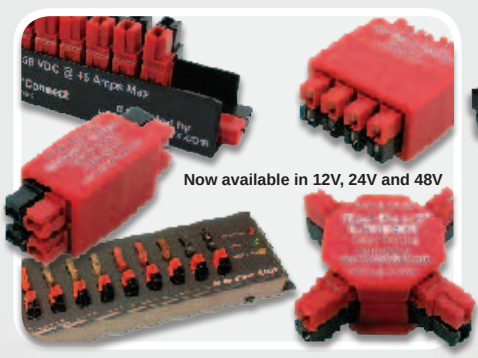

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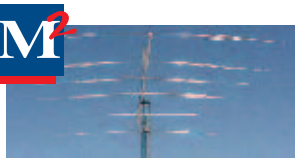

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