AUGUST 2010 QST Vol 94 No 8

QST

DEVOTED ENTIRELY TO AMATEUR RADIO

August 2010 WWW.ARRL.ORG

QST reviews:

Inside:

Arecibo on the Air...Via the Moon!

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ADVANCED D-STAR + ANALOG 2M & 70CM

- 50/15/5 Watt Output
- RX: 118–549.995, 118–173.995, 375–549.999, 810–999.990MHz*
- 522 Alphanumeric Memory Channels
- One Touch Reply Function
- Digital Voice/GPS**
- Low Speed Data**

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GPS MODULE AND ANTENNA

Diversity reception with band scope

Select your favorite display color, adjustable from green to amber

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GO DIGITAL ON 1.2GHZ

- 10 Watt Output on 23cm (FM, DV, DD)
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- 100 Alphanumeric Memory Channels
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- Black Box Operation
- Up to 128kbps Data Speed

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- 1052 Alphanumeric Memory Channels
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ANALOG 2M, D-STAR UPGRADEABLE

- 65 Watt Output
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- Dualwatch Receive
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IC–RX7 TRACK READY

- RX: 0.150–1300.0MHz*
- AM, FM, WFM
- 1825 Alphanumeric Memory Channels
- 100 Ch/Second High Speed Scan
- Computer Programmable[2]
- Water Resistance Equivalent to IPX4

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*Frequency specs may vary. Refer to owner's manual for exact frequency specs. [1]Optional CT-17 required. [2]Optional CS-RX7 required.

hy-gain® ROTATORS

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

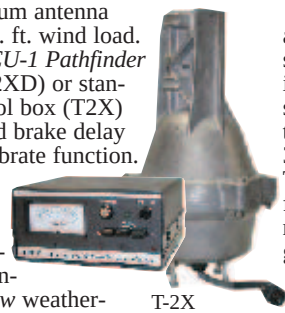
HAM-IV

HAM-IV
$649.95

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

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

TAILTWISTER SERIES II



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

T-2X
$799.95

T-2XD
$1229.95
with DCU-1

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

CD-45II

CD-45II
$449.95

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

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

HAM-V

HAM-V
$1099.95
with DCU-1

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

AR-40

AR-40
$349.95

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

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

HDR-300A

HDR-300A
$1499.95

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

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

ROTATOR OPTIONS

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

Digital Automatic Controller

DCU-1
$749.95

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

AR-35 Rotator/Controller

AR-35
$89.95

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

RBD-5
$29.95

NEW! Automatic Rotator Brake Delay

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

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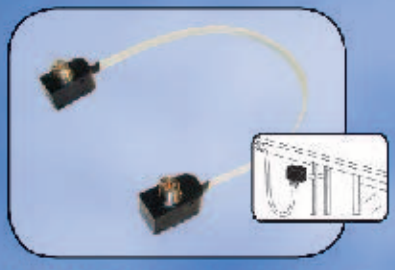


NEW! COMET CTC-50M
Window Gap Adapter!

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

MALDOL HVU-8
Ultra-Compact 8 Band Antenna!

Unique ground radial system rotates 180 degrees around the base if building side mounting is required.

Max Power: HF 200W SSB/100W FM
6M - 70cm: 150W FM
TX: 80/40/20/15/10/6/2M/70cm
Impedance: 50 Ohm
Length: 8'6" approx
Weight: 5lbs 7oz
Conn: SO-239
Max Wind Speed: 92MPH

Each band tunes independently.
Approx 2:1 band-width:
80M 22kHz
40M 52kHz
20M 52kHz
15M 134kHz
10M 280kHz

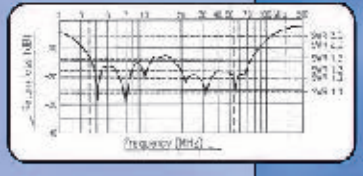
COMET CHA-250B
Broadband HF Vertical!

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

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

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

Max Power: 250W SSB/125W FM
TX: 3.5– 57MHz
RX: 2.0– 90MHz
Impedance: 50Ohm
Length: 23'5"
Weight: 7lbs 1 oz
Conn: SO-239
Max Wind Speed: 67MPH



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

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

Max Power: 1000W SSB / 500W FM
SWR: Less than 1.5:1 at center frequency
Rotation Radius: "V" 12' 6" "H" 17' 5"
Length: "V" 24' 5" "H" 33' 10"
Weight: 11 lbs 14 ozs
Wind load: 3.01 sq feet
Max Wind Speed: 67 MPH

COMET and Maldol

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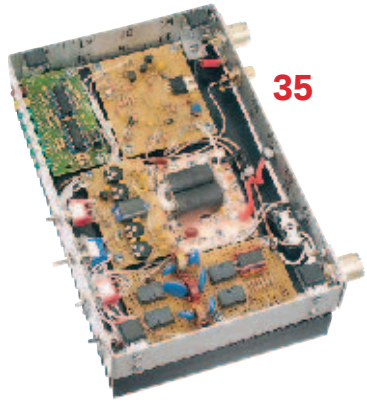

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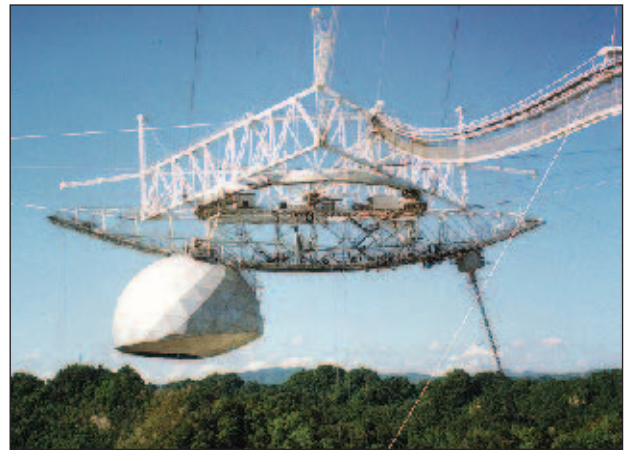
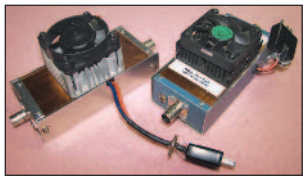


News and Features

Radiosport



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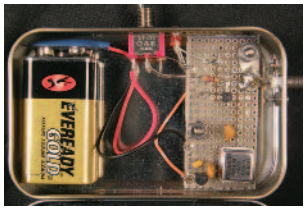

Our Cover
Joe Taylor, K1JT, and Jim Breakall, WA3FET (left), together with a team from KP4AO, the Arecibo Observatory Radio Club, completed almost 250 contacts via EME (Earth-Moon-Earth) using the Arecibo Observatory at the National Astronomical and Ionospheric Center in Puerto Rico. Inset photo by Angel M. Vazquez, WP3R. According to former Arecibo Observatory Director Frank Drake, the 1000 foot spherical dish — the largest single radio telescope in the world — can hold 357 million boxes of corn flakes; there's no word on how much milk is needed. Arecibo photo courtesy of NAIC — Arecibo Observatory, a facility of the National Science Foundation.

Departments

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FT-450AT With Built-in ATU-450 Automatic Antenna Tuner

Compact size : 9" X 3.3" x 8.5" and Light weight : 7.9 lb

HF/VHF/UHF Portable Operation
Just Got a Lot More Powerful!

FT-897D TCXO DSP 60 m Band

HF/50/144/430 MHz 100 W All Mode Transceiver
(144 MHz 50 W/430 MHz 20 W)

HF/VHF/UHF Multimode Mobile Transceiver,
now Including Built-in DSP

FT-857D DSP 60 m Band

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

Mobile Auto-Resonating 7~430 MHz for FT-897/857/450 Series Transceivers

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

VHF/UHF
Base RadialKit
ATBK-100 for
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ATAS MICRO
ATAS-25
Manually-Tuned
Portable Antenna

Real Performance, Really Portable

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

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FT-897D TCXO DSP 60 m Band

HF/50/144/430 MHz
100 W All Mode Transceiver (144 MHz 50 W/430 MHz 20 W)

HF/VHF/UHF Multimode Mobile Transceiver, now Including Built-in DSP

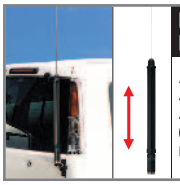
FT-857D DSP 60 m Band

HF/50/144/430 MHz
100 W All Mode Transceiver (144 MHz 50 W/430 MHz 20 W)

Automatic Matching for FT-897/857 Series Transceivers

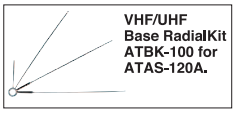
FC-40
Automatic-Matching 200-Memory Antenna Tuner (160 m ~ 6 m Band)

WATERPROOF



Mobile Auto-Resonating 7~430 MHz for FT-897/857 Series Transceivers

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



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FT-817ND
HF/50/144/430 MHz
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60 m Band

ATAS-25 ATAS MICRO
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Choose the Yaesu that meets your APRS® operating preferences in the field

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

Actual Size

144/430 MHz
FM 5 W Dual Band Handheld
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All-in-one Prestigious Tri-band Transceiver
Bluetooth® for hands-free Operation with optional accessories
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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

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

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

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‘It Seems to Us’

Anomalies

“In most radio services, ours included, great emphasis is placed on how to improve reliability. The focus, and rightly so, is on how to get as close as possible to 100% — how to make radio a reliable, albeit invisible, infrastructure. But it’s the low-percentage occurrences of unusual radio propagation — the anomalies — that excite us.”

The history of radio is about discovery as well as invention. Radio wave propagation is a natural phenomenon; it was there all the time. Once devices were invented that made it possible to communicate between two points without wires or visible signals, it was human nature to move the devices farther apart and try again. Marconi is credited with having achieved the most dramatic early breakthroughs and earned great commercial success by showing that the horizon was no boundary for radio communication. Discovering the various means by which radio signals of different wavelengths (frequencies) propagate did not come until later, and after more than a century we’re still learning.

As radio amateurs we are privileged to be able to explore this phenomenon. Our licenses grant us access to frequency bands arrayed across a wide range of radio spectrum. Most of the time, the bands behave predictably and we use them in routine ways. For example, the VHF bands provide good local communication. The 80 and 75 meter bands offer good regional coverage at night, as does 160 meters in the winter; 40 meters does the same during the day. If in the daytime you want to contact a friend half a continent away you’re likely to choose 20 meters.

Sometimes, though, remarkable things happen — and we seem to be observing them more and more. On this page in April we talked about the opportunities offered by the 6 meter band — which in mid-June blossomed forth with remarkable intercontinental and transcontinental openings. Here are a few more examples.

Our most popular band is 2 meters. It’s our “watering hole” for staying in touch with the local amateur community. Yet, 144 MHz signals can travel across extraordinary distances. Intense patches of ionization in the E layer of the ionosphere will support paths of more than 1,000 miles for brief periods; even with a modest station, if you’re in the right place at the right time you can experience — and will never forget — the thrill of your call being acknowledged by a booming signal from several states away.

The ionosphere isn’t the only way for radio waves to travel long distances. Ducts in the troposphere — the lowest portion of the atmosphere — can guide signals hundreds of miles with very little attenuation. As it happens, 2 meters is a good place to begin to explore tropospheric propagation. The higher-frequency bands are even better, all the way up to 10 GHz.

Both sporadic E and ducting can be experienced with FM equipment, although SSB is the mode of choice. There are more esoteric propagation modes available to 2 meter operators, but they generally require SSB, CW or a digital mode tailored for the purpose.

One of the beauties of exploring anomalies on the VHF, UHF and microwave bands is that it can be done with antennas that look a lot like TV antennas. If you can’t put one up at home you still can monitor the Internet for propagation reports, hop in your car, and head to a portable location. By the way, the Internet is one reason why band openings are spotted more often today than in the past; keen observers watch for favorable conditions and alert one another. Then they get on the air and “make some noise” (if everyone just listens, no one will ever know the band is open unless a beacon happens to be in the right spot).

The VHF and higher bands are not the only places where today we have better tools and greater prospects for discovery than ever before. Not that many years ago, working DX on 160 meters was the pursuit of a small, hardy, and patient breed of operators who treasured each new contact. Today, while it’s not exactly “just another HF band,” 160 offers opportunities that earlier generations of Top Band denizens only dreamed of. For example, for the past couple of winters openings between the West Coast and Europe and between the East Coast and Japan have occurred much more frequently than in the past. What explains the change? While it’s true that there is more activity, operators have become more experienced, and our equipment (particularly receiving antennas) is better, it seems unlikely that the openings were there all the time and no one noticed. Is the ionosphere changing in ways we do not yet understand? Someday, if we keep ears and minds open, we may be able to answer that question.

As radio amateurs it is important that we continue to observe and record radio propagation anomalies, and that we do an even better job of it in the future. Why? Because we’re about the only people who still are. There was a time when anyone with a TV set could view the effects of sporadic E, whether they wanted to or not; it’s what interrupted the baseball game or “M*A*S*H” when the picture from your local station was knocked out by one from Miami or St Louis. I can remember sitting in a motel room in Santa Barbara in the summer of 1967, watching perfect TV pictures from stations in San Diego — a classic example of coastal ducting. With digital television sets programmed only for the usual local stations, these phenomena soon will fade from popular memory.

In every generation there are people who seek a better understanding of the natural forces that shape life on our planet. For more than a century, Amateur Radio has provided an outlet for such curiosity. It still does today — and it will tomorrow.

David Sumner, K1ZZ
ARRL Chief Executive Officer

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. . . are stronger, lighter, have less wind surface and last years longer.
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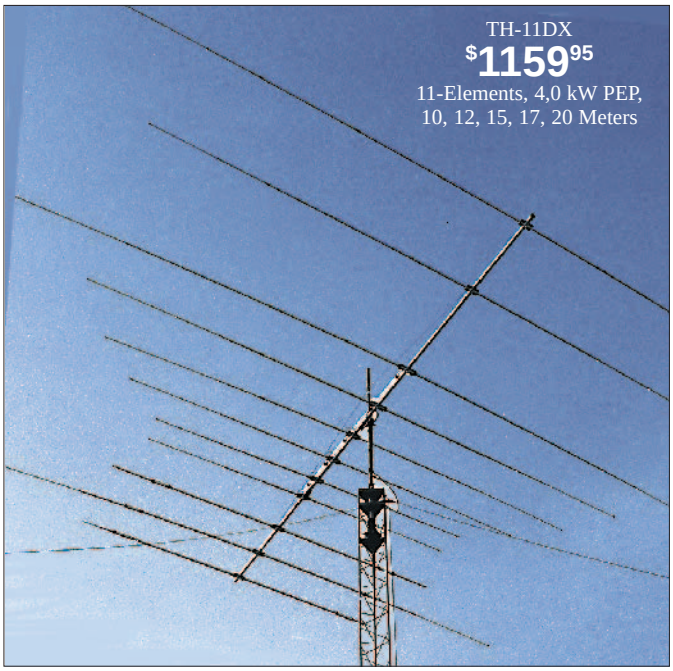

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With 11-elements, excellent gain and 5-bands, the super rugged TH-11DX is *the "Big Daddy" of all HF beams!*

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TH-5MK2, $759.95. 5-element, 1.5 kW PEP, 10,15,20 Meters

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

Separate air dielectric *Hy-Q* traps let you adjust for maximum F/B ratio on each band.

Also standard is *Hy-Gain's* exclusive *BetaMATCH™*, stainless steel hardware and compression clamps and BN-86 balun.

TH-3MK4, $469.95. 3-element, 1.5 kW PEP, 10,15,20 Meters

The super popular TH-3MK4 gives you the *most gain for your money* in a full-power, full-size durable Hy-Gain tri-bander!

You get an impressive average gain and a whopping average front-to-back ratio. Handles a full 1500 Watts PEP. 95 MPH wind survival.

Fits on average size lot with room to spare -- turning radius is just 15.3 feet. Four piece boom is ideal for DXpeditions. Rotates with CD-45II or HAM-IV rotator.

Features *Hy-Gain BetaMatch™* for DC ground, full power *Hy-Q™* traps, rugged boom-to-mast bracket and mounts on standard 2"O.D. mast. Stainless steel hardware. BN-86 balun recommended.

TH-2MK3, $369.95. 2-element, 1.5 kW PEP, 10,15,20 Meters

The 2-element TH-2MK3 is Hy-Gain's *most economical* full power (1.5kW PEP) full size tri-bander.

For just $339.95 you can greatly increase your effective radiated power and hear far better!

Ruggedly constructed, top-performing, compact 6 foot boom, tight 14.3 foot turning radius. Installs almost anywhere. Rotate with CD-45II or HAM-IV. BN-86 balun recommened.

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Revolutionary 4-element compact tri-bander *lets you add 40 or 30 Meters!* Has 14 foot boom and tight 17.25 feet turning radius. Fits on roof tri-pod, mast or medium duty tower.

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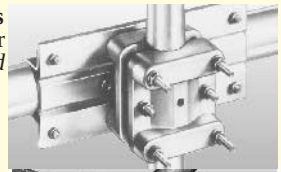
TH-11DX	11	For Gain and F/B ratio--See…		4000	10,12,15,17,20	12.5	100	24	37	22	88	1.9-2.5	T2X	$1159.95
TH-7DX	**7**			**1500**	**10, 15, 20**	**9.4**	**100**	**24**	**31**	**20**	**75**	**1.5-2.5**	**HAM-IV**	**$869.95**
TH-5MK2	5	• www.hy-gain.com		1500	10, 15, 20	7.4	100	19	31.5	18.42	57	1.5-2.5	HAM-IV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

Tooled Manufacturing . . . Highest Quality Materials



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2. ***Tooled*** *Boom-to-Element Clamp*

3. Thick-wall *swaged* aluminum tubing

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Screen Example

Dual Band (Spectrum Scope function)

Navigation (with GPS antenna unit attached)

Mono Band (Spectrum Scope function)

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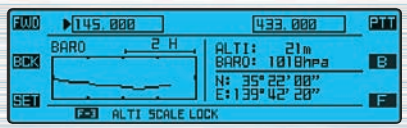

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This Just In

Joel P. Kleinman, N1BKE
jkleinman@arrl.org

In Brief

- Thousands of hams took to the great outdoors during ARRL Field Day weekend, June 26-27. For the first time this year, the ARRL used Twitter to promote FD.
- With cell coverage spotty in the rugged terrain, ham radio played a significant role in the aftermath of the sudden flood in Arkansas that killed 20 people. Details are in Happenings, this month.
- Comments on the FCC's *NPRM* concerning the amateur 60 meter band are due July 15, and reply comments are due July 30.
- Working Parties 1A and 1B of the International Telecommunication Union (ITU) Study Group 1 met in Geneva June 21-28.
- The ARRL filed comments on the FCC *NPRM* regarding spread spectrum communications.
- Another Congressional Representative, Mike McIntyre (D-NC-7), has pledged support for HR 2160, *The Amateur Radio Emergency Communications Enhancement Act of 2009*.
- In May, the ARRL filed its initial comments and on June 7 filed its reply comments in response to the FCC's *NPRM* concerning Amateur Radio operations during government-sponsored emergency preparedness and disaster readiness drills and tests.
- ARES® and SKYWARN® groups in Erie, Huron, Sandusky and Wood Counties activated nets during an early June outbreak of severe weather and tornadoes in northwest Ohio.
- In keeping with the Boy Scouts of America's centennial theme — *Celebrating the Adventure, Continuing the Journey* — four retired badges have been brought back for the group's 100th anniversary, including Signaling.
- The winner of the *QST* Cover Plaque Award for June is Donald Huff, W6JL, for his article "Homebrew Challenge II Winner #1 — The Lowest Cost Entry."
- Registration remains open through July 25 for these online course sessions beginning August 5: Amateur Radio Emergency Communications Level 1, Antenna Modeling, Radio Frequency Interference, Antenna Design and Construction, Propagation, Analog Electronics, and Digital Electronics.

Media Hits

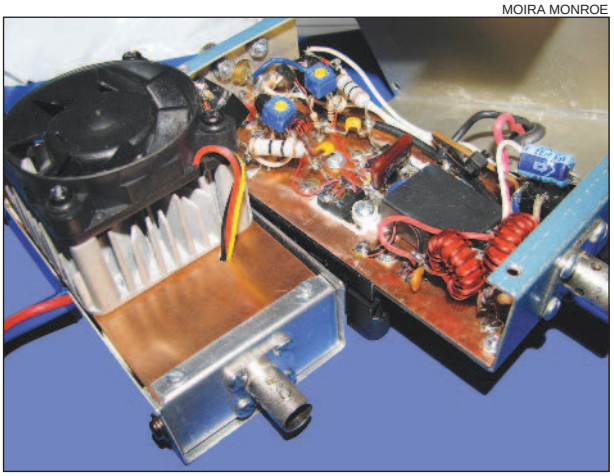
Allen Pitts, W1AGP
Media & Public Relations Manager

- Not all Media Hits have to be big to be noticed. Hancock's Main Street does not have sidewalks but gravel paths leading from home to home and almost every building is listed on the National Register of Historic Places. The New Hampshire town does not even have a newspaper, but only a simple *Hancock Happenings* — a hand folded monthly newsletter. But this apparently did not stop Matt Matteson, WB5JMJ. He made sure he got Field Day publicity with a nice article in the little town's June edition. It may not be Andy's Mayberry, but it sounds like good folks and a very nice place to be for Field Day.
- It has been an interesting month for Amateur Radio in the media. Amateur Radio shines in Corey McKenna's *Emergency Management Magazine* article, "A Critical Link. Amateur radio operators fill communication gaps and provide situational awareness to emergency managers during and after disasters" (**ht.ly/1N1U2**). This national publication is seen by emergency managers throughout the country. The article was a serious recommendation to include hams in planning and operational guidelines.
- Following the earthquake in Puerto Rico, on May 17 a press conference was held with the PR EMA Executive Director, Heriberto Sauri. Hams were happily surprised to see him include praise and notice of the activation of "los capecuatros (KP4s)," as soon the event occurred. Sauri went on to say their initial information was from the local hams. As Angel Santana, WP3GW, noted, "They are taking us very seriously!"
- Then there was the joyful news that Michigan's Assistant Section Manager for Youth, Simon Boehme, KC8ZYD, and his team at Kalamazoo Central High School successfully won the national competition over hundreds of other schools to have President Obama speak at their high school commencement. Simon was the Senior Class president and also was a member of the Education & Technology Program and the Youth Forum and was a Dayton award winner. The students won by creating a video about their school and accomplishments.
- In Maine, the Travel Channel's Anthony Bourdain made a special Public Service Announcement about Amateur Radio for his "No Reservations" show. It got 5 stars on the Travel Channel Web site! To see it (after a 30 second commercial) go to **tinyurl.com/Mainehams**.
- Ham Radio Gaga — "After Internet caused lull in amateur radio scene, technology bringing it back" was an article in the *Standard Speaker* by Jim Dino. Covering multiple towns in the region around Hazleton, Pennsylvania, Dino noted, "…just that easy, ham radio operator Tom Krohn was talking to a fellow operator in England." It was 1.5 pages of excellent history, community service and what we are doing today.
- WDVX radio is back on the air, thanks to some radio friends after lightning damaged the station's transmitter. When local ham radio enthusiasts saw a story of the station's plight in the Knoxville (TN) *News Sentinel*, the group began looking for ways to help. One of the hams, Kevin Duplantis, W4KEV, an engineer with South Central Radio Group, said, "I can get you back on the air" — and they did. Meanwhile WYFN radio had gone under water in the Tennessee flooding. Ham ingenuity again came to the forefront as Ted Randall, WB8PUM, and his sons Matt and David, KG4WXX and KG4WXW, restored the devastated station. They noticed the oscillator circuit used a multiplier factor of two so they removed the crystal and first stage of the oscillator circuit and connected a Yaesu FT-757GX Amateur Radio transceiver tuned to 1960 kHz. As Randall remarked, "Nothing like the warm glow of transmitter tubes and the smell of the radio station dust baking on the glass, something that is only memory in the minds of many!"
- Switched.com is a major technical gizmo blog. So it when an article "Amateurs Send First HD Camcorder Into Space via Balloon" appeared, it was seen by thousands of creative techno-geeks who read of the BEAR-4 project sending amateur pictures from 107,000 feet up.
- So…Amateur Radio operators were all seen as "good guys" this month? Not quite. *The New York Times* noted an interesting exception — a ham who was initially seen as no less than a national security threat by the US. It seems that a 70 year old Amateur Radio astronomer, Greg Roberts, ZS1BI, spotted and recorded footage of a super-secret, spacecraft, the X-37B, developed by the US Air Force. Oops! Obviously, it could not have been that well-kept a secret, but like Sergeant Schultz, "I see nothing! Nothing!"

Homebrew Challenge Amplifier Impresses Visitors to Seaside Convention

Roger Monroe, K7NTW, of Clear Lake, Washington built the 40 meter/50 W amplifier described in the June 2010 issue of *QST* and showed it off at SEA-PAC 2010 in Seaside, Oregon. He described the reaction in a message to Don Huff, W6JL, the designer (and winner of the ARRL Homebrew Challenge II for the lowest cost entry): "I took the amps to Seaside this weekend and found a couple of builders who had read the article and were interested and looked 'under the hood.' One was a fellow I'd guess to be about 18-22 years old."

MOIRA MONROE



Roger Monroe, K7NTW, got a positive reaction when he displayed the amplifier he built based on the design published in the June 2010 issue of *QST*.

Leonard Award Presented in Pennsylvania

In May, ARRL Atlantic Division Director Bill Edgar, N3LLR, presented the 2010 Leonard Award for print media to Vicky Taylor, a reporter for *Public Opinion*, the daily newspaper in Chambersburg, Pennsylvania. Her article recounted the story of how 8 year old Victoria Latham, KB3SSM, and her 7 year old sister, Veronica, KB3SSN, convinced their parents (KB3RNP and W3SML) that they were ready to earn their Amateur Radio licenses. The Leonard Professional Media Award is given to professional journalists in three categories: audio, visual and print.

PAM EDGAR, KB3SVG

At the Leonard Award presentation in Chambersburg: **Bill Edgar, N3LLR; Vicky Taylor, and the Lathams — Victoria, KB3SSM; Veronica, KB3SSN, and Rachel, KB3RNP.**

Inside HQ

More Volunteer Opportunities

"Volunteering can be an exciting, growing, enjoyable experience. It is truly gratifying to serve a cause, practice one's ideals, work with people, solve problems, see benefits and know one had a hand in them." — *Harriet Naylor*

Last month I discussed some of the volunteer opportunities in the ARRL Field Organization. What other volunteer opportunities are available to ARRL members?

One of the largest and most active groups of ARRL volunteers are Volunteer Examiners, VEs for short. VEs offer their time and talents to administer Amateur Radio FCC licensing tests. Maria Somma, AB1FM, our VE Department Manager, believes that "The VE program ensures the future of Amateur Radio. It's a great feeling to give someone that CSCE (Certificate of Successful Completion of Examination) after they have passed their exam."

The ARRL has been giving Amateur Radio exams for 25 years, since the inception of the Volunteer Examiner Program. Today, there are more than 32,000 ARRL VEs who have conducted over 90,000 test sessions. You can learn how to become a VE associated with the ARRL Volunteer Examiner Coordinator office (VEC) at **www.arrl.org/become-an-arrl-ve**. Our Web site offers many resources for VEs. Because VEs are trained and experienced in giving exams, they also conduct exam sessions for ARRL's Amateur Radio Emergency Communications Course. (An additional registration with ARRL's Continuing Education Program is required.) Find out more at **www.arrl.org/Emergency-Communications-Field-Examiners**.

If you like teaching and enjoy sharing your Amateur Radio knowhow with people of all ages and walks of life, you can sign up to be a registered ARRL Instructor. Join the almost 4000 dedicated ARRL Instructors who put in countless hours teaching Technician classes to newcomers and teaching advanced classes to people who want to upgrade their licenses. I'm one of them, since I teach the General class here inside HQ. You can register at **www.arrl.org/license-instructor-registration**.

According to Debra Johnson, K1DMJ, Manager of the Educational Services Department that oversees Instructors: "Most Licensing Instructors tell me that Amateur Radio has brought them so much joy in their life that they want to give something back and share their Amateur Radio experience and knowledge with as many people as possible. These volunteers spend many, many hours preparing for and teaching classes and we appreciate their efforts and dedication."

Along with licensing instructors, about 750 teaching professionals have registered with us because they are interested in using Amateur Radio in the classroom. Learn more at **www.arrl.org/amateur-radio-in-the-classroom**. Volunteers also teach our foundation Emergency Communications course in the field. We have added some shared resources on our Web site for these volunteers at **www.arrl.org/emergency-communications-field-instructor-resources**.

There are even more volunteer opportunities within the ARRL. These include station level appointments such as Official Emergency Stations, Local Government Liaisons, Official Observers, Card Checkers and sorters, Technical Coordinators and many others.

Whatever your Amateur Radio interest, we have a volunteer opportunity for you. Thanks again to our current volunteers for stepping up and lending a hand. Want to get involved? See **www.arrl.org/volunteer-opportunities**.

73,

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

Guide to ARRL Member Services

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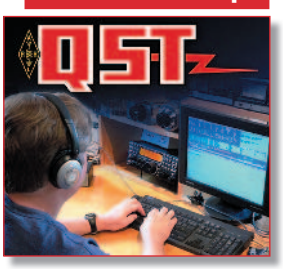

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ARRL is an incorporated association without capital stock chartered under the laws of the State of Connecticut, and is an exempt organization under Section 501(c)(3) of the Internal Revenue Code of 1986. Its affairs are governed by a Board of Directors,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

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

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

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

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

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www.arrl.org/sections

The 15 divisions of ARRL are arranged into 71 administrative *sections*, each headed by an elected *section manager* (SM). Your section manager is the person to contact when you have news about your activities, or those of your club. If you need assistance with a local problem, your section manager is your first point of contact. He or she can put you in touch with various ARRL volunteers who can help (such as technical specialists). Your section manager is also the person to see if you'd like to become a section volunteer. Whatever your license class, your SM has an appointment available. Visit your section page on the Web at **www.arrl.org/sections/**.

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

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

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

From QST Magazine, March, 2005

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

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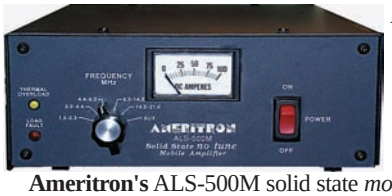
"The ALS-600S makes it possible to pack a transceiver and a 600 Watt amplifier, that together weigh less than 30 pounds."

AMERITRON *mobile* 500 Watt *no tune* Solid State Amp

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



ALS-500M $849 Suggested Retail

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Covers 1.5-22 MHz, (10/12 Meters with $29.95 kit, requires FCC license).

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

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

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

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The Best Radio Contact of Them All!

Dan White, W5DNT

Back in April 2009, I attended the Visalia DX Convention. While my reasons for attending were to see old friends and perhaps make some new ones in the world of DXing, this trip resulted in quite a different and unexpected outcome.

Over breakfast one morning, I casually mentioned a health related situation involving Daniel Vaughan, my 18 year old nephew, to my friend, fellow DXer and Orthopedic Surgeon Glenn Johnson, WØGJ. I explained that Daniel's condition had baffled a number of cardiologists in the Dallas area and there was concern he was experiencing a potentially life threatening ventricular arrhythmia. The doctors had suggested a teaching institution be considered for further evaluation.

Upon hearing the story, Glenn suggested contacting a mutual friend and fellow DXer, Scott Wright, KØMD, a cardiologist at the Mayo Clinic in Rochester, Minnesota. Knowing Scott, I immediately realized what a great suggestion Glenn had made. After returning home, I sent a note to Scott and within a few days Daniel had an appointment.

After a full week of diagnostics, under the care of a host of doctors and clinicians, the medical team came to a firm diagnosis. Daniel has a very rare form of Dysautonomia that affects cardiac function, resulting in abnormally low heart rates. This diagnosis, which had been totally missed by previous doctors, will now result in a definitive management plan and may well have saved this young man's life.

There is yet a second part to this story. Dysautonomia is hereditary. Daniel's sister Michelle, although with quite different symptoms, has not been feeling well for over 2 years. Upon hearing the details, the doctors at the Mayo Clinic feel confident that she too suffers from the same disease. She is now following up with specialists.

God puts us in places for various reasons, often unbeknownst at the time. He put both Glenn and Scott in my path through ham radio and DXing, with a totally unimaginable result. I believe two lives may well have been saved through the great hobby of Amateur Radio. I am most thankful for what both Glenn and Scott have done for my family and will forever be indebted to them for their kindness and thoughtful attention. This is the greatest "radio contact" of them all for me!

There is an interesting follow-up to this article. My daughter, who has also been experiencing medical problems, has also been seen by the doctors at the Mayo Clinic and has been diagnosed with a different type of life threatening genetic heart problem. As a genetic problem, it may impact other family members. Thankfully for us, we had the connections to get to the right doctors. All thanks to ham radio.

COURTESY OF DAN WHITE, W5DNT

Dan White, W5DNT (left) with his nephew Daniel Vaughan, whose rare heart condition was diagnosed with the help of Dan's DX friend Scott Wright, KØMD.

JODY MILLSPAUGH, VP5JM

Seen here as members of a DXpedition to Turks and Caicos, VP5H, in March 2008 are (from left) Scott Wright MD, KØMD; Glenn Johnson MD, WØGJ, and Vivien Johnson, KL7YL.

Have Goldwing, will travel: **Ray Davis, KD6FHN, is chairman of the Motorcycle Amateur Radio Club, a club he founded nearly 20 years ago in Irvine, California. MARC members spread the story of Amateur Radio during their extensive travels. Moreover, they are respected volunteers who use their ham skills to support charitable events. Ray has a reputation for going the extra mile. I can't tell you how many times he has been awakened in the middle of the night by a stranded MARC member who needed help with a broken down bike.**
— tnx Mick Stwertnik, KB6JVT

MICK STWERTNIK, KB6JVT

DAN FISHER, AI4GK

When a ham goes house shopping, in addition to the usual location location location you'll want to search out a property with a good earth ground. This one's for sale in Palm Bay, Florida, reports Palm Bay police officer Dan Fisher, AI4GK.

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FOR THE BIRDS

♦ The hundreds of thousands of dollars invested in Amateur Satellite systems can be rendered useless when amateurs use the satellite uplink frequencies for simplex and EchoLink "link" system terrestrial communications. This has been a growing problem, particularly on the 2 meter uplink frequencies between 145.8-146.0 MHz. Without realizing the havoc that they are causing, amateurs who have found that nice, quiet simplex channel to have an intimate chat with a friend can prevent legitimate users of the satellites from enjoying the few fleeting moments available during a 10-12 minute window of opportunity to access the satellite.

When you think you are just talking across town or connecting into your local Internet node to access EchoLink, you are actually transmitting from space across the thousands of square miles that make up the footprint (coverage) of the satellite as it passes over head in orbit. It is often difficult to identify the offending station to alert them of the interference their simplex contacts are causing because many times the satellite footprint time is less than the 10 minute time interval required between station identifications, or more likely, the operators think that since they are simplex and not using one of the common simplex frequencies, that they can get away without the required identification.

Enforcement of the satellite sub-band frequencies would be difficult; the more effective solution is through education. I encourage volunteer instructors, mentors and clubs take a few extra moments to review the satellite frequency band plan and emphasize the importance of not using those frequencies for terrestrial operations. I included mentors and clubs in the mix because the most likely offender of the satellite sub-bands is not the new amateur, but the more experienced amateur may have forgotten or is not aware of the interference that is caused by using satellite sub-band frequencies for non-satellite communications. Better yet, why not do some satellite demonstrations and have them join us on the birds?

MARK SPENCER, WA8SME
ARRL Official Observer
Coleville, California

REMEMBERING MIDWAY

♦ In reading "K4M — Midway Atoll 2009" ["How's DX?" Mar 2010, pages 91-92], I found it interesting that the author made no mention of Midway's historic past. How could this happen? The Battle of Midway — June 4-7, 1942 — is widely regarded as the turning point of the Pacific theatre in World War II. Three American aircraft carriers opposed a large portion of the Japanese fleet, including four Japanese carriers; on the first day of the battle, planes from the American carriers sunk all four Japanese carriers. The USS *Yorktown* was severely damaged in the battle and was sunk on June 7. In all, 307 Americans and 2013 Japanese lost their lives in those four days.

While the K4M group activated a DXCC entity in 2009, almost 67 years before, many severely outnumbered Americans were in a desperate life-and-death struggle to save Midway — and the America they loved. They succeeded. I was a Radioman on the USS *Yorktown*; my call sign back then was W2LXD. I don't doubt that among the 307 Americans killed that some of them were Amateur Radio operators. They and others made the supreme sacrifice in order that we have the freedom that we enjoy today. What a tremendous debt we owe them, a debt that we can never repay. They must not be forgotten.

Midway is not just a lump of sand in the Pacific Ocean — it is American hallowed ground, just like Valley Forge and Gettysburg.

ARAM L. EHRAMJIAN, K2US
Pawleys Island, South Carolina

FISHING FOR FREQUENCIES

♦ I wanted to comment on the article about the compact 3-element Yagi antenna ["The Mini Horse Antenna," Mar 2010, pages 37-38]. I built the 20 meter version using 14 foot long spinning rods that I purchased from a local sporting goods store. I welded an 18 foot mast out of rigid aluminum conduit and attached it to a television antenna rotator. It is mounted on my chimney and sits approximately 25 feet above the ground. It works wonderfully and I'm getting great reports — and a lot of interest — when I tell them that I'm "fishing for frequencies." Thanks for the article because I'm truly enjoying the antenna.

BRAD MATHE, KF5DPN
Grapevine, Texas

WEB SITE KUDOS

♦ Congratulations on the new ARRL Web site! Even though the project was massive, the results are well worth your collective efforts. Every time I visit the new site, I find some neat new functionality. The search function is extremely helpful. I know there are areas that need tweaking, but all in good time.

JIM PERRY, KJ3P
Schwenksville, Pennsylvania

BANDWIDTH BANDWAGON

♦ I have spoken with many groups and club members at ham radio events — I even shared my opinions about joining the ARRL while in Dayton. My main message is this: If for no other reason, *all* hams should join the ARRL, as they protect our bandwidths. My wife works for a computer networking company and they are constantly shopping for more bandwidth in support of their clients and customers. Our hobby and enjoyment in ham radio is under constant attack for our bandwidths — it is the ARRL that does a stellar job at protecting them! If you speak to a ham who is not an ARRL member, just share this thought with them and impress upon them how serious this issue of bandwidth is!

DOUG ALLEN, KØDRA
St Charles, Missouri

RIGS OR RADIOS?

♦ A few years ago — "few" is relative, and can mean 5 to 50, depending on one's age — the average ham's station equipment consisted of a receiver and a transmitter and was known as a "rig." The transmitter contained a wide range pi-network output circuit that could match practically anything from 50 Ω to a wet string. In the mid-1950s, one could work the world on that wet string.

Today, the typical station equipment has been packaged into a convenient single unit, the transceiver. Unfortunately, its fix-tuned output circuit gets very unhappy when presented with a load other than 50 Ω, or something very close. This often necessitates a separate antenna tuner. This modern single package transceiver is generally referred to by amateurs as a "radio." Calling our sophisticated station equipment a radio sounds, well, unprofessional. Nothing against radios — they are useful receivers, usually tuned to a local AM or FM station to listen to music, news or weather reports.

Today we tend to shorten long words, such as "fridge" for refrigerator. "Transceiver" is a rather long word, and most would want a shorter version. In print, this could be "XCVR," but would be hard to pronounce in this form. So how about simply "rig"?

TED BERGSTROM, W1IQW
Mashpee, Massachusetts

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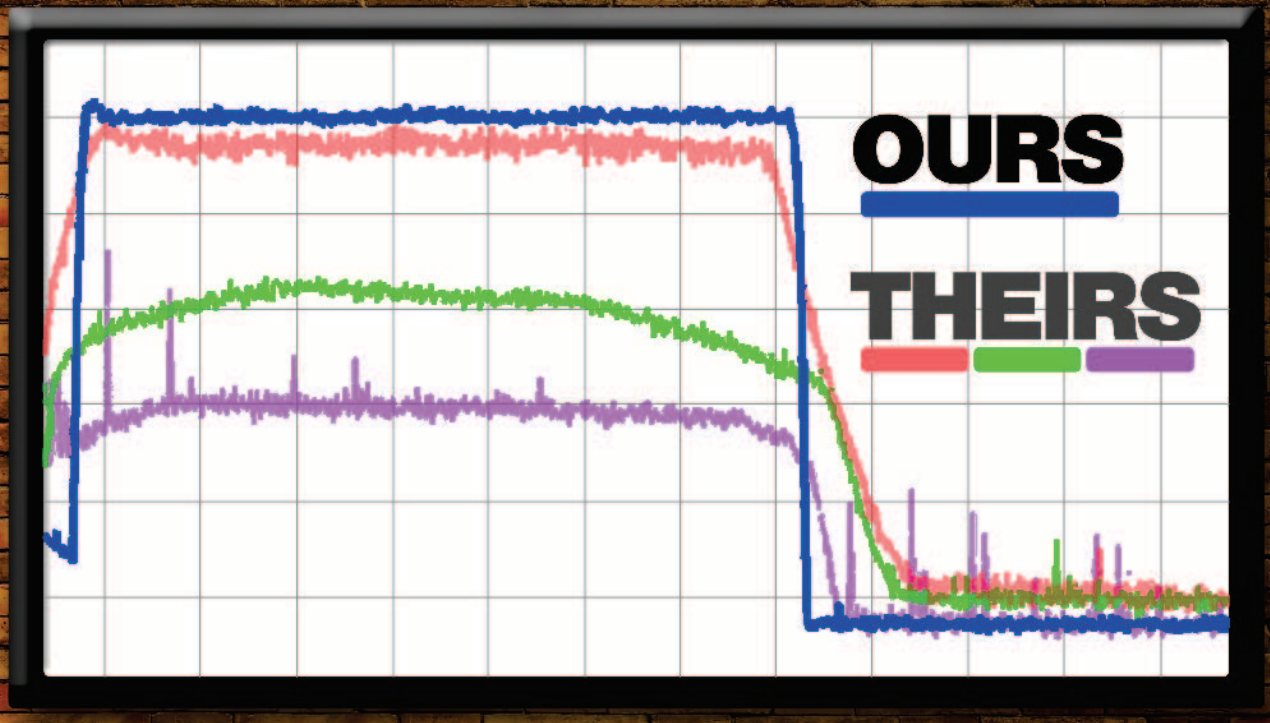
brick wall /brĭk - wôl/ - *noun*

anything or anyone that is impenetrable, unrelenting, or unyielding



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- RX: 0.030–60.000MHz*
- 32 Bit IF-DSPs + 24 Bit AD/DA Converters
- Single Receive
- +40 dBm 3rd Order Intercept Point
- 3 Roofing Filters
- Selectable, “Build Your Own” IF Filter Shapes

IC-7600 HF+6M

- 100 Watt Output (30W AM)
- RX: 0.030–60.000MHz*
- 2 Independent DSP Units
- Dual Receive
- +30 dBm 3rd Order Intercept Point
- 3 Roofing Filters
- Selectable, “Build Your Own” IF Filter Shapes

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Picture is an artistic rendition to show scale and portability of antenna.

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James C. Garland, W8ZR

A half century ago, a well-equipped amateur station consisted of a single transceiver (or receiver/transmitter pair) and possibly a linear amplifier. In those days, the operator merely plugged a key and microphone into the radio's front panel, screwed a coax feed line into a rear jack, hooked up a speaker and amplifier relay control, tucked the wires neatly away behind the desk, and sat down to operate. Easy.

Now fast forward to the 21st century. That area behind the station operating desk has become a no ham's land of computer cables, wall warts, amplifier control wiring, audio processing cables, RTTY and packet cables, and a morass of coax feed lines. And if you have more than one rig in your station, and more than one linear amplifier, then the snarl of cables and wires can be daunting. Switching over to your "backup" transceiver or amplifier is a time-consuming challenge, likely complicated by incompatible microphone, data, audio and control connectors. Wouldn't it be great if you could just throw a toggle switch and have all this switching — RF, data, microphone, key, audio and others — taken care of automatically?

Enter the StationPro, a build-it-yourself master station controller that integrates the switching and control functions of even the most complex amateur stations. Now by just flipping a switch you can mix and match transceivers, amplifiers and microphones, in any combination. Furthermore, the StationPro simplifies behind the table clutter, reducing the time spent crouched behind your operating desk, flashlight in hand, trying to make sense out of the rat's nest.

Figure 1 — The StationPro comes in two versions. The SP-I (top) handles the switching for two transceivers and linear amplifiers, while the deluxe SP-II version accommodates up to three transceivers and amplifiers.

There are two versions of the StationPro (Figure 1). The "basic" version, *SP-I* for short, controls two transceivers (or transmitter/receiver pairs) and two linear amplifiers. The *SP-II* is the microprocessor based deluxe version. The SP-II can control up to three transceivers and three linear amplifiers and has an LCD readout and additional convenience features. In addition, up to three SP-IIs can be networked together, allowing nine rigs to be controlled. That ought to be enough even for over the top vintage radio collectors (such as yours truly). Here, we'll focus on the SP-I and refer readers to the QST-In-Depth Web site (**www.arrl.org/qst-in-depth**) and the author's Web site (**www.w8zr.net/stationpro/**) for the details on the deluxe SP-II. Briefly, here is what both versions can do for you:

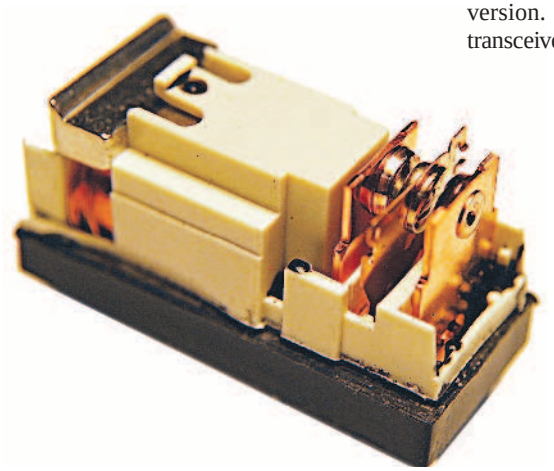


Figure 2 — This miniature Tyco/Schrack RTB14012F power relay, shown with the cover removed, easily handles the amateur legal power limit, has excellent RF properties and costs about $2. The StationPro uses 10 of these relays to switch all RF circuits.

Figure 3 — The RF relay enclosure mounts behind the station desk and handles all the RF switching for the StationPro.

■ Route all the RF switching (up through the 6 meter band) to and from your transceivers and linear amplifiers. The StationPro's RF relays (Figure 2) are conservatively rated at the amateur legal power limit, with a substantial safety margin.

■ Transfer key or paddle, microphones (two can be selected, even having different pinouts), speakers, RTTY or packet, computer, linear amplifier relay and ALC, line in and out, footswitch (or PTT) — up to 24 separate control lines, including several spares and user configurable lines.

■ Control all linear amplifiers, including vintage and homebrew amplifiers, no matter whether they use positive, negative or ac relay control voltages. This flexibility means no more worries about the voltage and current limitations of your transceiver's amplifier keying circuit.

■ Provide a +12 V dc control voltage for operating a master station power relay.

Note that builders of an SP-I can upgrade to an SP-II as their station needs evolve. Upgrading merely involves replacing the front panel circuit board assembly, and plugging in a microcontroller circuit board.

Figure 4 — Breakout pods, customized for each transceiver or exciter, interface the StationPro to the builders' rigs and minimize behind-the-desk "cable clutter."

StationPro Design Concepts

The StationPro's design makes use of recently developed, ultra reliable printed circuit mount relays. Two types of relays are used: small signal relays that switch audio, data and control functions and compact power relays that have excellent RF characteristics up into the VHF range. In more than 20,000 hours of 24 × 7 operation with the four StationPros in the author's station, there has not been a single relay failure.

In the StationPro, RF switching is handled by a remote relay enclosure (Figure 3) that mounts behind the operating table and is operated by the StationPro's control unit (via an ordinary Ethernet type computer cable). Separating the RF from other control switching helps prevent unwanted RF from leaking into audio and data lines and also keeps bulky coax cables from hanging off the back of the StationPro's compact control unit.

And finally, the StationPro minimizes cable clutter by using simple breakout *pods* (Figure 4) to interface control cables to each trans-

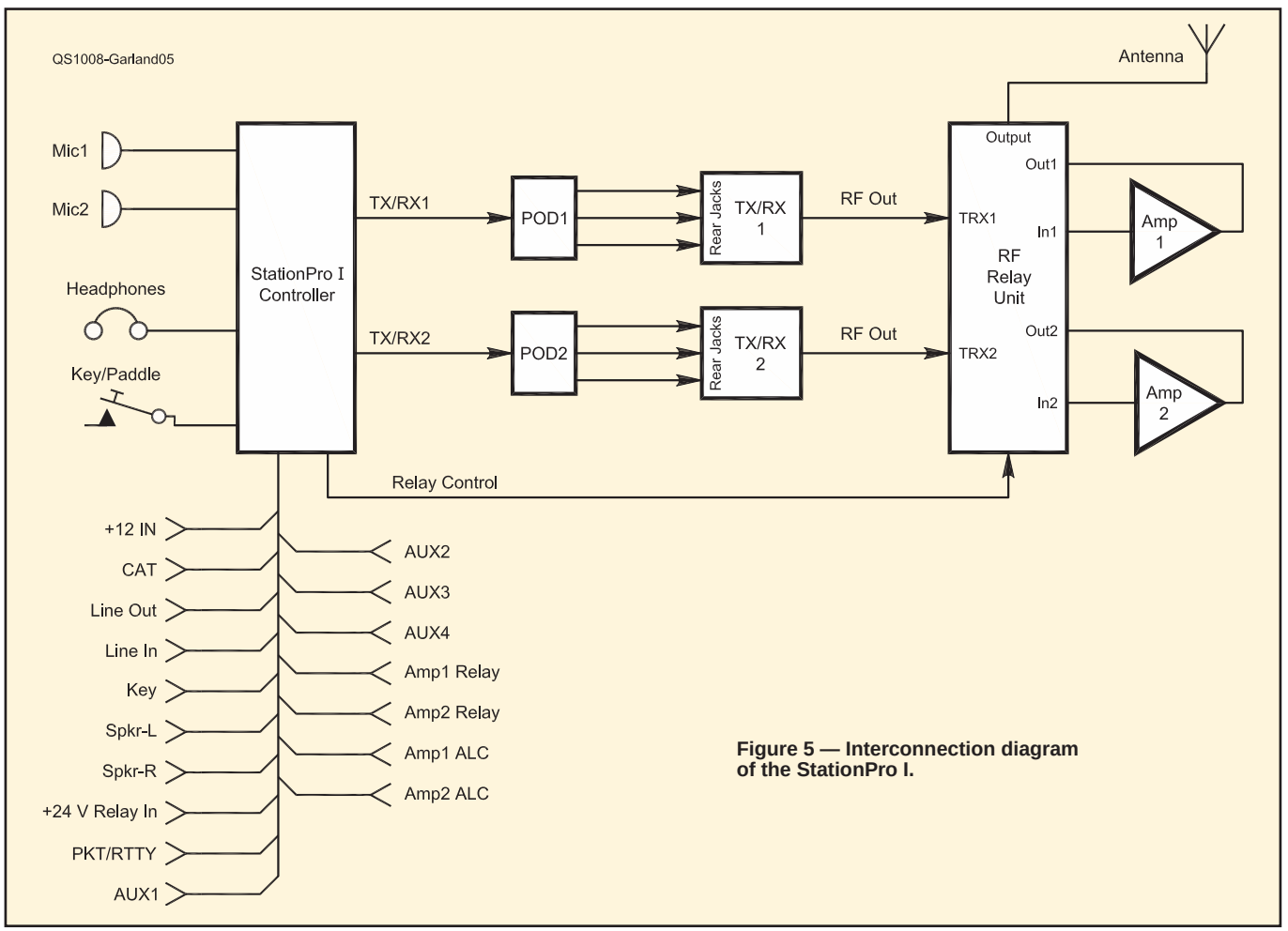


Figure 5 — Interconnection diagram of the StationPro I.

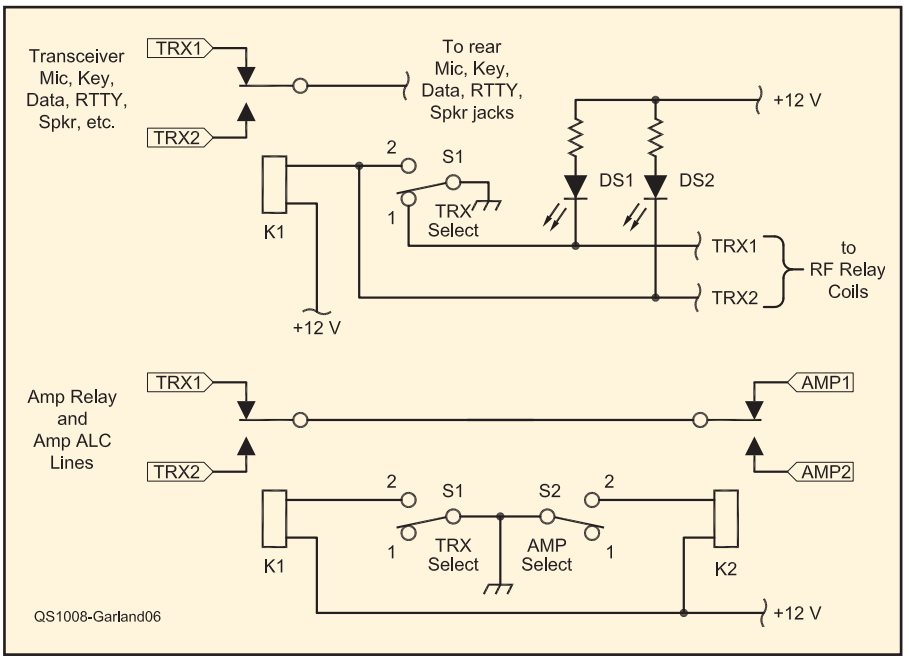


Figure 6 — Simplified diagram of the switching used in the StationPro I. Complete circuit diagrams and parts lists can be downloaded from the QST-In-Depth Web site.

ceiver. Each pod is configured by the builder during assembly to meet the requirements of a particular transceiver. The pods are connected to the StationPro control unit via a 25 conductor serial type computer cable. Short breakout cables connect each pod to the rear panel of the connected transceiver, holding behind the desk cable congestion to a minimum.

Figure 5 shows how these various elements connect together. A key or paddle, headphones (either ¼ inch or 3.5 mm plugs can be accommodated), and one or two microphones plug into jacks on the SP-I's front panel. For convenience, there are duplicate rear panel jacks for key, audio and PTT lines. The rear panel also has dedicated jacks for two external speakers, a computer serial interface, sound card as well as jacks for other control functions including ALC and amplifier relay control. Each transceiver connects to the control unit through a single DB-25 connector, labeled TX/RX1 and TX/RX2 in the figure. Figure 5 also shows the remote RF relay unit, which routes RF from a selected transceiver to a selected amplifier. Unselected transceiver outputs and ampli-

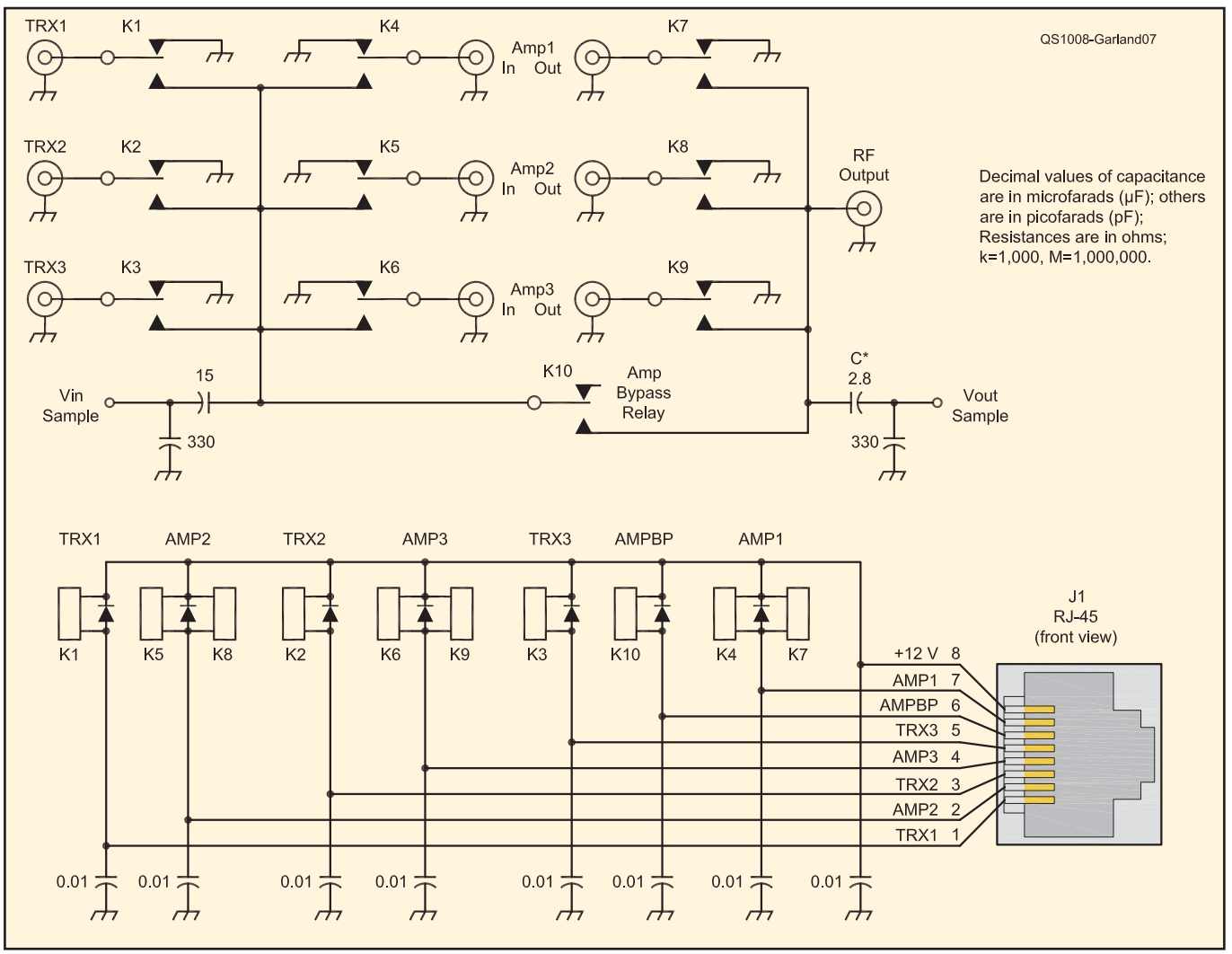


Figure 7 — Schematic diagram of the StationPro RF relay circuits, used in both the SP-I and SP-II.

fier inputs are grounded, and for barefoot operation, a relay in the RF unit bypasses all amplifiers.

Both versions of the StationPro operate on 12 V dc and draw less than 500 mA. For special applications such as VHF/UHF stations, or for amateurs who prefer to use vacuum relays for switching HF, the control unit has an auxiliary input dc power jack that can accommodate up to +30 V dc to control user supplied RF relays. If needed, this voltage is automatically routed to the builder's RF relays by the control unit.

Circuit Description

Figure 6 shows a simplified diagram of the basic switching concept used by the SP-I. Inputs from either of two transceiver/exciters, shown as TRX1 and TRX2, are switched by relay K1. This relay is actuated by S1, a front panel toggle switch labeled TRX SELECT in the diagram. This switch grounds the coil of K1 and also illuminates front panel LEDs corresponding to the selected transceiver. In actuality, K1 consists of 12 DPDT signal relays, which switch a total of 24 control lines, all dedicated to dc, audio, and data signals from each transceiver.

Most of the 24 control lines are directly routed from TRX1 or TRX2 to front and rear panel jacks on the SP-I. However, the amplifier control lines, designated AMP RELAY and AMP ALC are routed by K2 to the linear amplifier selected by switch S2, labeled AMP SELECT. The AMP RELAY line is not directly connected to the selected linear amplifier, but rather is buffered through a solid state driver circuit rated at 400 V (ac or dc) and 250 mA. During construction, the builder also has the option of replacing this driver circuit with a different circuit rated at 200 V dc (positive voltage only) and 3 A. Although it is not shown in the figure, S2 also actuates the remote RF relays for switching the selected amplifier on line. Additionally, a front panel bypass switch (not shown) deselects both amplifiers and deactivates the AMP RELAY line so that bypassed amplifiers cannot inadvertently be keyed up.

Figure 7 shows the schematic diagram of the RF relay enclosure. Nine printed circuit-mount relays, K1 through K9, route RF from a selected transceiver to a selected linear amplifier, while a 10th relay, K10, bypasses all the amplifiers. Because identical RF switching circuitry is used in both versions of the StationPro, some of the RF unit's capability is not used by the SP-I. The cost of the unused components is low, however, and having common circuitry allows an SP-I to be upgraded to an SP-II without having to replace the entire RF enclosure. The remote relay unit optionally includes RF sampling capacitors that pick off some of the RF voltage at the input and output of a selected amplifier for use by a monitor oscilloscope. The 2.8 pF pickoff capacitor, denoted C* in the diagram, is an integral part of the circuit board pattern. All of the RF relays mount on a compact double sided printed circuit board (Figure 8), measuring 4.2 × 6.75 inches. The use of wide traces, careful layout and ground planes on the board ensure good port-to-port isolation and negligible insertion loss and VSWR up through the 6 meter band.

Construction Details

Although the StationPro is a sophisticated piece of equipment, amateurs who have prior experience with electronics kits or homebrew construction projects should have no difficulty duplicating it. Nearly all the circuitry is housed on double sided printed circuit boards, thus minimizing tedious point-to-point wiring. Prepunched and silk-screened enclosures are also available for builders.

Figure 9 shows how the three circuit boards making up the SP-I control unit are interconnected. The front and rear panel circuit boards plug into the main board with short ribbon cables. The 10 SO-239 (UHF) coax jacks in the remote relay unit are soldered directly to their circuit board (Figure 10) in order to facilitate assembly and minimize lead lengths. In addition, there are two small circuit boards used in the transceiver pod breakout boxes (Figure 11). Figure 12 shows how short jumper wires on the front panel connector pins solder to mating pads on the front panel circuit board.

The printed circuit boards in the SP-I control unit fit an available 9 × 4 × 7 inch WHD Ten-Tec model BK-947 enclosure. The remote RF relay unit is housed in a custom fabricated 7.5 × 5 × 1.5 inch WHD aluminum enclosure with flanges for mounting behind an operating table. For my personal StationPros, the blank front and rear panels of the stock BK-947 enclosures were discarded and replaced by one-of-a kind custom panels having engraved lettering (**www.frontpanelexpress.com**). Although elegant, these prototype panels were quite pricey, and I have therefore arranged for Ten-Tec to manufacture a limited number of complete sets of punched and labeled enclosures for StationPro builders at a reasonable cost.

After bare circuit boards, components

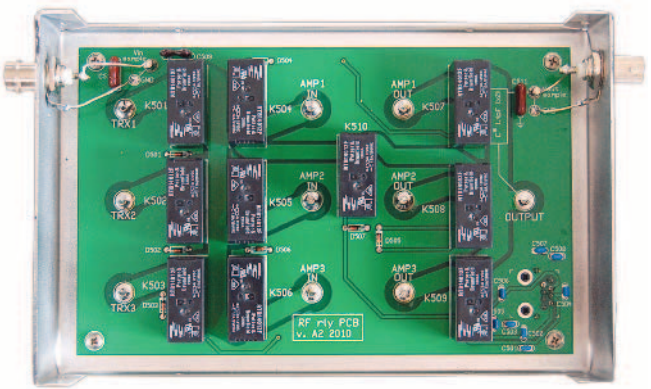


Figure 8 — All RF switching is accomplished by relays on this 4.2 × 6.75 inch printed circuit board.

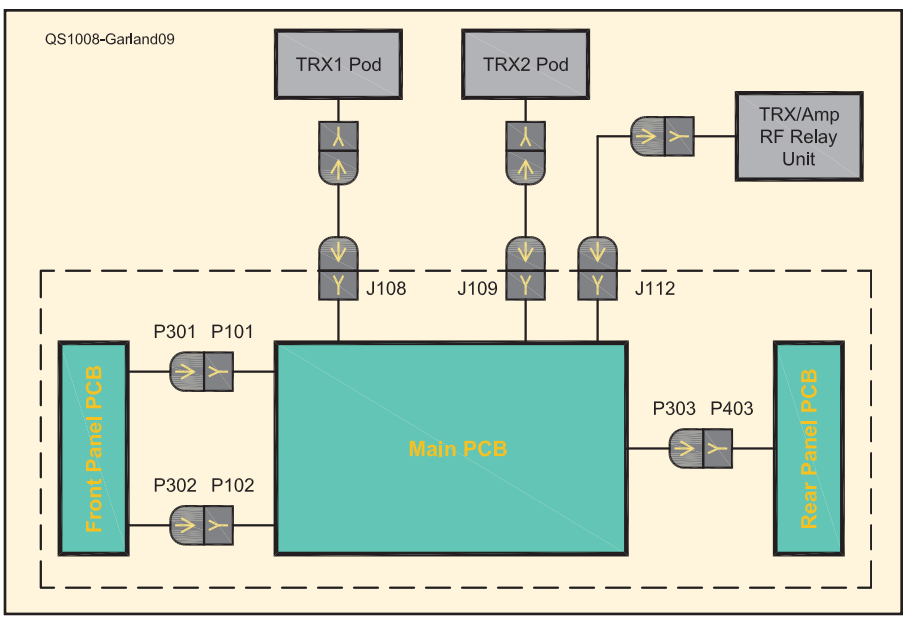


Figure 9 — All rear panel connectors on the StationPro mount directly on printed circuit boards. The use of short ribbon cables minimizes the need for tedious point-to-point wiring.

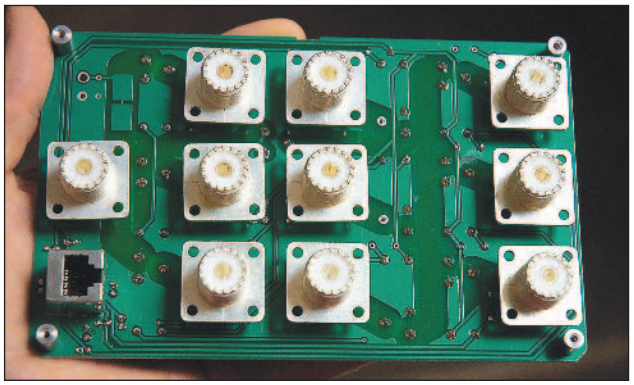


Figure 10 — The 10 SO-239 (UHF) coax connectors on the RF relay enclosure attach directly to the printed circuit board in order to minimize lead lengths. The Ethernet-type control connector is visible at the lower left of the board. The 2.8 pF high voltage RF pickoff capacitor, visible on the upper left, is an integral part of the board pattern.

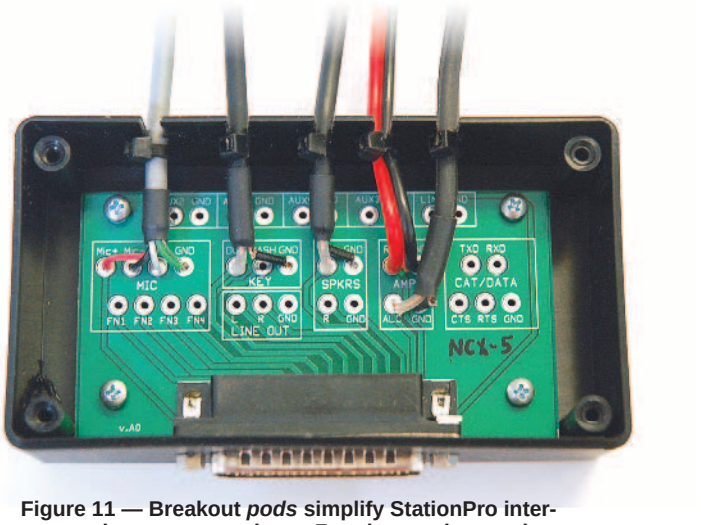


Figure 11 — Breakout *pods* simplify StationPro interconnections to transceivers. For vintage rigs, such as the 1960 era National NCX-5 transceiver, only a few of the available control lines are needed.

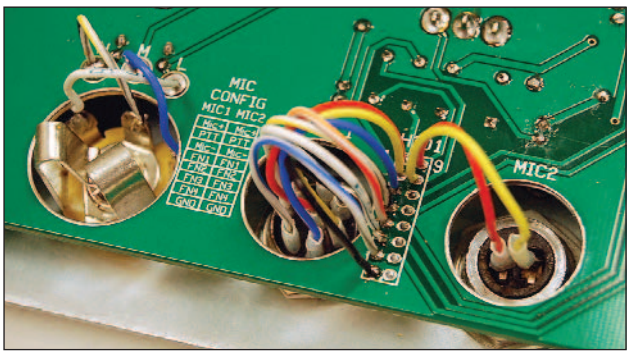


Figure 12 — To minimize laborious point-to-point wiring, short jumper wires from front panel connectors solder to mating pads on the printed circuit board.

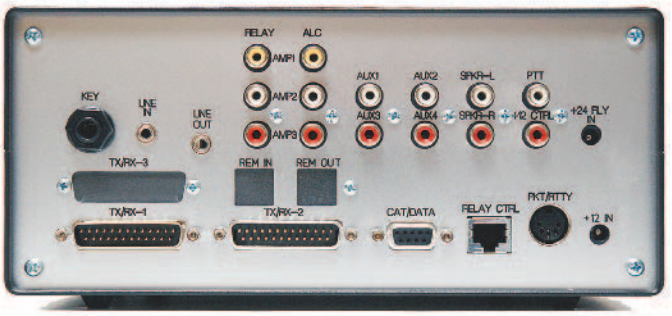


Figure 13 — Both versions of the StationPro use identical rear panels in order to facilitate upgrades. Unused cutouts on the SP-I's panel, shown here, are blanked off with a small cover plate.

and enclosures are obtained, builders should allow about 7 to 10 hours to construct an SP-I. Comprehensive step-by-step assembly instructions can be downloaded from the author's StationPro Web site at **www.w8zr.net/stationpro/** or from the QST-In-Depth Web site. Both Web sites also contain detailed parts listings, additional photographs and construction hints, complete circuit diagrams, circuit descriptions and operating instructions. The sites also have information about obtaining printed circuit boards, components, and enclosures. In addition, a StationPro user group forum is available at **groups.yahoo.com/group/stationpro/**, where builders can exchange hints, offer advice and share experiences.

Installation and Operation

Installation of a completed SP-I is straightforward. One connects the control unit to the RF relay enclosure using an ordinary CAT 5 Ethernet cable. The transceiver pods connect to the control unit with a standard 25 conductor serial cable, available from any computer or office supply store. Coax jumpers from the transceivers and linear amplifiers connect to the mating jacks on the RF enclosure, and the station speaker(s), computer serial cable, sound card and any control cables plug into the rear panel (Figure 13). One or two microphones plug into front panel jacks, along with a key or paddle and headphones. Using the StationPro I literally requires no instruction. One turns the unit on and selects the desired microphone, transceiver and linear amplifier. The StationPro takes care of everything else.

When I received my FCC license as a teenager, it was common practice for amateurs to build their own stations. In those bygone days, receivers and transmitters were mostly straightforward vacuum tube designs, and while the workmanship of homebrew efforts sometimes left a bit to be desired, thousands of amateurs not only experienced the great satisfaction (and significant cost-savings) of building their own rigs, but also developed lifelong interests that led to careers in science, engineering and technology.

Today, ham transceivers are highly complex instruments, designed by teams of engineers, and their innards are crammed with thousands of surface mount components that are almost too small to see. Although this march of progress has resulted in affordable rigs having extraordinarily high performance, it has also made it harder for amateurs to realize the educational benefits and personal satisfaction of that earlier era. The StationPro, as with some of my earlier *QST* projects, is my effort to tempt amateurs to head back to their workbench, fire up their soldering iron, hone their skills, and enjoy the rewards of building a useful station accessory they can't just go out and buy.[1,2]

[1]J. Garland, W8ZR,"The EZ-Tuner, Part I," *QST* Apr 2002, pp 40-43; "Part II," *QST,* May 2002, pp 28-34; "Part III," *QST,* Jun 2002, pp 33-36.
[2]J. Garland, W8ZR, "A Deluxe HF Receiver Multicontroller," *QST,* May 2004, pp 31-38.

Photos by the author.

Jim holds an Amateur Extra Class license and is a former physics professor and university president. He is a Life Member of the ARRL and a Gold member of the ARRL Diamond Club who lives in Santa Fe, New Mexico. His Amateur Radio Web site is **www.w8zr.net** *and he may be contacted at 102 Spur Ranch Rd, Santa Fe, NM 87540 or at* **w8zr@arrl.net**.

A Multiband 50 W Linear Amplifier

Give a bit of a kick to your homebrew challenge transceiver or other low power HF rig.

Jim Veatch, WA2EUJ

Here is a low cost linear power amplifier for the 40, 30, 20, 17 and 15 meter bands capable of 50 W output with as low as 2.5 W of drive. That's a gain of 13 dB, more than two S-units, a worthwhile increase if conditions are poor. The amplifier was designed specifically for the Second ARRL Homebrew Challenge and was designed to meet all the contest technical requirements.[1] This amplifier version

[1]Notes appear on page 38.

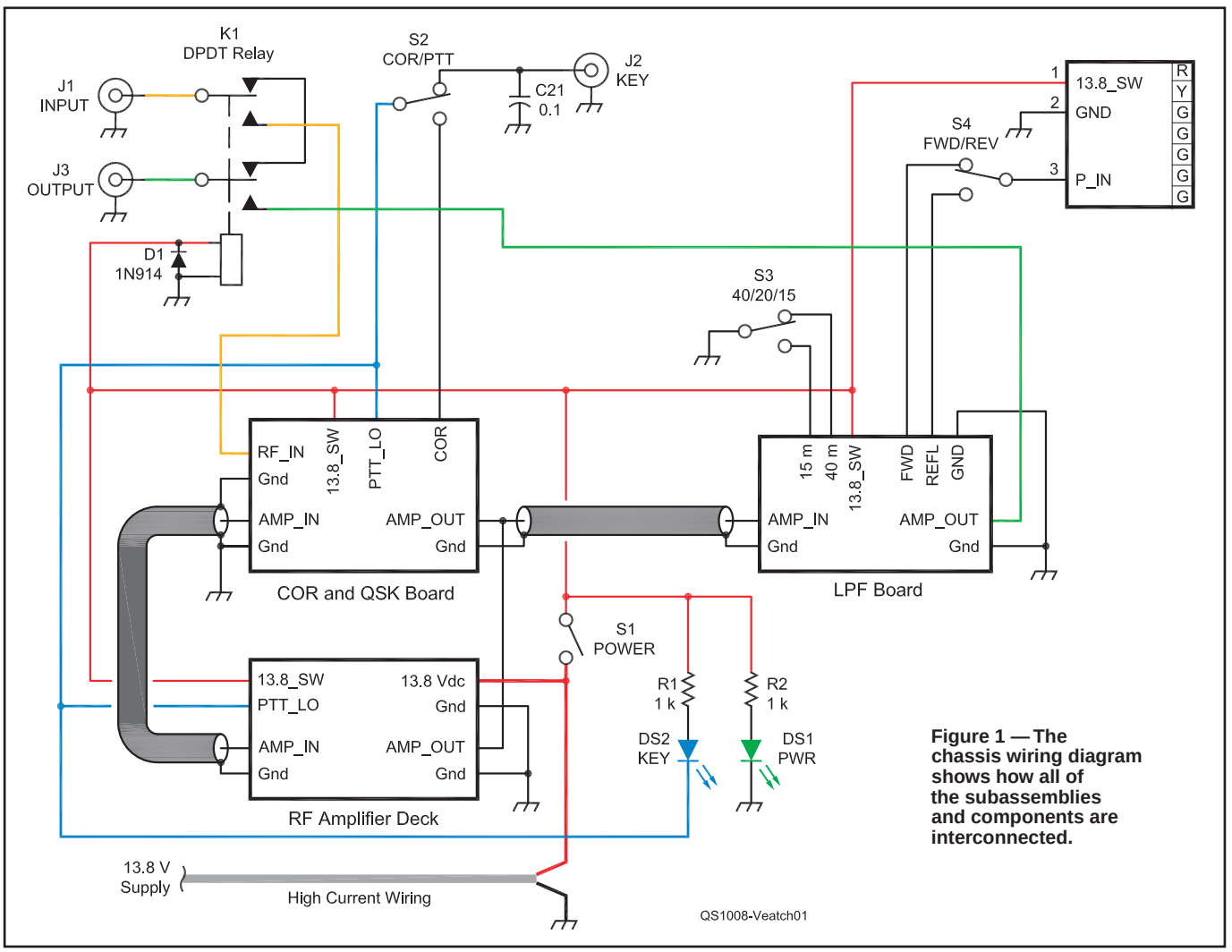


Figure 1 — The chassis wiring diagram shows how all of the subassemblies and components are interconnected.

was specifically designed to meet the special category of "most features in an amplifier that cost less than $125." In addition to the basic technical requirements, this amplifier features:

- Full output with an input of 2.5 W, to allow operation with other popular radios (the first HBC transceiver put out 5 W).
- Aluminum oxide power transistors were used to avoid safety issues of beryllium oxide devices.
- In addition to the required 40 meter operation, this amplifier operates on 30, 20, 17 and 15 meters.
- Transmit-receive switching supports full break-in (QSK) operation and, if selected, will switch over based on RF for radios without transmit-receive keying contacts. This is sometimes referred to as a carrier operated relay (COR), in spite of the fact that it also works with suppressed carrier modes.
- A directional wattmeter reads the forward and reflected power at the output of the amplifier with a display of seven LEDs serving as a bar graph.
- The amplifier also includes a mechanical bypass relay that connects the input and output connectors when the amplifier is powered off.

The total cost for the amplifier, as built, was under $95. A more basic one band version could be built for less than $50. The complete bill of materials including suppliers is available on the QST-In-Depth Web site.[2] The design is easy to modify, so only build the features you need and add more if you think that I've left out something important.

Transistors, Transistors, Transistors!

The first step in designing a power amplifier is selecting which active amplifying device to use. I decided to limit my search to RF power transistors that operate in the HF frequency range (3 to 30 MHz) and are designed to operate in Class A or Class AB modes. Using more exotic modes, or using devices that were not primarily designed for RF linear amplifier service seemed a bit ambitious for this competition and my design skills.

I evaluated every readily available 13.8 V, HF device to determine the cheapest way to get to 50 W. My answer was the RD16HHT1 power MOSFET available from RF Parts for $4.20.[3] Since the RD16HHT1 is only rated for 16 W, four devices are required to get to required output with a total transistor cost of less than $17.

I experimented with input and output combiners but quickly settled on the venerable and widely used parallel push-pull architecture. This allows the bias current of each transistor to be adjusted individually so matching of the devices is not required. The RD16HHT1 comes in a TO-220 package with the mounting tab internally connected to the source, which is grounded in this amplifier, so no electrical insulation is required between the heat sink and the transistors. Another advantage of using four devices is that the power in an individual device is still relatively low, which makes the job of removing heat a little easier. This amplifier uses an extruded aluminum heat sink that is bigger than necessary for this application so go ahead and run RTTY all night long.

The Circuit

The amplifier consists of four basic assemblies that are wired together and connected to the chassis mounted components to form a complete amplifier. The chassis wiring diagram (Figure 1) shows how all of these components are interconnected. Figure 2 shows the way the subassemblies are positioned on the bottom of the chassis.

The Amplifier Deck

The RF amplifier assembly schematic (Figure 3) shows the various components and connections of the amplifier deck. MOSFETs Q1 through Q4 form the RF amplifier. The parallel combination of Q1 and Q2 operate push-pull with the parallel combination of Q3 and Q4. The drain voltage is applied to all four MOSFETs via the primary winding of transformer T2. When the gate voltage is 0, the MOSFETs are in cutoff and very little drain current flows. This means that it is not necessary to switch the high current 13.8 V supply, but it also means that T2 and the drain connections are at 13.8 V even if the front panel POWER switch is set to OFF. So remember to disconnect the amplifier from the power supply before working on the amplifier.

Bias for each MOSFET is supplied via variable 1 kΩ resistors (R1 to R4), bypassed with 0.1 µF capacitors (C5 to C8) through 47 Ω resistors (R1 to R4). The 5.1 V Zener diode, D3, provides a regulated voltage to VR1-VR4 and even if inadvertently set to maximum voltage, the drain current, while excessive, will not destroy the MOSFET. The bias point changes very little with temperature so there is no need for temperature compensation on the bias voltage. Q5 is used as a switch to turn on the bias supply when the amplifier is keyed and the base of Q5 is pulled low via R7. R5 and R6 provide current limiting to correctly bias D3.

T1 couples the drive into the amplifier. The turns ratio is 1:1 and provides an input VSWR of better than 1.5:1. It would be possible to design an input matching network to improve the match if the transmitter driving the amplifier required a better match. An input attenuator would also improve the match for transmitters in the 5 to 10 W range. T2 has a 1:4 turns ratio to match the drain impedance to 50 Ω. R15, R16, C23 and C24 are used to supply a small amount of negative feedback, which helps to reduce intermodulation distortion.

The Low Pass Filter and Directional Coupler Board

The schematic of the low pass filter board (Figure 4 on the QST-In-Depth Web page) shows the components and connections of the output circuitry. Relays RY201-RY204 are DPDT relays wired with both poles in parallel to increase the power handling capability and reduce stray inductance. These relays select one of

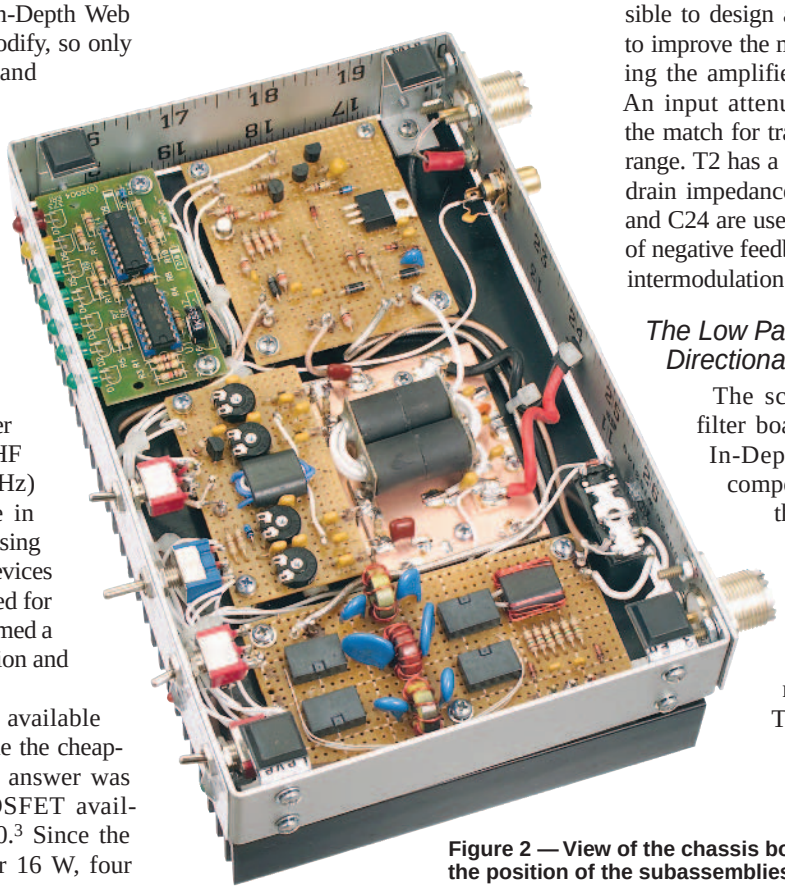


Figure 2 — View of the chassis bottom shows the position of the subassemblies.

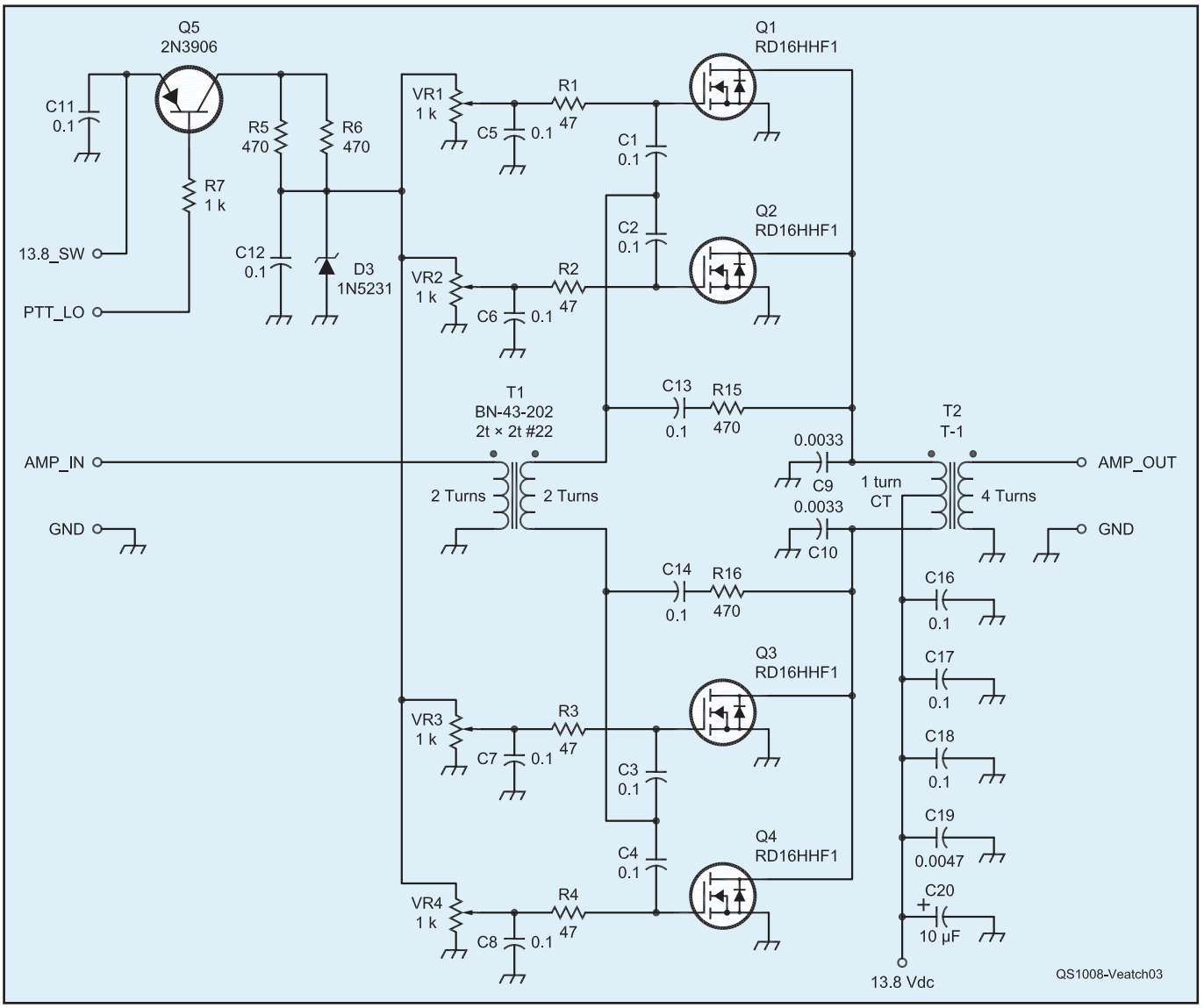


Figure 3 — The RF amplifier assembly schematic shows the various components and connections within the amplifier deck.

three low pass filters which, in turn, selects the band of operation. C107, C108, C109 and L103 are used on 40 meters. C104, C105, C106 and L102 are used on 30 and 20 meters, and C101, C102, C103 and L101 are used on 17 and 15 meters. There are only two control lines because with no relays activated, the 20/30 meter filter is selected. This allows the use of a center off toggle switch for band selection.

The directional coupler used to drive the power meter consists of a BN-43-202 binocular core with a total of four windings. Two of the windings consist of a single loop of #22 AWG Teflon insulated wire passed through each opening in the core. One is in line with the RF output and the other is terminated on each end by three 150 Ω resistors in parallel (50 Ω). Each opening also has a 10 turn winding of #30 AWG enameled wire, one end connected to ground, the other connected to the opposite 1 turn winding. The resulting RF across the terminating resistors is rectified to produce a dc voltage proportional to the forward or reflected power.

This is a fairly standard design and is easy to reproduce if the leads are kept short. I found the best way to build this directional coupler is to focus on neat layout and good RF practices, then figure out which one is forward and which is reverse after the fact.

The COR and QSK Board

The COR and QSK board (Figure 5 on the QST-In-Depth Web page) contains a single pole double throw RF switch, driving circuitry and an RF detector that can be used to key the amplifier when RF is applied to the input. D201 applies the RF to the input of the amplifier when biased on by Q202 and Q203. When Q202 and Q203 are off (unkeyed) a reverse bias is applied to D201 using R203 and R209. L201 and L202 isolate the RF lines from the DC bias voltages.

D202 and D203 are biased on by Q201 allowing the received signal to pass from the output of the amplifier to the input connector. During transmit, a small portion of the output voltage provided via C206 is converted to a large negative dc voltage by the voltage doubler circuit formed by D204, D205, C205 and C206. This negative voltage is applied to D202 and D203 via R212. L203 provides a dc return path for D202. The dc return for D203 is via the secondary winding of T2 on the amplifier deck.

The voltage produced at the output of the doubler can reach –100 V with 50 W of output power. Q201 is rated to handle –200 V so don't substitute just any P channel MOSFET here.

The Display Board

The display board consists of an off-the-shelf kit available from Jameco Electronics.[4] The kit is designed to be a voltage monitor and can be populated for a variety of different voltages and ranges. In this application we'd like to measure 0 to around 6.5 V, so we'll need to populate our board differently from any of the instructions included with the kit.

The LED dropping resistors, R3, R5, R7, R9, R11, R13 and R14, are 470 Ω. The voltage divider resistors, R1, R2, R4, R6, R8, R10, R12 and R18, are 1 kΩ. Put the 5.1 V Zener diode in the space for D8 *backwards* and bend the anode lead over to pick up the ground connection marked for D9's cathode. Do not populate D9 or R17. R15 is 1 kΩ and R16 is a 1 kΩ Trimpot. I put a 0.1 µF capacitor across the power leads of each IC (pins 4 and 11). 13.8 V is applied to the places marked INPUT + and INPUT – in the indicated polarity. The input voltage from the directional coupler is applied from the empty R17 leg that connects to R16 and ground.

I used D1-5 as green LEDs, D6 as yellow and D7 as red, but feel free to employ any color scheme that you feel appropriate. All of the required components are supplied with the kit except one green LED, which is included on the bill of materials on the QST-In-Depth Web site. I set my display so that the yellow LED comes on right around 50 W but if you don't have a wattmeter and can't borrow one set the yellow LED on at 6.5 V input and you'll be pretty close.

Construction

The amplifier case is made from an aluminum yardstick available from local hardware stores. An aluminum extruded heat sink forms the top of the case and the ruler is cut and bent into a rectangle that forms the back, front and sides of the case. Small L brackets are formed from small pieces of leftover ruler to attach the rectangle to the bottom of the heat sink. The individual boards and assemblies are mounted to the heat sink with standoffs secured in tapped holes. The COR/QSK and LPF/Directional coupler boards are built on small pieces of perforated project board and, as mentioned earlier, the display board is a PCB from a kit. The biasing components for the amplifier are assembled on perf board mounted above the RF MOSFETs so that the leads from R1 through R4 project off the perf board adjacent to the gate leads of the MOSFETs.

T2 and the high power dc components are mounted on a small piece of unetched PCB mounted in the chassis. Once the PCB is mounted to the heat sink and PA MOSFETs are mounted, use heat sink compound at the junction of the MOSFETs and the heat sink.

Use leftover PCB pieces to make insolated PCB lands for the MOSFET drains and V_{CC} connection points. T2 has metal tubes and PCBs on either end that form the primary winding. The drain side is the end that is split and the V_{CC} side is continuous. Solder T2 to the PCB lands before mounting T2 in the chassis. Form the leads of C8, C9, C16, C17, C18, C19 and C20 and solder one leg of each to the appropriate PC board land before this assembly is placed in the chassis.

Wind four turns for the secondary of T2 leaving the ends fairly long and free. Use Teflon coated #18 AWG wire for this winding. Trim the source (center) leads and solder to the PCB to make a ground connection at each MOSFET. Place the T2, land and capacitor assembly on the PCB and slide the drain lands under the drain (left hand lead) on each MOSFET and solder. Solder the ground (unconnected lead) for C8, C9, C16, C17, C18, C19 and C20 to the ground PCB. Solder one end of T2's secondary to a convenient spot on the ground plane. This is all that is needed to hold T2 in place but feel free to put a dab of RTV under T2 if you like.

The remainder of the chassis wiring can be completed at this point. This includes connections to the rear panel connectors and the front panel switches and LED as well as the module interconnections.

T1 is made from 2 turns of #22 AWG Teflon insulated wire for the primary and 2 turns for the secondary. Make the leads for each winding come out opposite ends of the core to simplify final connection. The core can be attached to the perf board by RTV adhesive for stability, if desired. Wherever an off-board connection is to be made, create a soldering loop with a component lead.

It may help to label these on the board with a single letter and mark them on the schematic as well. Mount all perf boards in the final position and make all off-board connections except the MOSFET gate connections. The front panel lettering is on a piece of glossy photo paper with the panel markings printed with an inkjet printer. There's a rectangular cutout for the LEDs and I blackened the rules with a marker to increase the display contrast.

Adjustments

After the amplifier is assembled, double check all wiring, check for shorts, then apply 13.8 V to the amplifier. Before connecting the gate leads to the bias resistors, check that the corresponding variable resistor causes the voltage at R1 through R4 to swing from 0 to 5 V dc and make sure that the voltage present at R1 to R4 goes to 0 V when the PPT line is not grounded. Then reset VR1-VR4 to 0 V at R-R4 respectively. Remove the 13.8 V supply and connect the MOSFET gates to the bias resistors R1-R4 as indicated.

My connections are arranged so that I can easily isolate the dc power going to the MOSFETs and that which goes to the bias and keying circuitry. If you can do this you'll set the bias closer because the bias circuitry seems to drift a little. In any case connect a milliammeter in line with the amplifier, note the idling current and adjust VR1 to VR4 in sequence looking for a 10 mA rise in the current. The distortion products will be lower if you take some time to balance these closely. Remove the milliammeter before applying the RF drive.

On the Air

Now you are ready to connect your favorite QRP transmitter, an antenna and work some stations. The drive level for 50 W output is just over 2 W. The amplifier is nice and linear at this power level. If running CW it's okay to drive it up to 70 or 75 W output but not for SSB. I tried this amplifier with my Elecraft K2, which does not have a PTT output so I ran the COR circuit. From Baltimore I was able to work Mississippi, Austria, France and Argentina with a GAP vertical on the roof of a row house.

Notes

[1]J. Hallas, W1ZR, "ARRL Homebrew Challenge," *QST,* Aug 2006, p 20.
[2]**www.arrl.org/qst-in-depth**
[3]**www.rfparts.com**
[4]**www.jameco.com**

ARRL member Jim Veatch, WA2EUJ, holds an Amateur Extra class license and has been a ham since 1976. Jim was a winner of the first ARRL Homebrew Challenge with his TAK-40 transceiver described in May 2008 QST. *He holds degrees in electronics technology and electrical engineering. Jim spent 12 years engineering long range HF and VHF sites for air-to-ground communications around the world. He is currently employed by L3 Communications developing RF direction finding systems. Jim is active on HF and 2 meters and is a volunteer in the Baltimore City RACES organization. He can be reached at 1704 Bolton St, Baltimore, MD 21217 or at* **wa2euj@arrl.net**.

Simplify Transceiver to Amplifier Interfacing with an In-Line Attenuator

Solve a classic interface problem with this simple to make device.

Phil Salas, AD5X

Many high power HF amplifiers require less than 100 W to drive them to full output. All modern transceivers have the ability to have their output power reduced as necessary to properly drive an external amplifier. Besides having to remember to turn down your transceiver's output power when you put your amplifier on-line, it can also be a hassle to readjust your transceiver's output power, especially if it has to be done via a menu setting.

The Problem May be More Serious

Many transceivers output a full power transmit spike when first keyed at the beginning of each new transmission, even if the power has been reduced. The output power is quickly cut back to the desired output level by the radio's internal automatic level control (ALC) circuitry. Even so, the initial spike may cause some amplifiers to go into a fault condition due to the amplifier's internal overdrive protection circuitry.

I first ran into this problem while driving my Ameritron ALS-600 solid-state amplifier with my ICOM IC-706MKIIG transceiver. The ALS-600 needs about 65 W to drive it to full output power. Turning back the power of the IC-706MKIIG to 65 W is done via a menu setting. But the first dit of each new CW transmission would always result in an initial full power spike, which would badly overdrive the amplifier.

The Solution at Hand

I solved these issues by simply putting a 2 dB attenuator pad in series with the transceiver's output. This permits me to leave the radio set for full power all the time, while the resulting power to the amplifier stays constant at about 60 to 65 W. With the transceiver set for full output power, a full power spike won't occur. The 2 dB attenuator has minimal effect on the receiver signal-to-noise ratio, and makes a negligible reduction in receiver sensitivity. Finally, the attenuator even improves the match to your transceiver when feeding a less than perfect tuned amplifier input network — as you might have if trying to use an older amplifier

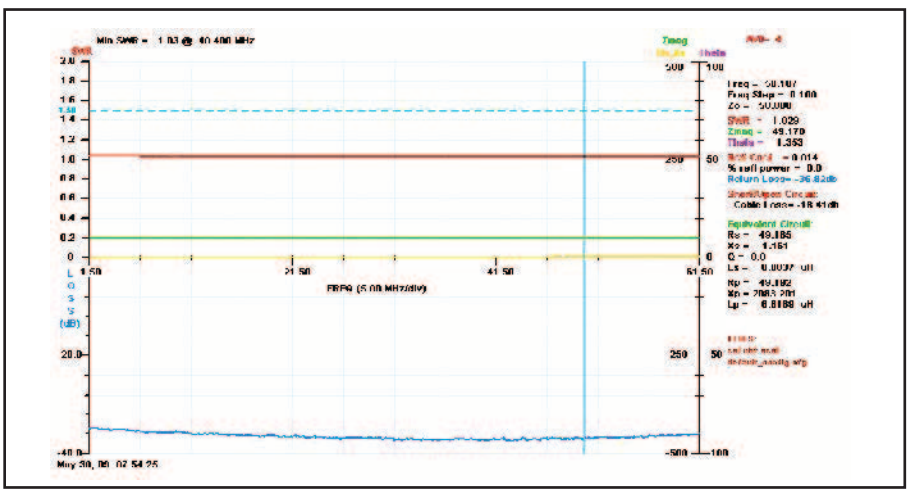
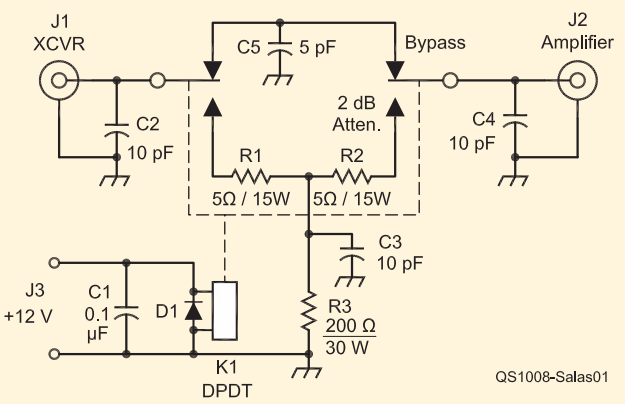


Figure 2 — SWR and Return Loss plot — 2 dB attenuator with 5 and 10 pF tuning capacitors.

Figure 1 — Schematic diagram and parts list for the 2 dB power attenuator. Mouser parts are available at www.mouser.com.
C1 — 0.1 µF, 50 V capacitor (Mouser 140-50U5-104M-RC).
C2-C4 — 10 pF, 1 kV ceramic capacitor (Mouser 75-561R10TCCQ10).
C5 — 5 pF, 1 kV ceramic capacitor (Mouser 75-561R10TCCV50).
D1 — 1N4003 diode (Mouser 625-1N4003-E3/73).
J1, J2 — SO-239, UHF type coaxial jacks (Mouser 601-25-7350).
J3 — 2.1 × 5.5 mm dc power connector (Mouser 163-4304-E).
K1 — 12 V, DPDT relay (Mouser 769-DS2E-M-DC12V).*
R1, R2 — 5 Ω, 15 W thick film resistor (Mouser 684-MP915-5).
R3 — 200 Ω, 30 W thick film resistor (Mouser 684-MP930-200).
Cast aluminum box (Mouser 563-CU-5123).
***Alternately, a DPDT slide switch, such as Mouser 629-GF11261110, can be used.**



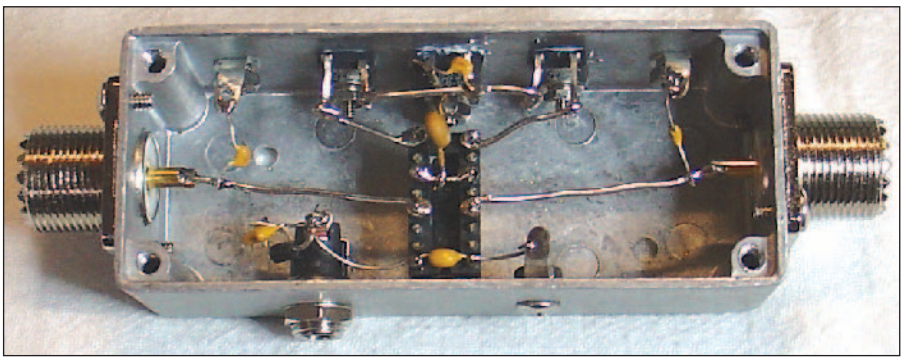


Figure 3 — Inside view of 2 dB power attenuator mounted in cast aluminum box.

Figure 4 — Attenuator mounted on top of the ALS-600 amplifier cabinet for additional heat disipation capacity.

on the 30, 17 or 12 meter bands that weren't available when the amplifier was made. As an example, a 2:1 load SWR becomes a 1.5:1 SWR with the 2 dB pad placed in-line.

Under the Covers

Figure 1 is the schematic diagram with parts list of my 2 dB attenuator. While this is not a precision attenuator, it is certainly close enough for our purposes (1.04:1 SWR if terminated in a perfect 50 Ω load, with 1.95 dB loss). The resistors are Caddock 15 and 30 W thick-film resistors, which are purely resistive well up into the VHF range. The 5 Ω resistors dissipate about 7 W each at full power so you can use 15 W rated resistors. The 200 Ω resistor dissipates about 20 W so a 30 W rated resistor is used.

An internal DPDT relay bypasses the 2 dB attenuator if operating barefoot. The relay contacts are rated to 3 A, which is more than sufficient for a 100 W transceiver. Note that the relay coil is polarity sensitive. If desired, you may wish to use a DPDT switch instead of the relay. Point-to-point wiring is used, which works pretty well for HF operation. There is, however, some stray inductance that I tuned out with the small capacitors shown on the schematic.

This tuning is not really necessary for most HF applications, as the SWR is less than 1.2:1 through 30 MHz without the capacitors. Figure 2 shows the SWR plots with the tuned 2 dB attenuator is in-line.

Attenuator Construction

The attenuator is built into a cast aluminum box, which does a good job of dissipating the heat, especially for low duty cycle CW and SSB amateur applications (see Figure 3). However, you may want to provide additional heat sinking as this attenuator dissipates about 35 W. In my case, I mounted the attenuator directly to the cover of my ALS-600 amplifier as you can see in Figure 4. The ALS-600 cover provides all the power dissipation needed. For a stand-alone unit (not mounted to a large surface), a large microprocessor-type heat sink can be attached to the die-cast attenuator box.

The attenuator relay is powered from the +12 V dc RCA accessory jack on the back of the ALS-600. In this way, the attenuator automatically goes in line whenever the amplifier is turned on. It's a truly "stupid-proof" implementation for me, as there is no thinking necessary about drive power when I want to use the amplifier.

If 2 dB isn't Enough

If your amplifier wants to see 50 W drive, the attenuator can easily be changed to a 3 dB unit that also uses readily available thick film resistors. Change R1 and R2 to 10 Ω, 30 W (Mouser 684-MP930-10) and R3 to 150 Ω, 30 W (Mouser 684-MP930-150) units. Again, this is not a perfect 3 dB attenuator pad, but it is very close (1.06:1 SWR when terminated in a perfect 50 Ω load, and 3.2 dB loss). The same compensating capacitors as in the 2 dB attenuator will improve the match here as well. Again, these are not really necessary — especially if you use the DPDT slide switch, which has less stray inductance.

If 2 or 3 dB of attenuation is not enough, within the same cast aluminum box you can cascade two attenuators as necessary to achieve 4, 5 or 6 dB of attenuation using these inexpensive and readily available thick film resistors.

Conclusion

I've described a simple and automatic means of reducing transceiver power when you are driving an amplifier. Not only does the described attenuator eliminate having to remember to turn down your transceiver's output power when driving an amplifier, but it also eliminates an initial high power spike that is output by some transceivers when they are adjusted for less than full power output. If you are having problems with a high amplifier input SWR, such as if operating on the 30, 17 and 12 meter bands with an amplifier built before they became ham bands, this attenuator will also improve that mismatch. [Note that 30 meter operation in the US is limited to 200 W PEP output. — *Ed.*] Build this inexpensive accessory and make amplifier operation more convenient.

Photos by the author.

Frequent QST *author and ARRL Life Member Phil Salas, AD5X, has been an active ham since he was first licensed in 1964. He obtained BSEE and MSEE degrees from Virginia Tech and Southern Methodist University, respectively, and spent the next 33 years holding positions from design engineer to vice president of engineering in microwave and lightwave development. Now fully retired, Phil enjoys spending all his time with his wife Debbie, N5UPT, along with continued tinkering with ham related projects.*

You can reach Phil at 1517 Creekside Dr, Richardson, TX 75081 or at **ad5x@arrl.net**.

Build a Two Finger Key

Electronic keyer paddles don't have to be expensive, and they don't have to move sideways.

Burt VanderClute, N4ERM

I enjoyed the recent *QST* Product Reviews of dual-lever keyer paddles for sending Morse code with an electronic keyer, but I am concerned that readers might wrongly think that they must spend upwards of $300 to get a usable dual-lever paddle.[1,2] The paddles in this article can be built for little or no expense with just common household tools. Even the keys that actually send code and have memory can be built for less than $50, even if you have to purchase everything.

[1]Notes appear on page 43.

A Different Drummer

First sit down at a table and tap your fingers. Easy, isn't it? This up and down finger motion is easy, and probably why most of us start learning the code using the up and down vertical movement of the classic straight key. So why is it that when we advance from the straight key to paddles for an electronic key, most folks change from vertical to horizontal motion? The reason *may* be that the historical progression went from vertical (straight) key to the horizontal (sideswiper or semiautomatic key, a *bug*). Perhaps the transition back to vertical was too difficult for an experienced bug user.

For people considering the transition to an electronic key today, the bug experience is likely not an issue. The proposed key arrangement will preserve the horizontal touch for a bug if you want to add it to your skills later.

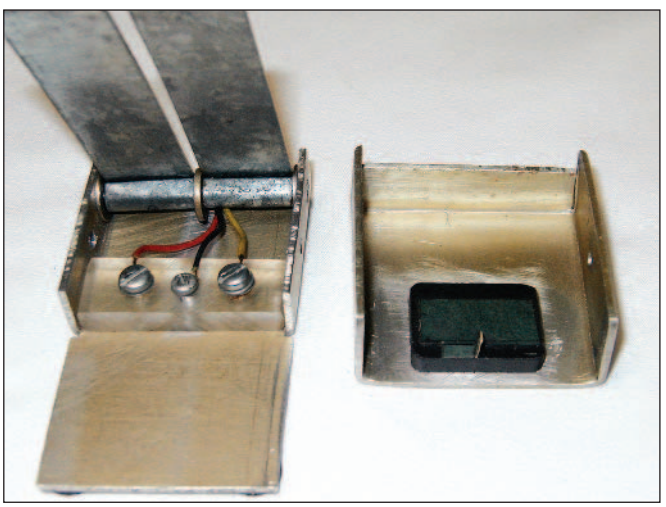


Figure 1 — The two finger paddle with cover removed and levers raised to reveal the contact screws mounted on a small sheet of acrylic. The bottom of the screws that form the dot and dash contacts must be insulated from the base. Note the magnet in the inverted cover.

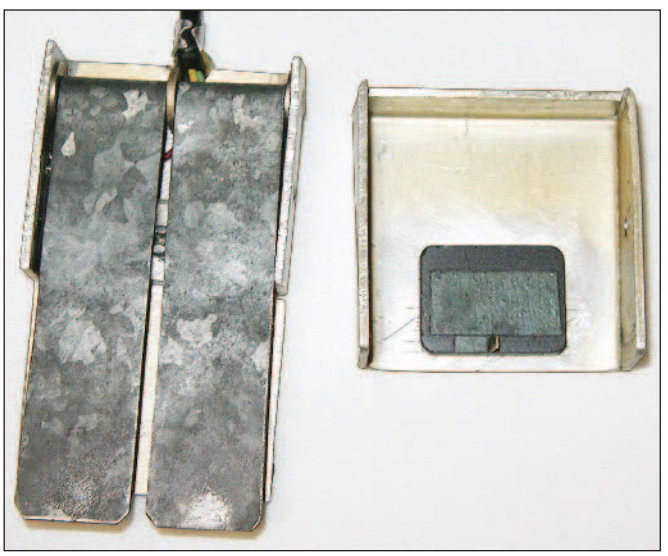


Figure 2 — The two finger paddle with cover removed and ferrous levers lowered to normal position. In use, the magnet would lift the levers until depressed by a finger. If desired, small round or square pieces of scrap acrylic could be glued to each lever to serve as more elegant finger pieces.

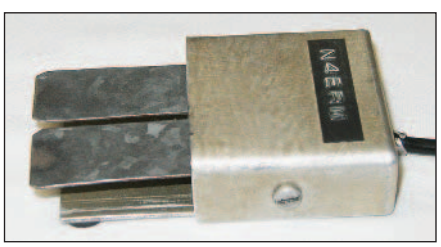


Figure 3 — Side view of the two finger paddle with cover in place ready for use.

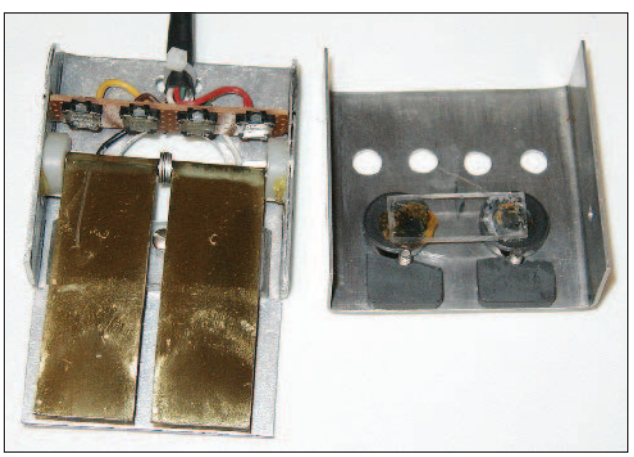


Figure 4 — Enhanced paddles with memory buttons, shown with cover removed.

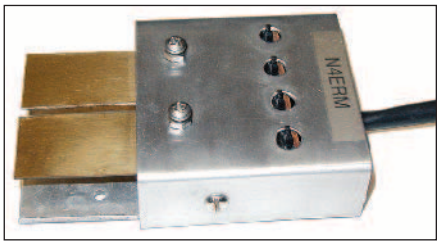


Figure 5 — Enhanced paddles with cover installed. The magnetic tension adjustment screws can be seen on top of the cover.

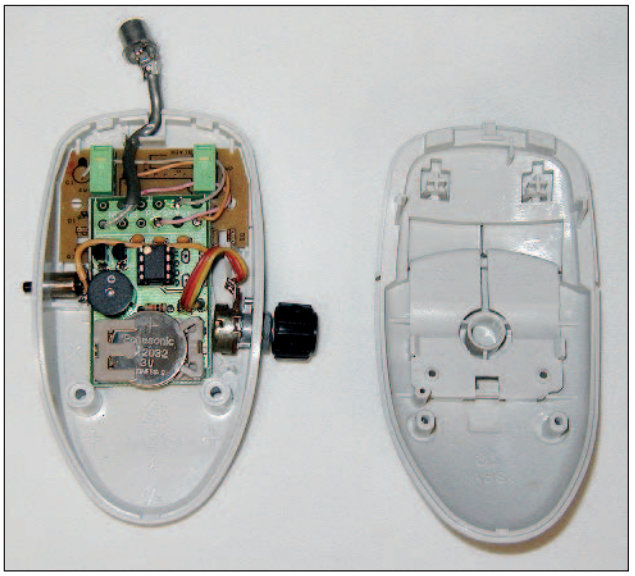


Figure 6 — Inside view of the mouse based paddles. The NØXAS Super PicoKeyer is used in this version, although the paddle contacts could be used with an internal keyer as well. The speed control and memory button for the keyer board are mounted on the sides of the housing.

These vertical dual-paddle keys have several advantages over their horizontal brothers. The keys are played with the soft touch of two fingers so the action is gently toward the operating surface, rather than parallel to it. No heavy base, straps, leg mounts or tie downs are required. The keyer can even be held in the hand while sending. They're perfect for portable or mobile operation. These paddles even require fewer muscles to operate.

Build Your Own Vertical Keyer Paddles

Armed with a hacksaw, drill, file, hammer and vise, I set about making my first two finger key. The design is based on a *QST* article by John Lewis, W5TS, that appeared many years ago.[3] The ferrous paddles are held in the UP position by a magnet.[4] Pressing on the paddles with pointer and middle finger completes the dot and dash circuits respectively by contacting small screws mounted into a piece of nonconductive material, such as acrylic, polycarbonate or wood. One of these keys is shown in Figures 1 through 3. Let's describe how this one was constructed.

The aluminum for the base and top of the key can come from old cast off electronics chassis or baking sheets.[5] The steel paddle material can also come from a variety of sources. The paddles shown were cut out of an old galvanized radiator humidifier. If the material can be attracted to a magnet, you're in, but the material must be thin enough to wrap. The paddles are wrapped around a suitable pivot rod such as an 8 or 10 penny nail cut to fit through the bent up sides of the base that support the pivot rod. The paddles should make good electrical contact with the pivot, but should move freely up and down and not bind on the pivot. Washers were used to keep space between the two paddles and the sides of the base as shown.

Glue the magnet to the cover near the front. I used some material over the top of the magnet to cushion the keys and to shorten their "throw." The short piece of material seen at the center front of the magnet in Figure 1 is to keep the key levers separated.

I used ⅜ inch acrylic sheet and ¼ inch long screws for the dot and dash contacts. The contact screws were inserted into tapped holes in the acrylic. A small bolt and nut were counter sunk into the acrylic and secured both it and the common (ground) lead to the keyer base. The three connections are made under the screws and routed out the rear of the assembly.

Wiring can be to your preference. I selected the pointer finger, since it is usually more agile, to key the dots and the middle finger is used for the dashes. With a plug to match your transceiver, the key should now be ready to run with your radio's internal keyer.

Refinements Happen

Later, I built the CMOS Super Keyer II kit from Idiom Press in order to take advantage of its four memories.[6] I moved the memory buttons to the key as shown in Figure 4. The four memory buttons were mounted on a piece of perforated project board and glued vertically inside the key. This key also featured a magnet on each of the dot and dash paddles with screws to adjust the tension and throw of the paddles (see Figure 5) — an easy product improvement. Here the dual paddles were cut from a brass colored steel frame that was part of a fireplace screen. The base and cover were from a cast off aluminum baking sheet.

Figure 7 — Mouse based paddle with keyer, buttoned up and ready to go. For mobile use, a pair of stick-on hook and loop fastener strips can keep the paddle in place.

Paddles on the Road

The next challenge came when I wanted to use code while on trips in the car. At first I used one of my regular two finger keys with the internal keyer of my mobile HF transceiver. I built an NØXAS Super PicoKeyer to have a keyer and memory independent of the radio's keyer.[7] I used a junked computer mouse as the basis for the keyer paddles with the two mouse buttons serving as the paddles. As shown in Figure 6, the original mouse switch contacts are used with the keyer module in the space made available by removing the remainder of the mouse entrails. The speed control and memory button are mounted on the sides of the housing as shown.

In addition to the dit and dah buttons, the keyer has a button to access the four memories and a SPEED control. I mounted the mouse key (Figure 7) on my steering column using hook and loop fasteners. The keyer is shown in Figure 8.

More recently, I built a two finger touch keyer, this one from the kit version (P3K) from **www.cwtouchkeyer.com**. The touch paddles were etched from a single piece of copper clad circuit board and stuck to, but isolated from, the tin by using strips of double sided sticky tape. See Figure 9 for details. Perfect keying and no moving parts.

One of the greatest rewards of being a ham is constructing your own antennas, radios and

Figure 8 — NØXAS Super PicoKeyer in Altoids box.

Figure 9 — Inside view of Altoids can mounted P3K keyer attached with double sided tape.

equipment. I hope this article will renew interest in the construction and use of these inexpensive and effective two finger keys. They rival the most expensive paddles for efficiency and ease of use, but cost much less. You can take pride in having built it yourself.

Notes

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

[2]B. Prior, N7RR, "Product Review — High End Dual-Lever Keyer Paddles," Part 1 — *QST*, May 2010, pp 49-52; Part 2 — *QST*, Jun 2010, pp 49-51.

[3]J. Lewis, W5TS, "The Code at Your Fingertips, *QST*, Nov 1976, p 28.

[4]Suitable magnets are available from RadioShack in a number of different sizes.

[5]Material for the key base and cover can be any suitable material. The important components are the magnet, ferrous paddles and the pivot pin they move on, as well as the dit, dah contacts and common connection.

[6]**www.idiompress.com/keyers.php**

[7]**www.hamgadgets.com**

Photos by the author.

Burt VanderClute, N4ERM, earned his Novice class license in 1958 and received the call sign WN2BMN. He upgraded to General class in 1976 (WB4RLQ) and earned Advanced and Amateur Extra class licenses, and his current call in 1984. Burt earned a BA from Rutgers University and an MMAS degree from the US Army Command and General Staff College. He is retired following a 23 year career as a US Army officer and has been employed in the cellular industry since 1988.

Burt has been licensed as TA2BAV and DA1ER. He is a member of ARRL and the Cape Fear Amateur Radio Society (CFARS) in Fayetteville, North Carolina. Burt has earned WAC, WAS and DXCC awards. He is an avid builder and tinkerer and has authored several articles for the local radio club titled "Build is Better than Buy," to emphasize that one need not be wealthy to be a ham. Burt can be reached at 7669 Heriot Dr, Fayetteville, NC 28311, or at **n4erm@arrl.net**.

New Products

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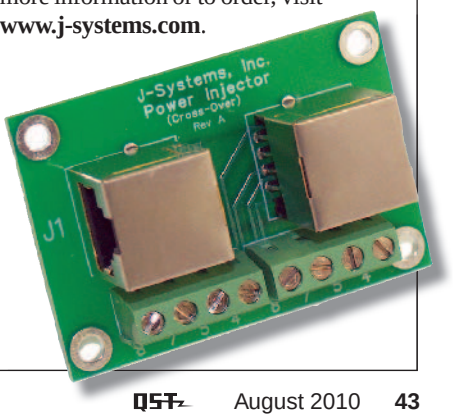

Earning 160 Meter WAS in 117 Days

This feat can be a lot easier than you may believe, even from a small lot using SSB.

Greg Crossman, WEØD

This article is not only about showing you how you can achieve a Worked All States (WAS) award on 160 meters, but also about how it can be done in a community with antenna restrictions.

I have been licensed since 1959 and have never been much into award chasing or contesting. I do enjoy listening and joining a conversation when I have something to add. Phil McMillan, K9ZK, a friend of mine in Florida moved to Illinois. Once there, he had his house built and then he started building his station. He had a friend in Frank Baker, WØKH, who checked into the 3905 Century Club Net on 1.892 MHz. Phil became interested in this band and net so he put up a double bazooka and a vertical antenna for 160 meters. The double bazooka antenna is similar in size to a dipole, about 240 feet long. Phil worked his WAS during his first season on 160 meters.

A Goal to Meet

It interested me to see if I could also achieve such an award, but to do it on 160 meters SSB. Wow, that would be impressive! I live in a community with antenna restrictions, however, so I wondered whether it would even be possible for me to work WAS on 160 meters. I decided to find out.

The only antenna I thought that might be practical, because of the antenna restrictions, would be a short vertical. After all, my lot size was really too small for a horizontal 160 meter antenna. Another consideration was how to put up a 160 meter vertical antenna so that my neighbors wouldn't notice.

The Solution at Hand

I eventually settled on building a telescoping, base loaded, short vertical that I could raise up at night when I would go on the air, and that I could take down when it was not in use (see Figure 1). I purchased a multisection 32 foot fiberglass pole from Max-Gain Systems to serve as the support.[1] I then dug a 2½ foot deep hole, and put a short length of 2 inch inside diameter PVC tubing into the hole. This was to serve as the base for my antenna (see Figure 2). The bottom section of the fiberglass antenna pole itself had a 2 inch outside diameter, so it fit nicely inside the PVC base.

Hooking it Up

I then attached an electrical box with a banana jack on top and an SO-239 UHF connector on the side to the PVC base (see Figure 3). The antenna wire can be plugged into the jack at night. The box also provided a convenient spot to terminate my radial field and grounding system. The coax leading to the transmitter connects to the UHF jack. Details of the connection arrangements are shown in Figure 4.

The next thing I had to do was rig the short vertical. With the multisection fiberglass pole fully collapsed and lying on the ground, I attached a length of piano wire to the top of (and outside) the highest section using a hose clamp.[2] I then extended the top section out as far as I could and repeated the process using a new hose clamp, making sure the wire above the clamp was tight. For each section I did the same until I reached the bottom section. I used the bottom section as the form for the loading coil.

Making it Tune

A loading coil would be needed since the antenna itself was only 30 feet high. I had to wind nearly 100 feet of wire around the 2 inch round bottom section of the fiberglass pole, more than needed so I could trim off small lengths of wire until the vertical became resonant at 1.892 MHz. Each time

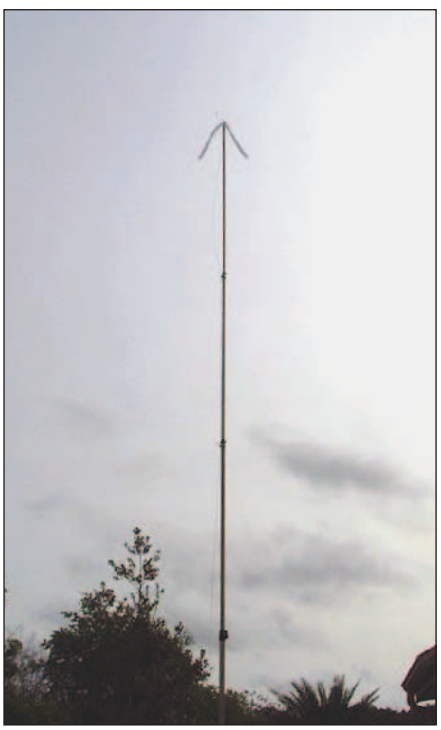

Figure 1 — A rare view of the antenna in elevated position. This normally only happens at night, when the neighbors can't see it and 160 meters is open.

Figure 2 — Close-up view of the base construction. A standard PVC pipe is used as a socket for the mast, forming a telescoping arrangement that can be removed when not in use. The three 18 inch capacitance hat wires are connected to the top of the wire.

[1]Notes appear on page 45.

Figure 3 — The hardware store electrical box contains all the interconnections.

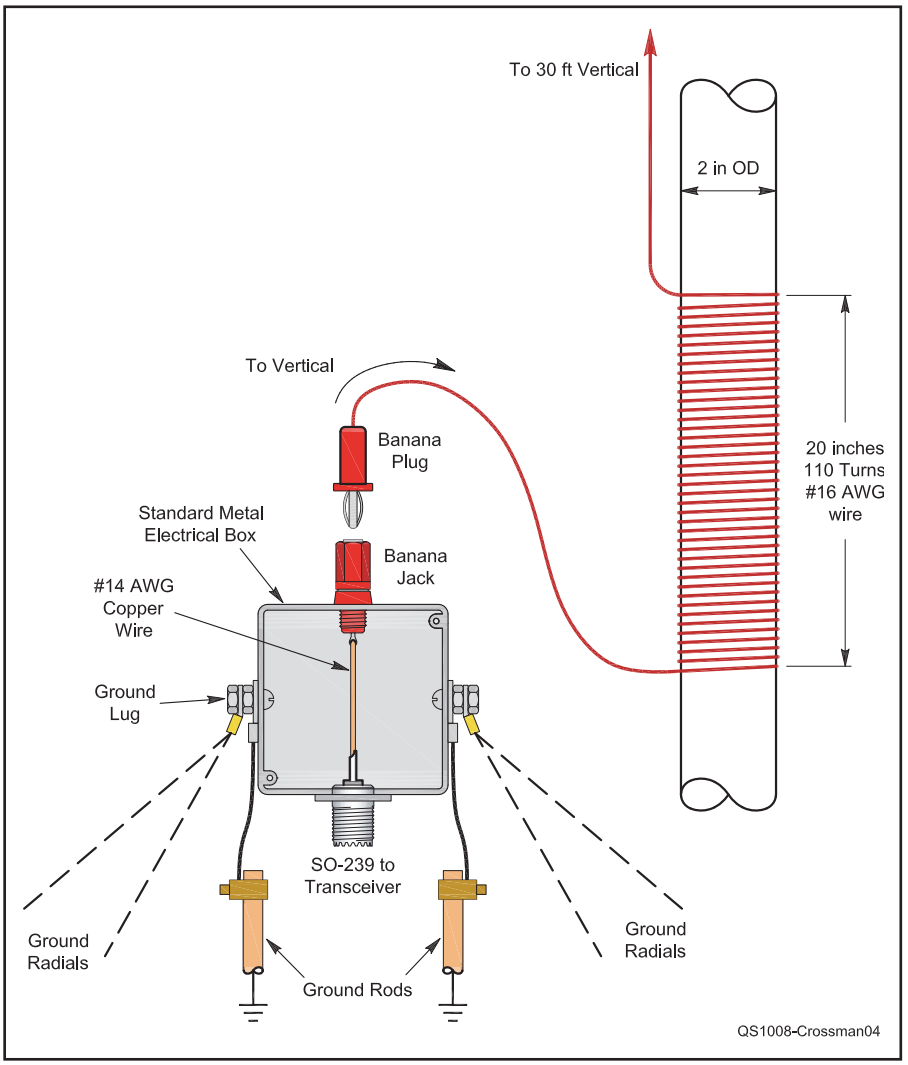

Figure 4 — Construction and wiring details for the collapsible antenna system.

before trimming the loading coil, I would check for resonance using my antenna analyzer, and then trim a short piece of wire until my desired resonant frequency was reached.

Into the Air in the Dead of Night

If fully collapsed, the antenna assembly in its base was only 4½ feet above the ground. To raise the antenna, I simply raised each section until the wire above was tight, and then I clamped that section to keep it up (there is a preinstalled compression clamp at the top of each section). I did this for all six sections of the fiberglass pole. It took less than 2 minutes to fully extend the antenna. To lower the antenna, I simply unclamp each section, one at a time. I could also unplug the banana plug, pull the antenna out of the PVC base, and place the entire assembly on the ground, if I had a good spot to store it.

With the PVC base 2½ feet in the ground, the now 160 meter base loaded vertical stood straight and tall. I used only four radials because that's all the room I had on my lot. Of course, it is recommended to use many more.[4] I would check the SWR before going on the air. It looked good, not a lot of bandwidth, but good enough to operate with my radio and amplifier on full power without the need for an antenna tuner.

On the Air

With much excitement I waited to hear the first station of the 3905 net come on the air at 10 PM local time. On October 1, 2008 I made my first contact with Dale Casterline, KM5MS, a net controller in Mississippi. I got a 5-8 signal report. Then I worked KM4MH in Alabama with a 5-9 report. By this time I was really hooked on 160 meters. By January 25, 2009 I finally worked my 50th state, all on 160 meter SSB with my homemade short vertical. I can't describe how I felt after achieving WAS.

I feel the antenna I built served me well. No one ever seemed to notice the antenna, because it only went up at night. There is lots of excitement still on 160 meters, so come and join the fun and see how easy it really is, even if you have limited space and antenna restrictions.

Special thanks to the 3905 Century Club officers, net controllers and members.

Notes

[1]**www.mgs4u.com**

[2]The piano wire is a very flexible steel wire. I selected it for the radiating part of the vertical because I raise and lower the mast each night. Because of the flexibility of the piano wire and strength when the mast is lowered, the wire just curls very nicely and does not tangle at all. [While steel is less conductive than copper or aluminum, the difference in radiated signal is less than 0.5 dB, per an *EZNEC* model.[3] — *Ed.*]

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

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

Photos by the author.

ARRL member Gregory M. Crossman WEØD, was first licensed in 1959 and is now an Amateur Extra class licensee. Greg was an electronics technician petty officer in the US Navy aboard the USS Shangri-La CVA-38. He earned an FCC First Class Radiotelephone License in 1970. Greg worked in the engineering department at the US Military Academy at West Point and then for Radio Free Europe - Radio Liberty as a senior project engineer overseeing the installation of 500 and 100 kW shortwave transmitters throughout Europe. He became a broadcast engineering consultant overseeing high power transmitter installation and then worked for Nortel Networks as a Global Deployment Manager until 2001. He is now retired and enjoying Amateur Radio. You can reach Greg at 9429 SE 124th Loop, Summerfield, FL 34491 or at **gmxman@aol.com**. QST

Who are You Calling a *Dummy*?

Sometimes the perfect antenna is the one that radiates least.

Steve Ford, WB8IMY

WARREN KUNKLE

Figure 1 — This dummy load at KSNC-TV in Great Bend, Kansas is rated at 100 kW continuous power and is cooled by a mixture of distilled water and an ethylene glycol based heat transfer fluid. The actual load is the object that looks like a horizontal pipe along the bottom of the image.

We're so obsessed with the goal of radiating signals it seems almost inconceivable that there would ever be a time when we *wouldn't* want to radiate.

But let's say you're hunting down an odd problem in your antenna system. You'd swear the antenna is properly adjusted, but you are still seeing a high standing wave ratio (SWR) reading at the transceiver, a sure indicator that something has gone awry. If you could swap the antenna with a substitute, you might pick up a valuable clue, especially if the substitute is a *perfect* antenna guaranteed to present a 50 Ω load to your radio. If the SWR is still high with the substitute antenna in place, that means there is a problem somewhere in the transmission line between the radio and antenna.

Or let's say you've finished up a nifty little transceiver kit and you want to adjust it for proper output. It would be nice to have that perfect antenna again, preferably a perfect antenna that didn't allow your test transmissions to drive everyone else crazy.

The perfect, non-radiating antenna already exists — it is called a *dummy antenna*, or *dummy load*.

Not All Dummies are Created Equal

A dummy load is an exceedingly simple device. It is little more than a resistor in a shielded container. There can be one resistor, or many — it really doesn't matter as long as the total *load resistance* is 50 Ω.

The chief task of a dummy load is to turn RF energy into heat while radiating as little as possible. So, the design of a dummy load can vary quite a bit depending on its power rating. Dummy loads designed for use with QRP (low power) applications need only dissipate 5 W or less. As a result, they are often so small they'll fit in the palm of your hand. At the opposite end of the scale you'll find dummy loads used by commercial broadcasters. These behemoths are capable of handling tens of thousands of watts or more (see Figure 1). At these power levels, some loads resort to using continuously circulating water to carry away the heat.

Many, but not all, dummy loads found in Amateur Radio applications are air cooled. They rely on the air circulating around metal fins (heat sinks) to keep the resistive element from self destructing. Some popular higher powered dummy loads are oil cooled as described below. All loads are rated by their power handling capability and, in most cases, by how long they can safely dissipate energy. For instance, a dummy load may carry a maximum rating of 1000 W, but only for 60 seconds.

S. FORD, WB8IMY

Figure 2 — My little toolbox dummy load is rated at a maximum power of 60 W for 60 seconds.

It's wise to pay careful attention to your dummy load's power rating. Veteran amateurs may recall the famous Heathkit Cantenna. This dummy load consisted of a large 50 Ω noninductive resistor inside a 1 gallon paint can that the user was obliged to fill with transformer, mineral or other non flammable oil. I owned a Cantenna and often used it for testing my 1 kW amplifier — *briefly*. If I lingered too long while squinting at my wattmeter, the safety valve on the Cantenna would begin sputtering hot oil! The same type load is still offered by some manufacturers.

And speaking of veteran hams, these same old timers will also be quick to remind you that dummy loads *do* radiate. It's all a matter of degree, after all. If you are pumping 500 W into a dummy load, chances are at least some of the RF energy will escape. Amateur Radio lore is replete with tales of contacts made with dummy loads — and even *between* dummy loads!

A Worthwhile Investment

Back in the days when hams had to manually tune their transmitters before operating, dummy loads were common fixtures in most stations. Tuning took a certain amount of time and it was rude (not to mention illegal if you didn't identify) to inflict this on your fellow amateurs. The usual procedure was to tune into the dummy load first, then switch to the antenna.

Modern transceivers don't require manual tuning, but dummy loads are still valuable tools for testing and adjustment. A number of *QST* advertisers offer dummy loads. You can also almost always find used models at hamfests and on Internet auction sites such as eBay. I no longer have my Cantenna (or my amplifier, for that matter), but I still keep a small air-cooled dummy load (see Figure 2) in my tool kit. It is one of those things you may not use frequently, but when you need it, you *really* need it!

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

Elecraft Accessories for the K3 HF/VHF Modular Transceiver

Reviewed by Joel R. Hallas, W1ZR
Technical Editor, QST

One of the major benefits of an Elecraft K3 transceiver is that it is modular and can be expanded as interests or finances change. We have previously reviewed two versions of the K3, a "bare bones" 10 W transceiver built from a kit and a fairly well equipped 100 W version with a second receiver.[1,2] At the time of the second review, two major modules were not yet available, and we will review them here.

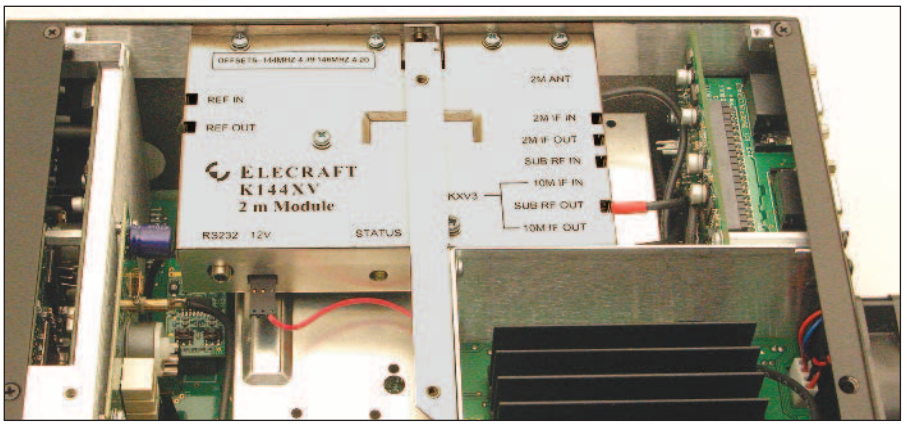

Figure 1 — Inside view of the K3 showing the added transverter next to the left side panel.

K144XV INTERNAL 2 METER TRANSVERTER

Elecraft has offered high performance external VHF and UHF transverters for some time. While their external units were originally designed to interoperate with the Elecraft K2, they are also fully functional with, and fully supported by, the newer, higher performance K3.[3]

To enhance the portability of the K3, Elecraft now also offers an internal 2 meter transverter that fits within the K3 enclosure (see Figure 1). While the K144XV appears to be resting atop the secondary or sub receiver of the K3, it is actually mounted to the left side panel. A replacement side panel with holes to accept mounting hardware is provided as part of the kit, unless your K3 is new enough to have the required holes. Thus the transverter is suitable for use in a K3 with any combination of the many other optional features.

The K144XV can be used in either the 10 W or 100 W version of the K3, but you need to tell them which you have at the time of your order. This is because the separate 2 meter antenna jack is located in either the rear cover of a 10 W transceiver, or the fan panel of the 100 W unit (see Figure 2).

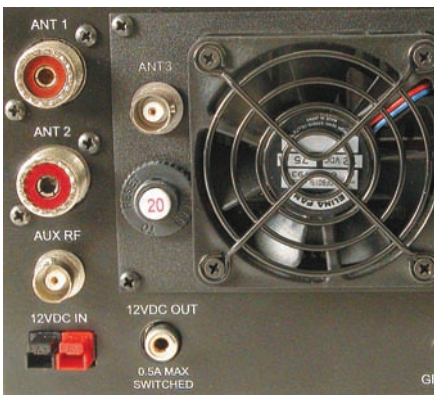

Figure 2 — Rear panel of the K3/100 showing the added dedicated 2 meter antenna connector, ANT3, on the fan panel. The K3/10, which doesn't have fans, has the connector in a similar spot on a blank panel. The ANT2 connector is provided as part of the KAT3 internal antenna tuner.

The only special requirement is that a KXV3A transverter interface assembly also be installed. The KXV3A is an upgraded KXV3 transverter interface designed to operate with the internal RF connections needed to support the new transverter module. The KXV3A costs $110, or if you already have a KXV3, you can swap it for a KXV3A for $40. External transverters for other bands are still supported. In addition to the transverter interface function, this useful module also provides connections for a receive-only HF antenna as well as a wideband IF signal that can be used to drive a panoramic receiver or panadapter.

Installation of the K144XV

The installation effort required to install the K144XV will depend on the date of manufacture of your K3. Those made after the K144XV design was set include the modifications to the hardware necessary to support the internal transverter. Transverter installation will go very quickly, especially if the KXV3A transverter interface is already in place, only requiring the removal of the top and one side cover. Older transceivers, such as my elderly (serial number 431) model,

Bottom Line

The K144XV internal 2 meter transverter, KDVR3 voice recorder and KAT3 internal automatic antenna tuner integrate seamlessly and add even more functionality to the versatile K3.

[1]B. Prior, N7RR, "First Look: Elecraft K3 HF/6 Meter Transceiver," Product Review, *QST*, Apr 2008, pp 41-45. *QST* Product Reviews are available to ARRL members on the Web at **www.arrl.org/product-review**.
[2]J. Hallas, W1ZR, "Elecraft K3/100 HF/6 Meter Transceiver," Product Review, *QST*, Jan 2009, pp 43-49.
[3]E. Zimmerman, W3ZZ, "Elecraft XV144 2 Meter Transverter Kit," Product Review, *QST*, Oct 2004, pp 68-73.

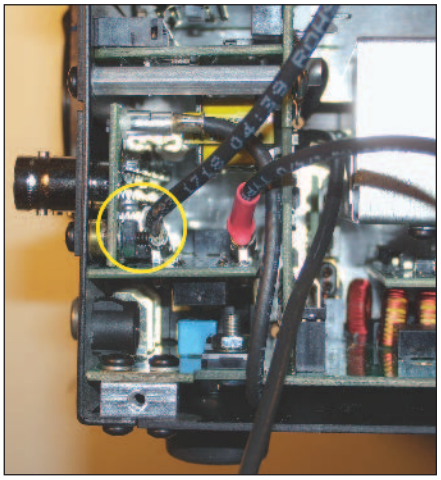

Figure 3 — Close-up of the tight quarters for the RF connector inside the KXV3A transverter interface. By temporarily removing the nut and lock washer, and backing out the screw, the connections could be made without difficulty.

will need a new side panel, new amplifier fan panel (for K3/10, a new blank panel), new top cover stiffener and a new power connector soldered to the main PC board. The last will require removing the subreceiver to gain access to the board. If you identify your serial number at the time of the order, Elecraft should send all the necessary pieces for your transceiver.

Unfortunately, my package arrived without the required mechanical parts. This was quickly resolved by the always helpful Elecraft team. Be sure to carefully check your supplied parts, since the exact hardware pieces needed depend on the manufacturing date or serial number of your K3. I took advantage of the opportunity to perform all the accumulated hardware modifications and upgrades, as well as installation of the FM filter. This gave me an opportunity to get familiar with FM operation on 10 and 6 meters while I waited for the missing parts.

There were only a few minor snags in the installation process. One minor problem showed itself during the process of connecting up the TMP coaxial cables to the KXV3A interface board. There was no way (see Figure 3) that I could get the rear connector into its socket because of the close bolt, nut and washer holding the board in place. Fortunately, once I figured out it wasn't going to work, it was easy to temporarily remove the nut and lock washer, insert the connector and then put it all back together.

Documentation

The K144XV includes the usual Elecraft step-by-step assembly and operating instructions needed to get the transverter up and running. The instructions include photographic illustrations that make the process go very smoothly. For those who elect not to modify

Table 1
Elecraft K144XV

Manufacturer's Specifications	***Measured in ARRL Lab (including K3)***
Frequency coverage: Receive and transmit 144.0-148.0 MHz.	Receive and transmit, as specified.
Power requirement: 13.8 V dc; receive, 0.25 A; transmit, 2 A (10 W out).	13.8 V dc; receive 864 mA (max audio); transmit, 1.8 A (10 W out).
Modes of operation: SSB, CW, AM*, FM*, FSK, AFSK, PSK, data.	As specified.
Receiver	***Receiver Dynamic Testing***
Sensitivity: –144 dBm.	Noise Floor (MDS), 400 Hz filter: *Preamp off* / *Preamp on* 144 MHz –144 dBm / –147 dBm 146 MHz –144 dBm / –147 dBm 148 MHz –144 dBm / –147 dBm
Noise figure: <1 dB.	146 MHz, preamp off/on: 3.5/<1 dB
AM sensitivity: not specified.	10 dB (S+N)/N, 1 kHz, 30% modulation: *Preamp off* / *Preamp on* 146 MHz 0.39 µV / 0.32 µV
FM sensitivity: 0.15 µV.	For 12 dB SINAD: *Preamp off* / *Preamp on* 146 MHz 0.13 µV / 0.11 µV
Blocking gain compression: Not specified.	Gain compression, 400 Hz bandwidth: *20 kHz offset Preamp off/on* / *5/2 kHz offset Preamp off* 146 MHz 119/123 dB / 119/119 dB
ARRL Lab Two-Tone IMD Testing	

Band/Preamp	*Spacing*	*Input Level*	*Measured IMD Level*	*Measured IMD DR*	*Calculated IP3*
146 MHz/Off	20 kHz	–53 dBm	–144 dBm	91 dB	–8 dBm
		–40 dBm	–97 dBm		–12 dBm
146 MHz/On	20 kHz	–56 dBm	–147 dBm	91 dB	–10 dBm
		–42 dBm	–97 dBm		–14 dBm
146 MHz/Off	5 kHz	–58 dBm	–144 dBm	86 dB	–15 dBm
		–41 dBm	–97 dBm		–13 dBm
146 MHz/Off	2 kHz	–72 dBm	–144 dBm	72 dB	–36 dBm
		–42 dBm	–97 dBm		–14 dBm

Second-order intercept point: Not specified.	Preamp off/on, +53, +53 dBm.
FM two-tone, third-order IMD dynamic range: Not specified.	20 kHz offset, preamp on: 85 dB**; 10 MHz channel spacing: 95 dB.
S-meter sensitivity: Not specified.	S9 signal at 146 MHz: preamp off, 13.2 µV; preamp on, 14.8 µV.
Squelch sensitivity: Not specified.	FM, preamp on, 0.072 µV.
Spurious and image rejection: Not specified.	First IF rejection, 146 MHz, 121 dB; image rejection, 146 MHz, 122 dB.
Transmitter	***Transmitter Dynamic Testing***
Power output: 8-10 W typical (maximum).	144.0-148 MHz, 3.6-9.9 W typical.
Spurious-signal and harmonic suppression: >60 dB.	>70 dB. Meets FCC requirements.
SSB carrier suppression: Not specified.	>70 dB.
Undesired sideband suppression: Not specified.	>70 dB.
Third-order intermodulation distortion (IMD) products: Not specified.	3rd / 5th / 7th / 9th order –30/–43/–44/–47 dB
CW keying characteristics: Not specified.	See Figures 4 and 5.
Transmit-receive turnaround time (PTT release to 50% audio output): Not specified.	S9 signal, 73 ms.
Receive-transmit turnaround time ("tx delay"): Not specified.	42 ms.
Price: K144XV kit; $299.95; assembled, $349.95; KXV3A transverter interface, $109.95; KXV3A UPGR upgrade for those with an earlier KXV3, $39.95 (requires return of KXV3). KDVR3 voice memory module, kit or assembled, $129.95. Price: KAT3 internal automatic antenna tuner for the K3, kit; $299.95; assembled, $329.95.	

*AM transmission requires the KFL3A-6K 6 kHz roofing filter, FM operation requires the KFL3B-FM 13 kHz roofing filter, each are $125.
**Measurement was noise-limited at the value indicated.

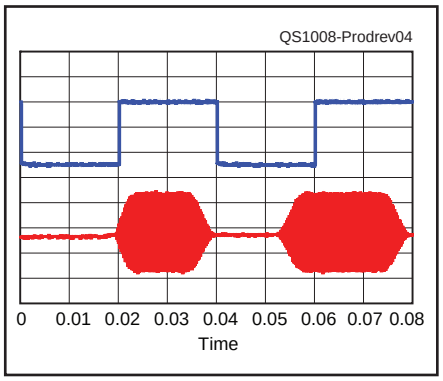

Figure 4 — CW keying waveform of the K3 with K144XV showing the first two dits in full-break-in (QSK) mode using external keying. Equivalent keying speed is 60 WPM. The upper trace is the actual key closure; the lower trace is the RF envelope. (Note that the first key closure starts at the left edge of the figure.) Horizontal divisions are 10 ms. The transceiver was being operated at 9 W output on 144.020 MHz.

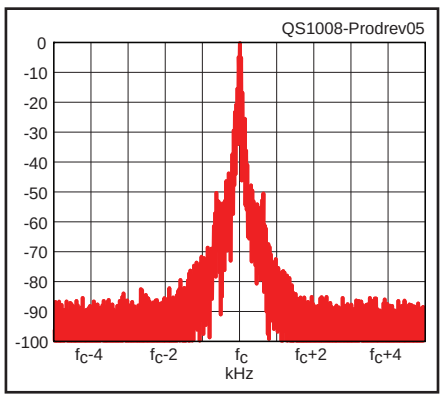

Figure 5 — Spectral display of the K3 with K144XV during keying sideband testing. Equivalent keying speed is 60 WPM using external keying. Spectrum analyzer resolution bandwidth is 10 Hz, and the sweep time is 30 seconds. The transmitter was being operated at 9 W PEP output on 144.020 MHz and this plot shows the transmitter output ±5 kHz from the carrier. The reference level is 0 dBc, and the vertical scale is in dB.

their K3, another option is to ship the K3 to the factory and have Elecraft perform the assembly and test. This service is available for an additional $50. Of course, the K144XV can be ordered along with other options in a new assembled K3.

The instructions are up to the usual detailed standard now expected from Elecraft. They are somewhat complicated by the number of options. They are different if you have the 10 W or 100 W version, but they are also different depending on the serial number of your K3. The various branch points make the instructions more complicated than they should need to be, it would seem.

There were just a couple of snags in following the instructions. The FREQUENCY CALIBRATION process is made very easy since each unit's local oscillator frequency offset is noted on a tag on the top cover of the module. These just need to be entered into the CONFIG menu, as nicely described, so a frequency counter is not required. If you have an accurate counter, you can enter in your measured offsets if you wish. Unfortunately, the instructions had the reference to VFO A and B reversed, although most experienced K3 users would know that immediately.

So What's it Do and What Else Might You Need?

The K144XV covers the entire 2 meter amateur band, 144 to 148 MHz. With the K144XV and KXV3A installed, you can operate in any mode that the K3 can support. This means that in addition to the standard equipment 2.7 kHz roofing filter that supports SSB, data and CW, an KFL3B-FM 13 kHz FM filter must be installed to transmit or receive FM. If it is already in your K3 — you're good to go. The 13 kHz "FM" filter is also useful for reception of higher fidelity AM on the MF and HF bands.

Once installed, the K144XV allows the K3 to operate seamlessly on all bands, 160 through 2 meters. Because of the separate 2 meter antenna connection, no changes need be made to antenna wiring. It would be nice if K3 owners with a sub receiver could monitor their local 2 meter repeater by having the K144XV receive chain routed through a squelched sub receiver with an FM filter while operating HF using the main receiver. Unfortunately, the antenna wiring isn't there to support this (but may be in the future, according to Elecraft). It can be accomplished by using the subreceiver as the HF receiver and receiving 2 meters on the main receiver. Both receivers can operate on 2 meters allowing, for example, simultaneous receive of both the input and output of a repeater or monitoring two different repeaters or simplex frequencies, perhaps handy in an EmComm operation.

The use as an HF transceiver while monitoring a 2 meter frequency is certainly a nice capability perhaps for a VHF to HF EmComm liaison station, or for someone operating from a vacation retreat while a family member is out in a 2 meter mobile equipped vehicle — a good way to stay entertained while others are on a shopping expedition or two.

The K3 supports CTCSS tone access (but not the decode function) for repeater use, as well as 1750 Hz tone burst for accessing repeaters in Europe. Any of the 100 available memory channels, including the two-button band specific quick memories, can be used to store repeater or simplex frequency pairs and tones. Digital coded squelch (DCS), now showing up on many dedicated VHF FM transceivers, is not yet supported by the K3.

For the serious long range 2 meter CW and SSB operator, the K3 with K144XV can serve as an exciter-receiver that provides all the operating conveniences and performance that the K3 provides on HF. This includes the excellent roofing filters, passband tuning, sharp DSP filters and noise reduction that can enhance received signal to noise ratio. On the transmit side, the usual K3 features, such as smooth full break-in keying on CW, audio equalization and compression on SSB and transmit memories operate just as they do on HF. When your favorite band has an opening, you are right there with your familiar mic, keyer and controls.

As with the K3, Elecraft has made provisions to update the firmware of the K144XV as improvements or features are added. They were unable to piggyback off the serial connection to the K3, so the K144XV has its own dedicated PC connection and a separate software utility to manage updates. To use, the K3 top cover must be removed and a supplied cable plugged into the SERIAL jack of the K144XV. The other end goes to your PC serial port or USB to serial adapter. At the time of this review, there were no upgrades available, so this was not tested. I would expect that upgrades to this device would appear on a much less frequent basis than the new revisions to the K3 code.

One minor inconvenience is the transmit power level control. On HF we are used to being able to use the front panel PWR knob to smoothly vary the peak output from 0 to 110 W in steps of 0.1 or 1 W — quite a range. With the K144XV, the K3 apparently thinks it's working with an external transverter and shows the power out at the intermediate internal transverter interface. The adjustment range is 0.1 to 1.0 mW, with the nominal at 1.0 mW. This translates into a range of about 3.9 to 10 W on 2 meters, not quite the wide range on HF, and possibly an issue with some power amplifiers. It would be very handy if the 2 meter output could be shown directly, especially for those who need to adjust the drive level for a transmit linear amplifier, as many will likely need to do.

How do Elecraft's Two 2 Meter Transverters Compare?

The power output rating of the K144XV is down compared to the XV144 external transverter, at least in CW and SSB modes. The internal K144XV transmits up to 10 W compared to 25 W for the external XV144, although for high duty cycle modes, such as FM or data, Elecraft recommends throttling back the external unit to 5 W, while the internal unit can operate FM at the full 10 W — a plus for portable operations. My guess is most serious 2 meter CW and SSB operators will have external linear amplifiers, making the power difference moot while operating from home.

On the receive side the noise figure of

internal unit is specified as typically 1 dB, while the external transverter is specified as about 0.8 dB. This is not a noticeable difference in most situations, and our internal unit tested better than either spec.

On the plus side, the external unit covers only 144 to 146 MHz, because of a single local oscillator (LO) frequency for use with a 10 meter (28 to 30 MHz) HF transceiver as a tunable IF. The internal transverter with two (automatically switched) LO frequencies and resulting 4 MHz coverage (144 to 148 MHz) is much more useable for FM repeater operation.

On the road, or for EmComm use, the barefoot transverter should provide all that is needed for routine line-of-sight communications in an appropriately portable single compact box. In addition to the compactness of being in a single box, the internal transverter avoids all the cabling needed to interface and power an external transverter, or a separate transceiver, for that matter.

K144XV in the Lab

Table 1 lists the measured results from ARRL Lab testing, augmented by Figures 4 and 5. It's important to note that the results, of necessity, are from the combination of the K3 transceiver and the K144XV. Thus, while the manufacturer's receive current spec of 0.25 A represents the added current of the K144XV, the measured current of 864 mA (0.9 A) is the K144XV receive current plus the receive current of this heavily loaded K3. The noise figure of the transverter is specified as "typically 1 dB," but the measured system noise figure includes the noise added by downstream stages in the K3. The K3's sensitivity on 10 meters was measured at –137 dBm, corresponding to a 10 meter noise figure of 10.5 dB at the transverter's IF. With the 25 dB conversion gain we measured, that 10.5 dB adds to the receiver noise implying that the approximately 0.5 dB system noise figure we measured corresponds to a transverter alone noise figure of less than 0.4 dB — remarkable!

We actually tested two units. The first one received had similar performance to that noted for the second one at mid band, but it was down in transmit power and noise figure by somewhat less than 1 dB at the bottom edge of the band. We discussed this with the folks at Elecraft who concluded that this was an anomaly of their original 2 meter bandpass filter alignment process that apparently showed up in some units. Following our discussions, they revised their factory alignment procedures to ensure that the performance extended all the way to 144 MHz. In our second unit there was no reduction in performance at either end of the band. They note that units aligned after May 17, 2010 will benefit from the new procedure. Most earlier units should also be fine, but a transmit power reduction at the edges may provide a clue to similar problems.

All other specs were met in both units in typical Elecraft fashion, with keying characteristics and transmit IMD that correspond to the excellent results we have seen from the K3 on HF. The receive dynamic performance is very good, if not quite up the Elecraft's top notch HF performance. On VHF, where SNR is generally receiver limited, it makes sense to sacrifice a bit of dynamic range to get the sensitivity needed for weak signal work.

K144XV on the Air

I had an opportunity to try the K3/K144XV combination on the air from my limited capability 2 meter station. I made contacts on CW, SSB and FM and received good quality reports on audio and keying in each mode — not surprising, since the signal content is mostly based on the K3 circuitry, just translated by the transverter. Still, the good transmit IMD response no doubt contributed to the good SSB audio reports I received. In cases with comparable power, I could hear better than the distant station due to the low receive noise figure of this transverter.

Is the K144XV Worth the Money?

If your primary interest in 2 meters is FM, you could easily conclude that you would be better served by purchasing one of the many 2 meter or multiband FM-only mobile oriented transceivers instead of the K144XV. I wouldn't disagree with you, although the single box with no extra cabling, mic or boxes does make travel easier if you want both HF and 2 meter FM at a single location.

If you are interested in having high performance 2 meter SSB and CW capability, including occasional FM use, the K144XV suddenly seems like a very reasonable approach. There are, to my knowledge, no longer any "2 meter multimode" transceivers available from major manufacturers, as there were some years back. The good news is that there are a number of radios that offer multimode MF, HF, VHF and even UHF operation from a single package. They are certainly a viable option for many applications, but if you demand top HF and VHF performance from that single radio, your search quickly narrows. To do a complete "apples to apples" comparison, you will need to factor in the price of a 50 to 100 W 2 meter amplifier [see the Product Review of two Mirage 2 meter amplifiers in this issue — *Ed.*] added to the price of the K144XV equipped K3 to put them all on the same footing.

Once you have the K144XV installed, all the features that made you decide on buying a K3 for HF are also available for use on 2 meters. This means that your favorite mic and key are already set up and your mic equalization settings let you sound the way you want to on VHF as well as HF, not something you'll likely get with the separate 2 meter FM rig. In addition, all the DSP selectivity, noise reduction, noise blanking, voice and CW memories and other advanced capabilities of the K3 are available and just where you'd look for them.

KDVR3 INTERNAL VOICE MEMORY MODULE FOR THE K3

The KDVR3 voice memory module is for the voice operator what a memory keyer is for a CW op. It can digitally record up to four separate voice messages in each of two banks, and messages can be replayed by pressing a single button. This is a real plus for the voice contester or DXer. With the KDVR3 installed, you can operate a complete phone contest with your mouth closed, unless you need to supply a sequence number or drink coffee.

Installation

The KDVR3 is a small board. Still, it doesn't just drop into the K3. You must first remove the top panel, one side panel, half the bottom panel and then remove the front panel assembly. You are now in an ESD susceptible area and should have your ground strap and conductive mat in place.

Once you are there you will need to remove one or two (if the KRX3 sub receiver is installed) digital signal processing (DSP) boards. The KDVR3 mounts in the upper center of the primary DSP board as shown in Figure 6. If you have an early K3, there are a few clearance checks and possible lead

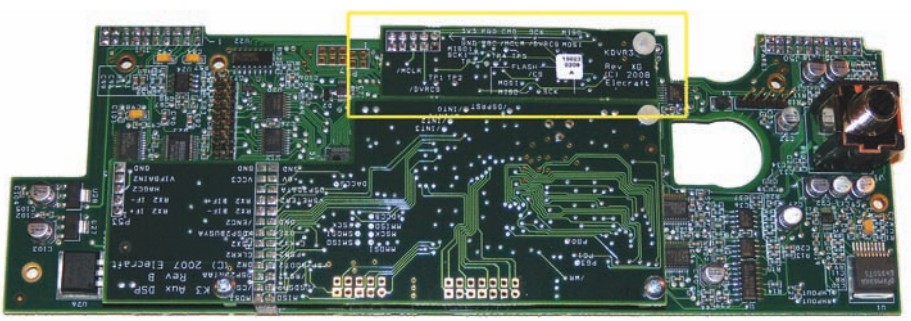

Figure 6 — View of the K3's DSP board (the larger board) with the added KDVR3 voice memory board (the small board near the top center of the DSP board).

trimming that may be required due to the additional thickness of the DSP with KDVR3 installed.

Everything is now reassembled in reverse order and, for me, having done this many times, it went together well. As usual the KDVR3 installation manual provides step-by-step directions, accompanied by high resolution photos that help considerably. Before you can use the KDVR3, you must first check to make sure your software has been upgraded to MCU version 2.72 or later and then in the CONFIGURATION menu, set KDVR3 to NOR.

Operation

Recording a message is easy. In a voice mode, just tap REC and then one of the buttons M1 to M4. If you hold instead of tap the REC button, you will toggle to the second memory bank. A tap of the REC button and M1 to M4 will record in that position in the second memory bank. You will stay in either bank until the next time you hold the REC button.

To repeat a message for up to 255 seconds (set via a menu), hold rather than tap memory button M1 through M4. On air reports indicated that the real time and recorded voice sounded exactly the same.

In addition to transmitting your recorded messages, the memory module can record a received signal. Just press AF REC and you can record up to the last 90 seconds of received audio. This can be played back over the air by pushing AF PLAY so you don't have to try to describe to the other station how great his new mic sounds, or why you think his compression is cranked up too far.

KAT3 INTERNAL AUTOMATIC ANTENNA TUNER FOR THE K3

While the KAT3 automatic antenna tuner was available earlier, we didn't discuss it in previous reviews. I took advantage of having the K3 opened up to add this option as well.

The KAT3 is a very useful addition to a K3 transceiver. It operates very nicely on all bands from 160 through 6 meters. In addition to providing a wide range (10:1 specified) impedance matching function, it also adds a second antenna connection.

Installation

Installation of the KAT3 (see Figure 7) should be quite straightforward: remove the top and one side cover, bolt in the UHF connector for the second antenna, push in the board and button it up. I think that the instructions were written before Elecraft offered the optional second receiver. In order to get to the nuts and lock washers on the side panel used to heat sink the driver transistors, I had to also remove the upper support bar and second receiver. I could just see the hardware with the second receiver installed, but couldn't see any way to remove it. If you haven't installed the second receiver, you won't have this problem.

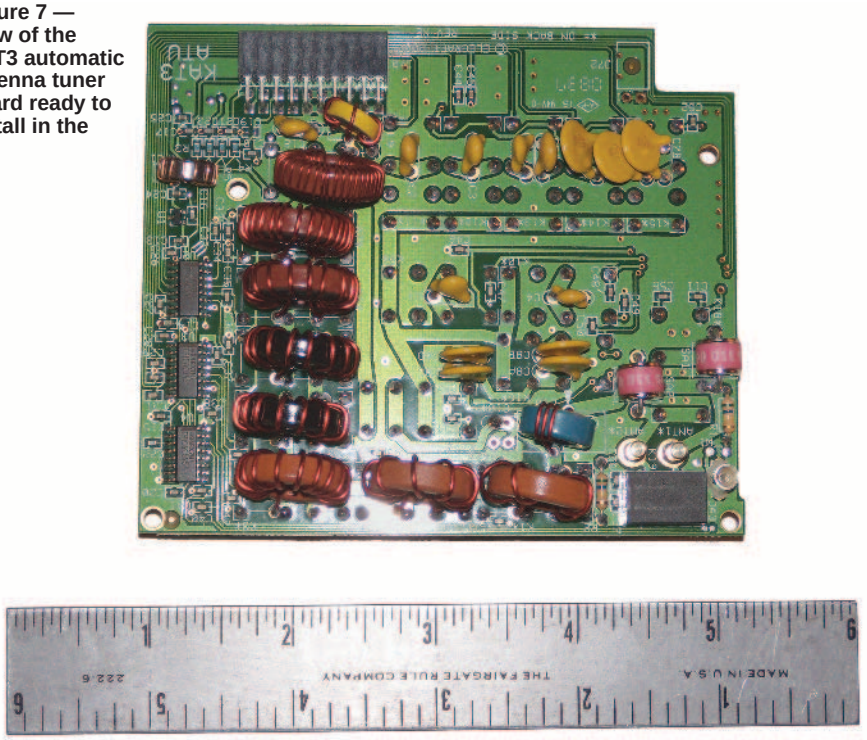

Figure 7 — View of the KAT3 automatic antenna tuner board ready to install in the K3.

The only other problem I had is perhaps in the category of "don't mess with Mother Nature." I prefer BNC connectors to the UHF SO-239 type provided for HF and 6 meter antenna connections and had changed out my original single antenna jack for one of the excellent Oak Hills UHF to BNC kits.[4] Unfortunately, the tuner board wouldn't clear the BNC connectors. Back went the original UHF jacks, and it all went together without difficulty.[5] For us, the entire process took less than 45 minutes, including the few false starts.

Operation

There are two front panel buttons associated with the antenna tuner functionality, ANT and ATU TUNE. Pushing the ANT button toggles between ANT 1 and ANT 2, indicated on the information display under the MHz units of the frequency indication. The ATU TUNE has two functions. Hold it for half a second and it toggles the tuner between BYPASS and AUTO, briefly displayed on the information panel of the LCD display. In BYPASS mode, the tuner acts as though it isn't there — suitable for matched antennas or driving an amplifier. In AUTO mode, a tap will initiate the tuning process.

The tuning process happens very quickly, on the order of a second for a first time tune, and much more quickly if you've been there before. The tuning automatically occurs at a 5 W level, with progress in SWR reduction indicated on the information display. If you aren't happy with the result, a second tap within 5 seconds will try for a finer tune. If desired, for example for out of ham band receive, you can manually adjust the L and C values for optimum reception.

The tuner remembers both antenna selection and tuning parameters on a band by band basis, making switching bands quick and easy. Of course a tap of the ANT TUNE button can override the memorized selection if both your antenna choices can cover the same band.

Conclusion

The K144XV allows any version of an Elecraft K3 transceiver to become a fully featured, multimode, 160 through 2 meter transceiver in a compact box. The KDVR3 digital voice recorder option is a must have for K3 owners who use their radios for voice contesting or DXing. It provides natural sounding voice and is easy to setup and use. The wide range KAT3 antenna tuner is a joy to use, and is especially well suited to allow operation with random wire and other portable or temporary travel antennas.

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

[4]Look for SO-239 to BNC Conversion Kit at **www.ohr.com/parts.htm**.

[5]After assembly was completed, it looked like there was enough clearance for the BNCs. Thus I might try again, perhaps by removing the rear panel to avoid the tight clearances during board installation. For now I have a pair of UHF to BNC adapters on the K3 instead.

A Pair of Mirage 2 Meter Amplifiers

Reviewed by Joel R. Hallas, W1ZR
Technical Editor, QST

I decided to look for an amplifier that would put the power level of my K144XV equipped K3 up to around 100 W to be on the same footing as popular HF/VHF transceivers such as the Kenwood TS-2000 or ICOM IC-7000. As described below, Mirage offers two amplifiers that seemed to be candidates. They also offer 10 W input 160 W output (B-1018-G) and 300 W (B-1030-G) output amplifiers at a correspondingly higher price. Their 25 W input, 160 W output B-2518-G, promises linearized SSB operation with a 110 W PEP output typically with 10 W of drive so we chose to check that one out.

Serious VHFers will probably already have a high power amplifier ready to be driven by their K3 with its new transverter, but there are many folks who enjoy casual 2 meter CW and SSB operation with a moderate size antenna and 100 W, so this seemed like a natural fit.

MIRAGE B-310-G 2 METER 100 W AMPLIFIER

The B-310-G is the least expensive Mirage amplifier that puts out 100 W. It includes a preamp and can be set for FM or SSB/CW modes. Switching to transmit will occur either based on sensing of RF or with the closure of external relay contacts.

Installation of the B-310-G

The installation of the B-310-G is very straightforward. It comes with an attached fused power cable ready for whatever connectors you use for your 13.8 V dc power distribution. Input and output RF connectors are sturdy appearing UHF series SO-239 jacks. Mirage provides a coax cable with a BNC plug on one end that will fit the K3 ANT 3 jack, or the antenna connector on many handhelds. The other end has a UHF PL-259 plug to fit the amplifier's RADIO jack. Hook up this and your antenna cable to the ANTENNA jack and you're on the air. If you wish to have TR switching via the K3 amplifier keying output, you will need to obtain a cable with a phono plug on one end (for the K3) and a ⅛ inch mono plug on the amplifier side.

You will also need to take advantage of one of the two mounting options. The B-310-G comes with four rubber feet, needed to raise the fan on the bottom of the unit off the operating desk or other surface. In addition, two mounting brackets are provided to allow for under dash or under shelf mounting.

Documentation

The amplifier comes with a 10 page manual, including installation and operating instructions as well as a very tight schematic and a page describing its one year limited warranty. An additional insert notes: "Use of input power greater than specified in the equipment's manual will void this warranty."

So What's It Do

I crimped some Anderson Powerpole connectors on the dc leads, hooked up the RF cables, and I was on the air. With either my transverter equipped K3 or an IC-706 MkII that I had on hand for comparison, it appeared to instantly switch to transmit upon applying the least RF I could send it. The controls are very straightforward. There are three switches and four LED indicators. The POWER switch just enables the transmit amplifier. Contrary to the manual description, even with the POWER switch set to OFF, the receive preamplifier still can be turned on. Fortunately, the TR switching is also available in that case, so you need not worry about transmitting through the preamp. Not a bad thing, just a bit of a surprise.

The PRE-AMP switch turns on the receive preamp, as you would expect. It has considerable gain. Its noise figure is not better than that of the K3, so to preserve dynamic range, it should be turned OFF if the amplifier is installed adjacent to the K3. The preamp could become very useful if the amplifier were installed near to the antenna and there was significant transmission line loss between the radio and amplifier. The preamp may also be of significant benefit if the amplifier is used with some handheld transceivers. The key here is the resulting signal to noise ratio, not the gain.

The MODE switch selects between SSB and FM. Although you might expect that the

Bottom Line

Either the B-310-G or the slightly larger B-2518-G can follow a K3 with its internal transverter and deliver 75 W PEP SSB with reasonable distortion. The smaller unit can also provide 100 W on CW or FM. The B-2518-G can do better with a transverter that can put out a bit more power, such as the external Elecraft XV144, delivering up to 110 W PEP on SSB and 160 W on CW or FM. The preamps may help with an FM transceiver or older multimode radio with a higher noise figure, or if near the antenna with a lossy coax run to the station

Table 2
Mirage B-310-G

Manufacturer's Specifications	Measured in ARRL Lab
Frequency range: 144-148 MHz.	As specified.
Power requirements: 12-15 V dc, 15 A typical.	Transmit, 14 A (at 100 W out); receive, preamp off, 17 mA, preamp on, 65 mA at 13.8 V dc.
Driving power required: 0.25-8 W.	Corresponding power output, 36-116 W.
Spurious and harmonic suppression: Not specified.	60 dB; Meets FCC requirements.
Receive preamp gain: 18 dB typical.	144/146/148 MHz, 22.7/24.5/23.9 dB.
Receive preamp noise figure: Not specified.	144/146/148 MHz, 2.7/2.0/1.7 dB

Size[1] (height, width, depth): 2.6 × 5.0 × 7.7 inches; weight, 2.5 pounds.

Price: B-310-G, $200.

[1]Includes extrusions. Size and weight measured in ARRL Lab.

Table 3
Mirage B-2518-G

Manufacturer's Specifications	Measured in ARRL Lab
Frequency range: 144-148 MHz.	As specified.
Power requirements: 11-15 V dc.	Transmit, 18 A (at 156 W out); receive, preamp off, 20 mA, preamp on, 87 mA.
Driving power required: 10-30 W.	Corresponding power output, 89-156 W.
Spurious and harmonic suppression: Not specified.	60 dB. Meets FCC requirements.
Receive preamp gain: 5/8/14dB.*	144/146/148 MHz, 7.4/7.0/6.6 dB 12.5/12.0/11.6 dB 13.2/12.8/12.4 dB
Receive preamp noise figure: See text.	144/146/148 dB. 2.7/2.0/1.7 dB 3.2/3.2/3.2 dB 3.3/3.2/3.1 dB

Size[2] (height, width, depth): 3.2 × 5.5 × 11.6 inches; weight, 5.5 pounds.

Price: B-2518-G, $290.

[2]Includes extrusions. Size and weight measured at ARRL Lab.
*Preamp gain selectable using internal jumper.

amplifier would be set to linear operation if switched to SSB, it is just as linear in FM as in SSB. In SSB mode, the amplifier just inserts a 1 second delay in switching back to receive after being in transmit mode. The reason for this is to avoid the relay clatter that would happen if SSB TR switching occurred on a syllable by syllable basis. The relay is quite noisy, so this may be useful. If you have a connection between the K3 KEY OUT jack and the amplifier EXTERNAL KEYING jack, and set the amplifier's MODE switch to FM; the keying delay will follow your radio's settings for VOX or semi break-in CW. I didn't attempt full break-in CW operation, since the switching time of the amplifier relays was not specified, and I thought the relay noise would eliminate any benefit of being able to hear between code elements.

How's It Work?

The output, as measured on my Bird 43 wattmeter and confirmed in the ARRL Lab, ranged from 70 W output with 1.4 W in, to more than 100 W at 3.8 W in. The 100 W can be used for FM or CW operation, but we found during transmit IMD testing that at powers above 75 W PEP output, the transverter IMD is significantly degraded.

This results in a bit of a problem with the K3 since its minimum 2 meter output puts it at the 100 W output point. We found that by backing off on the mic gain, it was possible to keep the signal in the right range for reasonable IMD.

This amplifier would also be very useful for someone who wanted a 100 W base station FM signal from a handheld transceiver that could put out 3 W. A serious antenna and this amplifier and preamp combination could perform very well in that role.

As shown in Table 2, the noise figure of the receive preamp is such that it will actually degrade the receive performance of the K3, unless it is at the antenna and there is significant loss in the cable between. For use with lower performance radios it may be helpful, however. With the preamp switched out, the insertion loss of the amplifier is 0.24 dB. This will add directly to the receiver noise figure, perhaps important for very weak signal reception.

MIRAGE B-2518-G 2 METER 160 W AMPLIFIER

This amplifier, with its 25 W input rating, might not float to the surface in your search for an amplifier to follow your K3, but a look a bit deeper reveals that it may be a good match. The 25 W in, 160 W out specification is really a statement about FM, and perhaps CW, operation. A look in the manual reveals that the special "Active-Bias" system is intended to provide low distortion amplification of SSB signals up to 110 W PEP output. We had to find out how well this worked, and whether the extra $100 would result in a more suitable SSB signal that we would put on a ham band.

Data on one dealer's Web site indicated that the 110 W PEP output could be realized with 10 W PEP input — perfect, I thought. Unfortunately, our unit could only muster 79 W with the K3 at full power. That meant that the maximum power of 79 W was all that was available to us in all modes, making it slightly less useful with the K3 than the smaller, less expensive, B-310-G.

Of course this is a K3 statement, not one about the amplifier. The B-2518-G would provide benefit to more powerful transverters such as Elecraft's external XV144, or transceivers with appropriate power output, such as my ICOM IC-706MkII HF and VHF transceiver that puts out 20 W on 2 meters. The preamp may provide significant benefit to earlier receivers as well.

During testing we were surprised to find that the preamp noise figure was significantly higher than the 0.6 dB that the Mirage Web site indicated. The manual stated that the noise figure would be "just over 1 dB," comparable to the Toshiba 3SK240 device specification (typical 1 dB, 2 dB maximum at 800 MHz). Upon investigation by Mirage, it was determined that the Web site value was in error. In addition, an unfortunate manufacturing substitution of an SMD RF choke in place of the original air core inductor at the preamp input (L101) further degraded the noise figure.

Mirage agreed to correct the error in their advertising and change the coil selection starting in their next production run. In addition, any owners of current B-2518-G with the RFC in the preamp can send them to Mirage for a replacement inductor at no charge except shipping. Contact Mirage for the details.

With the preamp switched out, the insertion loss of this amplifier measured 0.52 dB, somewhat more loss than the smaller version.

Manufacturer: Mirage Communications Equipment, 300 Industrial Rd, Starkville, MS 38759, tel 662-323-8287; **www.mirageamp.com**.

W1ZR

THE DOCTOR IS IN

Q Dennis, KBØZUD, asks: Are there any rules-of-thumb about how far away a conducting material should be from an air core linear inductor, in terms of inductor radius or diameter?

A According to Terman's *Radio Engineering*, third edition, it should be spaced at least the coil radius away from everything. If the shield is made up of a highly conducting material, such as copper or aluminum, the inductance will decrease by 10 to 20%.

Q Mike, K3LG, notes that there' s a lot of discussion on the various antenna e-mail groups regarding the G5RV "multiband" dipole. They seem to focus in the three areas:

- **What is the function of the usual 34 foot section of window line or twinlead between the antenna and the coax and which is preferred?**
- **Should there be a balun or choke at the transition from the balanced line to coax?**
- **Should the SWR on the coax be a matter of concern?**

A A G5RV (see Figure 1) is just a center fed, nonresonant dipole with a "flat top" of 102 feet. It was presented by Louis Varney (SK), G5RV, in the *R.S.G.B. Bulletin* in 1958, although he described it informally as early as 1946.[1] Varney wanted an antenna that would work well in certain directions on 20 meters (see Figure 2), and that could be used on all the HF bands, at that time just 80, 40, 20, 15 and 10 meters.

[1]L. Varney (SK), G5RV, "An Effective Multiband Aerial of Simple Construction, *R.S.G.B. Bulletin*, Jul 1958, pp 19-20.

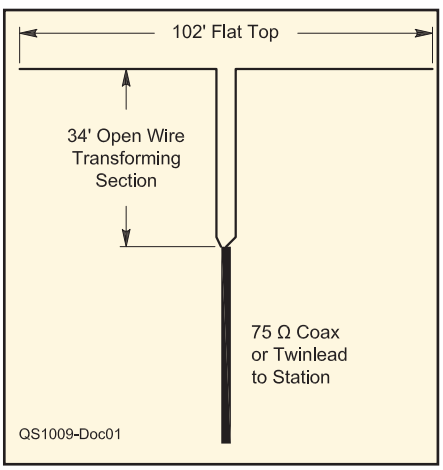

Figure 1 — Configuration of a G5RV dipole with a twin lead impedance transforming section. This is one of several configurations he described, including using open wire all the way back to a tuner at the station.

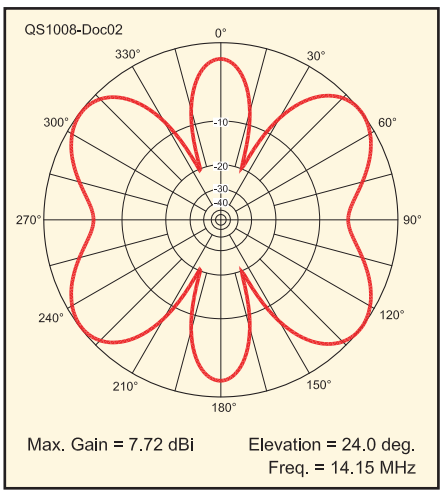

Figure 2 — Azimuth pattern of Varney's G5RV on 20 meters. At a typical height of 40 feet, the peak take off elevation was at 24°. Note the sharp lobes perpendicular to the antenna, as well the broad lobes at other potentially useful angles. The gain at each is within a decibel or 2 of the dual lobes of a half wave dipole at the same height.

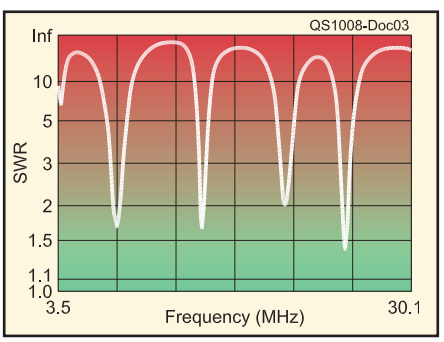

Figure 3 — 75 Ω SWR of a Varney's original G5RV design using a 34 foot section of air-dielectric open wire line as transforming section. The resonances almost line up with some amateur bands, with a 1.7:1 SWR at the top of 20 meters.

The section of balanced line, 34 feet of open wire in Varney's article, transforms whatever the antenna impedance is to a different impedance at its bottom. To say that it provides a good match on all bands may be wishful thinking. On 20 meters it is a half wave long and thus repeats the antenna impedance, as it does on 10.

The half wave window line or twinlead that he used as a transforming section resulted in an impedance at the bottom on 20 meters of around 100 Ω with some reactance. A look at the plot of 75 Ω SWR from 3.5 to 30 MHz (Figure 3) shows that indeed there are multiple resonances; however, not many of them line up well with amateur bands. His dimensions with a height of 40 feet have a 75 Ω SWR of 6.5:1 on 3.7, 5.6:1 on 7.1, 2.4:1 on 14.2, 4.6:1 on 21.2 and 2.1:1 on 24.9 MHz. Other bands are higher, typically at least 10:1. Varney also suggested tying the feeders together and feeding the antenna as a top loaded vertical on 160 meters.

A fundamental limitation of the design is that there are only three adjustments — the flat top length, the height and the transforming section length. With those variables, you likely can find dimensions that will work on multiple, but not all, bands. Unlike trimming a half wave dipole, the direction to go with each change is not obvious. I have never found a set of dimensions that resulted in acceptable SWR on all, or even most, bands. In Varney's article, he noted that the impedance was reactive, and suggested raising and lowering the antenna for different bands to find the lowest SWR. Somehow this suggestion has been lost over the years!

The question about the importance of the SWR depends on the length and loss of the coax used, as well as the tuning range of the antenna tuner used. A high SWR on the higher bands will result in significant loss for typical coax lengths. This makes the SWR at the radio look better than it really is, since the loss reduces the power that gets to the antenna and further reduces the reflected signal. This may explain why

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

many think it has better SWR on multiple bands than it really does.

Varney did not discuss a balun. In fact he fed his version with 72 Ω transmitting twinlead to a balanced tuner, so he didn't need one. As with any balanced load to unbalanced line transition, the need for a balun depends on the amount of current that flows on the outside of the shield. This in turn depends on the ground impedance and the electrical length of the coax. Considering its use on multiple bands, it is likely that there will be some bands that have high shield currents and thus could benefit from a balun. At least one manufacturer just slips multiple ferrite beads on the coax just below the transition with good results.

Q Andy, AE5EA, asks: I have an old three band, three element quad that was built by a company that is no longer in business. This quad was designed to be fed with coax to a 1:1 balun. I'm going to be putting it back up and am wondering if I can feed it with 450 Ω window line to avoid the loss in over 180 feet of coax?

A There are two approaches that should work with the window line:

- Feed the driven element directly with the window line. At the station, you will then need a wide range antenna tuner that can match balanced loads. This could be a regular unbalanced one with a balun on the output. Note that the impedance will be neither 50 nor 450 Ω, but will vary widely due to the transformation through the mismatched line, which will be different on every band. The 9:1 SWR with 180 feet of typical window line will result a bit less than 1 dB loss at 28.5 and 0.67 dB on 14 MHz.
- Use a 9:1 balun at each end of the window line. You may want to use coax from the antenna to below the rotator. Then attach a balun (waterproof units are available, or you can build your own). Run the window line to (or near to) the station and use another 9:1 balun to the radio. The two baluns combined will have less than 1 dB loss. The matched window line will have 0.2 dB additional loss on 14, 0.26 dB on 28 MHz.

Another thought is to use really good coax — 180 feet of LMR 400 or Belden 9913, for example (both fit standard UHF connectors). They have a matched loss of 1.2 dB at 28.5 MHz, but only 0.8 dB on 20 meters. While not cheap, it probably will cost less than the window line plus two baluns. A section of special "LMR Flex 400" can be used around the rotator.

The performance differences among the various approaches are small. If I were starting from scratch, I think I'd go with low loss coax, based on simplicity and ease of operation.

Q Dennis, KB9SDS, asks: What determines the characteristic impedance (Z_0) of coax and how can I tell what the Z_0 is of unmarked coax?

A The "characteristic" (sometimes called "surge") impedance is the property of the cable that determines the relationship between the voltage and current when a signal is first applied — usually for the short interval before the signal propagates to the far end and finds the termination impedance. After the signal reaches the far end, any mismatch will reflect part of the signal back toward the source. The combination of reflected signal and applied signal determines the effective impedance. Note that if the coax is terminated in its characteristic impedance, there is no reflection and the impedance looking into the cable equals the characteristic impedance over both short and long time periods.

The characteristic impedance is determined by the inductance and capacitance of the cable per unit length (usually given in units per foot in the US) and to a lesser extent, the resistance of the conductors. The inductance and the capacitance per length are determined by the dimensions and the dielectric constant of the insulation between them.

The easiest way to test for the Z_0 of coax is to recognize that there are only a few commonly encountered values. The most common are 50 and 75 Ω, with the occasional 93 or 35 Ω cables showing up, but much less frequently. If you connect a length of unknown cable between your transmitter and a usual 50 Ω dummy load, the SWR should equal 1:1 only under two conditions:

- The cable has a Z_0 of 50 Ω, or
- The cable is a multiple of a halfwave length long.

Thus, if you measure it at two or three nonharmonically related frequencies and it shows an SWR on each of 1:1, it is 50 Ω coax. If it doesn't, it has some other Z_0, but is probably 75 Ω cable, just because of its popularity.

If you have access to an antenna analyzer, another way to determine cable Z_0 is to measure the impedance with a 50, 75, 35 and 93 Ω resistive termination on the end. Put each termination on the far end and measure the Z of the cable on multiple frequencies. If it stays the value of the termination, that's the Z_0.

Another way to approximate the cable Z_0 is to take its physical measurements. Measure the outside diameter of the inner conductor and the inside diameter of the outer conductor — about the same as the outside of the insulation between them, which is easier to measure. For usual dimensions the $Z_0 = 138 \times \sqrt{1/\varepsilon_R} \times \log_{10}(D/d)$.

The term ε_R is the relative dielectric constant of the insulation compared to air. For air insulated lines, that is 1.0, for regular polyethylene it is 2.26 and for foamed poly, typically about 1.6, depending on the air/poly mix.

D is the inside diameter of the shield, while d is the outside diameter of the inner conductor — both in the same units.

For example, if we look at the Belden Web page (**www.belden.com**), we can find their standard RG-8 (catalog number 8237). They list the inner conductor at 0.85 and the insulation diameter (which should match the inside of the shield) at 0.285 inches. The standard poly insulation used should have a relative dielectric constant of 2.26. Plugging in the numbers, we get:

$Z_0 = 138 \times \sqrt{1/2.26} \times \log_{10}(0.285/0.085)$
$= 138 \times (1/1.5) \times \log_{10}(3.353)$
$= 138 \times 0.665 \times 0.5254 = 48.2$

Pretty close to the expected 50 Ω.

Thus, by measuring with our calipers, we can make a good estimate, if we can decide what the insulation is. Regular polyethylene looks like semisolid plastic that has a yellowish almost clear cast to it. Foamed dielectric is usually white, not transparent and is much softer and easier to bend than the regular. To determine the base 10 logarithm, we can use a scientific calculator (including the one that comes with *Windows* — make sure you tap VIEW, then select SCIENTIFIC) or do it all on a spreadsheet.

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

Feedback

◊In Figure 3 of the "*Homebrew Challenge II* Winner #1 — The Lowest Cost Entry" [Jun 2010, pp 30-33], the IRFZ24N MOSFET is incorrectly drawn as a depletion mode N channel device. It should have been drawn as an enhancement N channel MOSFET.

Strays

I would like to get in touch with…

◊hams who knew one of the pioneering members of the Los Angeles Amateur Radio Club, Tap, W6TDM (SK). Please contact Archie Buchanan, KD6OLH, **archieb@socal.rr.com**.

◊hams who may be able to provide information about Amateur Radio in Romania (particularly the Transylvania region) before 1990. I am looking for stories about those days, old QSL cards — anything connected to Romania. — *Liviu George Vanau*, **liviu@hambar18.ro**

SHORT TAKES

APRSPoint 4.5.4

Just in case you've never heard of the Automatic Packet Reporting System (APRS), here is a quick three-paragraph overview.

Created by Bob Bruninga, WB4APR, APRS was originally conceived as a means to track the positions of moving objects using amateur packet radio. A typical APRS station in, say, an automobile would consist of a Global Positioning System (GPS) receiver, a packet radio terminal node controller (TNC) and an ordinary 2 meter FM transceiver. The GPS receiver would supply position data to the TNC, which would then incorporate the information into data packets that would be translated as varying audio tones. These tones would be fed to the 2 meter FM transceiver for transmission, typically at 144.39 MHz.

At the receiving end, a 2 meter FM transceiver would feed the received tones to a TNC, which would decode the data and transfer it to a computer running APRS software. The result would be icons that appeared on software-generated maps. When the car changed positions, a new report would be transmitted, decoded and the icon would shift its position on the map.

Although APRS is still often used to track moving objects, much has changed over the years. The TNCs in vehicles have morphed into stripped-down "position encoders" — compact and easy to use. And the APRS network itself has expanded to include more than just position tracking. Some APRS stations make weather information available; bulletins and messages fly back and forth as well. The global APRS network is also hooked into the Internet, allowing anyone to tap into the APRS data stream from almost any location.

What Does This Have to Do with *APRSPoint?*

Depending on which survey you cite, roughly 95% of APRS-active hams are using computers running the *Windows* operating system. Of those, the majority are relying on *UI-View*, the APRS software developed by the late Roger Barker, G4IDE. *UI-View* is a fine program; I use it myself. However, the software is getting a bit long in the tooth, as they say, and except for third-party enhancements, it hasn't changed in years.

APRSPoint by Michael Cai, KF6ZDM, provides an alternative. Version 4.5.4 has some of the same features as *UI-View*, but also has several significant differences.

The Importance of Maps

APRS software is useless without maps on which to place icons. With *UI-View* you had to find and incorporate your own maps or mapping software (I use *Precision Mapping* by Undertow). In contrast, *APRSPoint* can be purchased "pre-bundled" with Microsoft's *MapPoint 2004*. For this review I ordered the bundled version. Although the version of *MapPoint* that comes with *APRSPoint* is six years old, it is possible to incorporate the maps from the free *MapPoint 2010* trial version (the *APRSPoint* Web site tells you how to go about this). Frankly, I found that the 2004 maps were sufficiently up to date for my applications.

Setup and Use

Since *APRSPoint* had already taken care of the "map problem," setup was a breeze. I only noticed two wrinkles in the otherwise smooth installation. The *APRSPoint* installer didn't place a shortcut icon on my *Windows* desktop when it was finished and it also didn't appear in the *Windows* START list for some reason. I used *Windows Explorer* to find the *APRSPoint* folder and created the desktop icon by right-clicking on the *APRSPoint* icon in the folder, and then selecting "Send to Desktop."

The other wrinkle involved COM ports. *APRSPoint* uses your PC serial (COM) ports to communicate with your packet TNC. My TNC was on COM 5, but the highest COM port available in the *APRSPoint* setup menu was COM 4. Fortunately, you can simply type in the higher port numbers.

By using *MapPoint* as its base, *APRSPoint* gives you the ability to easily drag maps around the screen with your mouse and zoom or shrink with single clicks. This is much easier and more intuitive than the mechanism used by *UI-View*. As my transceiver listened, the map quickly populated with APRS icons. The stations also appeared along the left-hand side of the map window in a convenient "tree view." Here they are organized by type (such as APRS weather stations). You can click on any station in the tree view and see the complete station information.

Message handling was also simplified with straightforward in and out boxes for e-mails. Sending an APRS message was not unlike sending normal e-mail.

Finally, *APRSPoint* does a terrific job of connecting to Internet APRS servers and displaying the resulting activity. When you order the software, you receive a password that allows you to log into the system. Once *APRSPoint* is connected to a server, you're treated to a torrent of position reports and other information from all over the world, and your maps populate accordingly unless you set up a restrictive filter. This is fascinating to watch, although it is analogous to drinking water from a fire hose!

Conclusion

APRSPoint is available with or without *MapPoint* (for those who may already own *MapPoint 2004* or later). Purchases must be made online. If you order the full version, the *MapPoint* CDs are mailed to you. Check the *APRSPoint* Web site for tutorial videos. These are well produced and provide a good overview of how the software operates.

Manufacturer: APRSPoint, **www.aprspoint.com**. *$77 for full version with* MapPoint 2004; *$47 without* MapPoint QST

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NØAX

HANDS-ON RADIO

Experiment 91 — Common Mode Choke

The *common mode choke* is an RFI fighting friend, although most hams know it as a dandy balun. Construction can be as simple as a coiled coax feed line, but most often the choke is made of a few turns on a toroid core, the subject of this month's column.

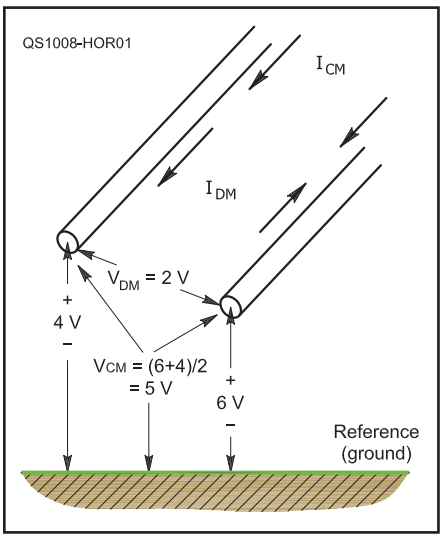
Differential versus Common Mode

Before the choke's long and winding story begins, it's important to understand *differential mode* and *common mode* voltages and currents. Applied to a voltage, *differential* means that the voltage is measured between two arbitrary points — a voltage difference — and not with respect to some absolute reference, such as the Earth. Differential mode current is really a pair of currents with the same amplitudes but flowing in parallel and opposite directions, completely independent of ground. So a differential mode signal exists as the voltage between two conductors, V_{DM}, and a pair of equal and opposite currents, I_{DM}, flowing on them. Neither conductor need be connected to ground in any way.

A special case of differential mode signals occurs if the conductors are very close together with respect to the signal's wavelength and either parallel to each other or concentric. In this case, the conductors form a transmission line in which the differential mode signal exists as an electromagnetic field traveling in the space between the conductors. Coaxial cables and open wire line are examples of *tightly coupled* conductors forming a transmission line for differential mode signals.

Common and differential mode voltages and current may coexist on the same conductors, but are measured differently. On our two conductor transmission line, a common mode voltage, V_{CM}, has the same absolute value on both conductors with respect to the circuit's or system's reference voltage. Similarly, common mode currents, I_{CM}, would flow on all conductors of the line in the same direction with the same value. We'll only discuss two wire transmission lines for this experiment, but remember that they are a special case of a multiwire cable, such as an antenna rotator control cable or a ribbon cable for a parallel data interface.

Here's an example — imagine that a voltmeter shows one wire of an open wire feed line at 6 V with respect to ground and the other wire at 4 V with respect to ground. The differential voltage is the difference of 6 – 4 = 2 V. Common mode voltage is the average of the two voltages: (6 + 4) / 2 = 5 V. Figure 1 illustrates the differential and common mode voltages in this case.



Figures 1 — Differential mode and common mode voltages are illustrated as V_{DM} and V_{CM}. Differential mode currents, I_{DM}, flow in opposite directions, while common mode currents, I_{CM}, flow in the same direction on both conductors.

Common Mode Chokes

There is a special case of common mode current for coaxial cable. Due to the skin effect, the outer conductor's inside and outside surfaces are effectively separate conductors at RF. A single current flowing on the outside of a shield can be treated as a common mode signal — a common situation. Hams know that the outside of a coaxial cable shield can pick up signals of all sorts, just as any isolated wire acts as an antenna. This common mode current can cause problems by reradiating the signal and distorting an antenna's radiation pattern.

If conducted into the shack, the current can flow between pieces of equipment and cause RF feedback or disrupt the equipment functions. If conducted into a neighbor's cable TV converter or home entertainment system, the resulting RFI can lead to disruption of a different kind — that of good neighborly relationships. In general, it is undesirable to have common mode currents flowing on the outer surface of antenna feed lines or of audio or control cables because of the unpredictable and usually unwanted effects.

While it's impossible to shield the shield to remove it as a conductor from the circuit completely, it is quite possible to block or dissipate the current. In this way, the unwanted currents are prevented from flowing — they are *choked* off. The component that performs this trick is called a *common mode choke*. (Other terms include *common mode RF choke* and *common mode ferrite choke*, describing more precisely the function or construction of the choke.)

Use in Antenna Systems

A popular use for a common mode choke is as a *current balun*. The current balun is used at the interface between an unbalanced feed line (such as a coaxial cable) and a balanced load (such as a dipole). No impedance transformation is performed by this balun because its sole function is to block common mode current that might flow back down the feed line's outer surface. Similarly, a *feed line isolator* is just a common mode choke installed on a feed line somewhere between the source and the antenna.

The choke can be made by winding coaxial feed line into a coil, by winding it around a toroidal ferrite core, or by placing ferrite beads (which are just one-turn toroid cores) over the outside of the cable. In all three cases, the differential mode signals inside the cable are completely unaffected. Only currents flowing on the outside surface of the coax's shield experience the choke's effects. Several examples of all three types of common mode chokes can be found in the *ARRL Handbook* or the *ARRL Antenna Book*. [1,2]

[1]*The ARRL Handbook for Radio Communications,* 2010 Edition, p 27.12. Available from your ARRL dealer or the ARRL Bookstore, ARRL order no. 1448 (Hardcover 1462). Telephone 860-594-0355, or toll-free in the US 888-277-5289; **www.arrl.org/shop**; **pubsales@arrl.org**.

[2]R. D. Straw, Editor, *The ARRL Antenna Book,* 21st Edition, pp 25-21ff. 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**.

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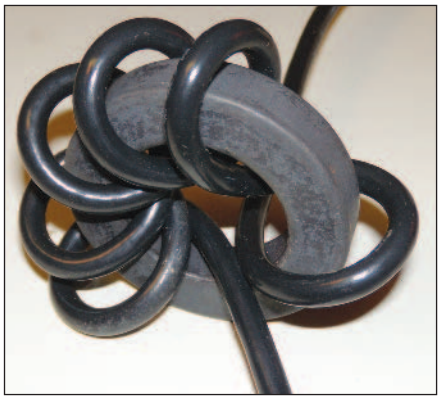
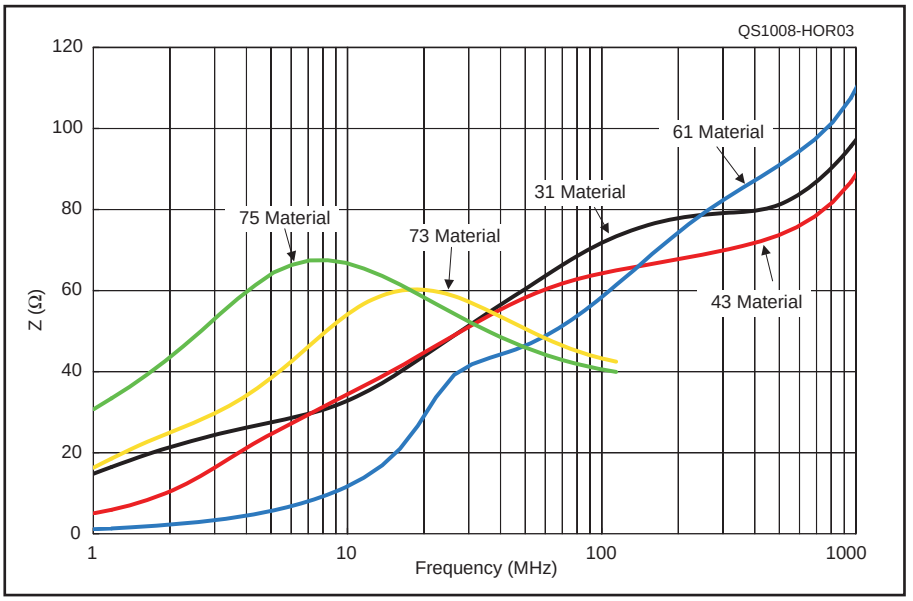


Figure 2 — A common mode choke made of coaxial cable wound on a ferrite toroid core. Note that each turn passes through the core in the same direction.



Figures 3 — These curves show the impedance versus frequency of a single ferrite bead made of different types of ferrite material. Each bead is 3.50 mm × 1.30 mm × 6.00 mm. (Information courtesy of Fair-Rite Corporation)

Use for RFI

Applying common mode chokes to suppress RFI can also be beneficial. It is here that the simple choke (we'll drop the common mode for now) really shows its value. With modern transmitters having very low spurious emission levels, such as harmonics and parasitics, most cases of RFI from amateur transmissions are caused by common mode currents picked up from strong local signals.[3]

The signal is picked up by RF or audio cables, speaker leads, power cords — any conductor more than a small fraction of a wavelength long at the signal's frequency — and appears as common mode current at and in the affected device. Even though the components required to filter out such a signal cost very little, most consumer equipment (and a surprising amount of industrial and professional equipment) does not include them. That means the current must be dissipated or blocked before it can enter the equipment. The choke rides to the rescue.

Ferrite Core Chokes

The small size of chokes wound on ferrite cores or beads slipped over cables fits the tight confines of both the ham shack and stereo system. Creating an effective choke requires that a ferrite material with an impedance that is largely resistive be used. The resistive and reactive components of ferrite's impedance changes with frequency. (The characteristics of ferrite are explored in detail in the *ARRL Handbook* and in the For Further Reading references.) For general purpose HF and lower VHF use, #31 material is the best choice. At VHF and above, #43 material performs best.

These materials are especially made for RFI suppression. They are designed to present a high impedance to common mode currents. Ferrite materials designed for inductive uses (in which energy is stored and not dissipated) are less effective than suppression materials. It is important to use the correct type of material to create an effective choke.

To make a choke from a toroid core, the process is fairly simple — wind as many turns of the cable through the toroid as practical, as shown in Figure 2. T-140 (1.4 inch OD) and T-240 (2.4 inch OD) cores are the most practical for use with audio and RF cables and ac power cords. A dozen turns or so is usually the practical limit, particularly if the connector is still installed on the cable. If you can remove and reinstall the connector, more turns may be possible. The goal is to create a choke with an impedance of at least several hundred ohms at the frequency of interest. All turns *must* pass through the core in the same direction or the magnetic flux created by each turn will cancel with that from an oppositely oriented turn, negating the effect of the core.

What about ferrite beads? The effects of a bead, in essence a single-turn core, are less than for a multiturn toroid. (A clamp-on *split core* is a special type of bead sawn in half with a plastic case that holds it together.) More than one bead can be added to a cable, however, acting in series to add their effect together. Figure 3 shows the impedance from one bead of different materials at different frequencies. A general rule is that beads are suitable for suppressing RFI at VHF, but it takes quite a few of them at HF to have the same effect as a few turns of cable through a toroid.

Testing a Choke

You can test the effect of a common mode choke by making some RFI and then getting rid of it. If you have a handheld VHF transceiver, transmit with the antenna close to a cable on your home stereo, TV system or other device. Try the RF, audio and power cables until you find one that enables the device to respond to your transmission. Obtain a T-140 or T-240 size toroid core of #31 or #43 material. (Mouser Electronics, **www.mouser.com**, is one source.) Wind turns of the responding cable onto the core one at a time, repeating the transmission and observing the device. You'll likely see small reductions in RFI until at some *threshold*, the RFI disappears. This is typical of the effects of a common mode choke, your best RFI toolkit friend.

For Further Reading

The "RF Techniques" chapter of the *ARRL Handbook, 2010 Edition* covers ferrite materials in detail. The downloadable RFI tutorial by K9YC **www.audiosystemsgroup.com/RFI-Ham.pdf** is excellent reading and more technical details are available in W1HIS's online paper, **www.yccc.org/Articles/W1HIS/CommonModeChokesW1HIS2006Apr06.pdf**. Be sure to ferret them out! QST

[3]ARRL RFI literature uses *fundamental overload* to refer to any disruption of a device's function by a strong local signal, whether the device is a radio receiver or not. Most fundamental overload is caused by common-mode RF current.

AG1YK

HINTS & KINKS

ACCURATE ZERO BEATING USING THE THREE-OSCILLATOR METHOD

◊When an oscillator is adjusted so it zero beats with WWV or other standard frequency transmissions, much comment has been made over the ability to approach true zero-beat. When the harmonic is directly zero-beat to the standard, the stated accuracy is generally in the 1-5 Hz range.

There is a technique that allows one to repeatedly zero-beat to a much higher accuracy. The method is called the "Three-oscillator Method" and dates back to the 1930s, or earlier. The earliest discussion I have found was on page 47 of Bulletin 10, *Frequency Measurements at Radio Frequencies*, published by the General Radio Company in February 1933. The bulletin states that the "method has been in use for a number of years…" The technique is also presented in the 1956 Technical Manual (TM11-2665) for the AN/URM-18 Frequency Calibrator Set. More recently, Alan Melia, G3NYK, reports an accuracy of 0.1 Hz using the same technique, **www.alan.melia.btinternet.co.uk/freqmeas.htm**.

The three oscillators are the standard, the unknown and either another less accurate oscillator or a receiver beat frequency oscillator (BFO). The AN/URM-18 and the General Radio 1100-A frequency standards utilize regenerative receivers. Using reception of WWV as an example, in normal practice the unknown signal is adjusted to zero-beat with WWV by injecting a sample of the unknown into the antenna of an AM receiver tuned to a WWV transmission. As the unknown is adjusted to match WWV, a beat frequency will be heard that approaches 0 Hz or zero-beat with the WWV transmission.

Unfortunately, the audio passband of the receiver and the observer's ear limit hearing a beat frequency much below 10 Hz. It is possible to reach closer (lower) beat frequencies by listening to the background noise wax and wane but the results are not readily repeatable.

Now, a third source is introduced when the receiver BFO is turned on or the regenerative receiver is adjusted to oscillate. With the unknown source temporarily disconnected, the receiver is tuned to give a nominal 1 kHz beat frequency while receiving the WWV transmission. When the unknown source is once again added, the 1 kHz beat will wax and wane at a rate equal to the beat between the unknown source and the WWV transmission. Changing the BFO or receiver tuning only changes the frequency of the tone that waxes and wanes. The waxing and waning rate is determined solely by the beat between the WWV transmission and the unknown source. It is now easy to reliably adjust the unknown, or its harmonic, to within a fraction of a hertz of the WWV transmission. — *73, John M. Franke, WA4WDL, 4500 Ibis Ct, Portsmouth, VA 23703,* **jmfranke@cox.net**

A SIMPLE CURE FOR A SLIPPING ROTATOR MAST

◊A couple of weeks after I had installed a new three element SteppIR (**www.steppir.com**) beam antenna, I noticed that the beam heading had shifted about 25°. I had very carefully leveled and aimed the antenna, so I was surprised to see that the actual beam heading did not coincide with the rotator control heading. It was apparent that a recent wind storm with gusts of up to 60 mi/h had shifted the beam direction by causing the mast to slip in the Tailtwister rotator's bracket. This occurred even though I had tightened the two rotator bracket U-bolts down securely.

DONALD A. CRISP, W7ZNN

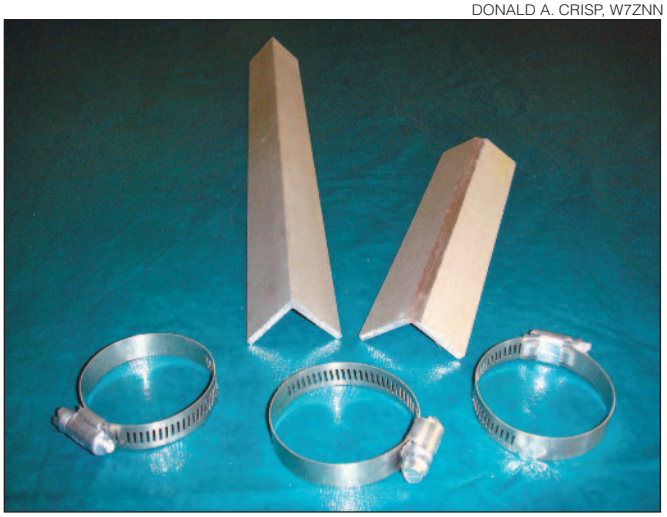


Figure 1 — All the components needed to insure your beam stays where you aim it. Note the aluminum angle on the right. The corner has been filed down to better fit the rotator bracket.

DONALD A. CRISP, W7ZNN

Figure 2 — The completed mounting arrangement has the corner of the aluminum angle ground down to fit into the corner of the rotator bracket. The three stainless steel hose clamps secure the aluminum angle to the mast.

In order to prevent the problem from reccurring, I made a shim out of 1¼ inch aluminum angle, as shown in Figure 1. I placed the angle between the mast and the V of the rotator bracket to lock the mast in place. The inside angle of the mast bracket on the Tailtwister is more than 90°, so it was necessary to file the outside corner of the aluminum angle in order to spread it to conform to the angle of the rotator bracket.

I cut the aluminum angle to 8 inches in length, which left 3 inches to protrude above the rotator bracket. Three stainless steel hose clamps, in conjunction with the rotator bracket and its U-bolts, were used to clamp the aluminum angle securely to the mast and rotator as shown in Figure 2.

The aluminum angle also

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serves as a rotator to mast shim, which centers the mast on the exact rotational center of the rotator. For the Tailtwister and other similar Hy-Gain and CDE rotators, the aluminum angle shim thickness should be half of the difference between the outside diameter of the mast and 2 1/16 inches. This assures that the rotator will not try to turn the mast eccentrically with respect to the tower top bushing or bearing.

In spite of some recent gusty winds, the beam heading has now remained rock solid. I suspect that many other hams have had the same problem and may benefit by this simple, inexpensive and easy fix. — *73, Donald A. Crisp, W7ZNN, 2907 North Rambo Rd, Spokane, WA 99224-9164,* **w7znnqrz@peoplepc.com**

INTERFACE CABLE MANAGEMENT

◊The interconnection of computers, GPSs, TNCs, interface modules and other equipment peripheral to our transceivers presents a problem with regard to management of the many specialized cables required. On the one hand, it is desirable to retain a certain lead length on the connecting cables so that various hookups can be accommodated in the shack without having to move the equipment very close together. On the other hand, cable lengths that are handy in the shack often lead to a "rats nest" setup in compact mobile or briefcase portable hookups. The active ham discovers that he has no sooner shortened and resoldered the interconnect cables for a compact setup when conditions necessitate lengthening the connecting cables to try out some alternate arrangement.

The widely available plastic food storage containers provide a handy solution to the problem. The interface cables can be coiled and layered in such containers with just the optimum length of connector ends passing out through a hole in the side or top of the container. Attaching the lid that comes with the container completes the assembly.

In my shack, one container captures the cables that interface a WiSys GPS/TNC unit to a Kenwood TM-241A for an under-the-seat mobile setup. The other container holds the interface cables that connect a computer to the Kenwood transceiver for a briefcase packet station. In both cases, a neat access hole was formed in the side of the plastic container using an old tube socket chassis hole cutter.

Fortunately, most of the signals that are transferred to and from transceivers to peripheral equipment are of fairly low frequency and the cables are almost always protected with ferrite cylinders to reduce RF pickup. We have found that if the setups did not suffer from RF pickup on the bench, they do not encounter similar problems when the connecting cables are coiled up in the plastic containers. Remember to operate the transceiver at the lowest reasonable RF power level. — *73, Ed Sack, W3NRG, 1780 Avenida Del Mundo, Apt 4, Coronado, CA 92118,* **esack@pacbell.net**

PLASTIC LID INSULATORS

◊One of my ham radio passions is to experiment with homebrew antennas and it seems as though I am always missing one or more of the components to build an antenna. Necessity and not wanting to wait for insulators and other parts to come in the mail has driven this project and it has worked very well. I now have plenty of readily available raw materials to build all the parts needed. This project is also simple, fast and durable.

I save the plastic lids from various products used regularly around the house. These lids can be trimmed in either a square or circle completing the first step of the project. Trim all lids to a circle and store them until needed in one of the cans (see Figure 3). This makes plenty of raw material available when you have an antenna project.

If your project requires end insulators, trim the circle to a square and then cut the square in half. Fold it in half and in half again. This makes a 4 layer end insulator after punching holes in it with a hole punch for notebook paper (see Figure 4). If you need a really heavy duty insulator, double it again.

For the center insulator I take a round piece and quarter it into four triangles, lay these on top of each other and once again using the hole punch, punch three holes in the appropriate areas and you have a supportable center insulator for your dipole. If you feel you need a stronger center just add more layers.

Here is all you need to build your dipole, tough, fast and cost efficient. Just calculate the length of your wire. Assemble it and you are in business. — *73, Roger Odorizzi, W7CH, 195 Ivan Morse Rd, Manson, WA 98831,* **w7ch@arrl.net**

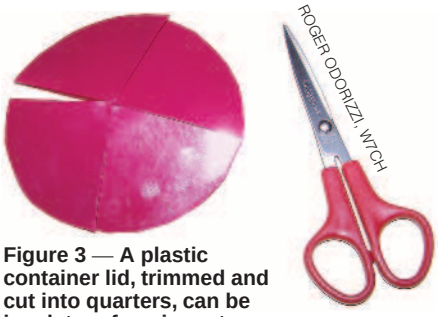


Figure 3 — A plastic container lid, trimmed and cut into quarters, can be insulators for wire antennas.

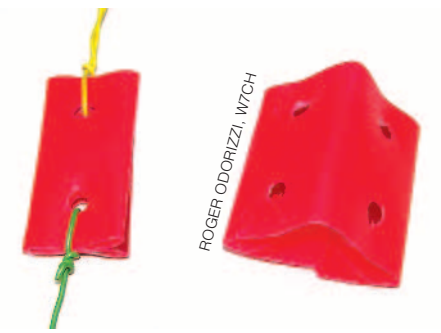


Figure 4 — An end insulator made from a plastic container top. The top is cut into an appropriately sized square and then folded over itself to form a multilayer insulator. A paper punch is used to make the holes.

A BETTER ELECTRET ELEMENT FOR HOMEBREW MICROPHONES

◊Many amateurs who build their own microphones use the readily available Radio Shack electret condenser microphone elements (**www.radioshack.com**). These elements, like so many similar elements on the parts market, have a flat response over a wide frequency range (for example, 20 Hz to 20 kHz). They work fine but require equalization if one desires crisp audio on SSB.

While building or modifying some microphones I was pleased to discover an inexpensive ($2) electret element manufactured by a world leader in the field (Knowles Acoustics) that has a tailored speech frequency response. It is available as Digi-Key item 423-1097-ND (**www.digikey.com**). The response, centered on 1 kHz, is down about 17 dB at 100 Hz and rises about 8 dB at 3 kHz. I've used the element in several microphones and have always gotten great audio reports on SSB. The element will work as a substitute element in almost any stock hand microphone that has a two terminal electret element. — *73, John J. Schultz, W4FA, 302 Glasgow Ln, Greenville, NC 27858*

REPAIRING SWITCH ARC-OVER DAMAGE

◊The band switch in my home-built amplifier (four 811-A tubes) arced between one of the grounded switch wafer support screws and adjacent switch contacts. Since the amplifier had been in service for many years, I expect that accumulated dust, etc caused the arc. Cleaning the ceramic wafer didn't help and I didn't have a replacement.

The solution was quite simple. I replaced the screws and spacers with nylon screws, nuts and washers. The amplifier is now back in service without further problem. If the switch contacts are damaged, as mine were, they can be replaced by drilling out the ends of the hollow rivets and attaching contacts (from a junk box switch) with #2-56 machine screws and nuts.

There are many sources for nylon hardware. I obtained the items I needed from Fastener-Express (**www.fastener-express.com**). For my switch, #6-32 screws of appropriate length along with nuts to fit and a number of #6 nylon washers did the job. Screws, nuts and washers were each sold in packages of

50 or 100 at very nominal cost. I ordered them online and they appeared in my mailbox in less than a week. — *73, Dean Elkins, K4ADJ, 212 Old Orchard Ln, Henderson, KY 42420-4755*, **k4adj@arrl.net**

PLATFORM MOBILE MOUNT

This describes an easy to build and install mobile mount. Just a board cut with a bevel and then carpeted, two legs with rubber ends and a nylon strap. Very simple and handy to use. Figure 5 shows the mount in my Ford F-150 pickup truck.

I used a standard 2 × 10 board 13½ inches long purchased at any lumber store (the length of this board should match the center console width of your vehicle). This board has a 30° bevel cut along one edge. The Kenwood TS-50's quick release mobile mounting bracket is screwed onto this cut edge.

I attached carpet to the board first and then mounted the bracket. Two ¾ × 1½ inch boards were cut and screwed to this edge to form the legs. The length of these two legs was determined after strapping the carpeted board to the center console with a ratcheted nylon strap commonly used to tie down a boat onto a trailer.

I mounted rubber furniture pads onto one end of each of the legs, held them in place to the board already tied down to the center console and marked the length they needed to be. After cutting them I screwed them onto the 30° beveled cut edge. It is important to get these "legs" the right length to give stability to the mount. Otherwise it would bounce up and down when on the road. — *73, Ron Toyne, WAØAJF, 1220 Hertz Dr SE, Cedar Rapids, IA 52403-3450*, **wa0ajf@aol.com**

RON TOYNE, WAØAJF

Figure 5 — The movable mount strapped in place in the author's F-150 truck. The width of the base board and length of the legs will vary according to your vehicle's interior layout.

CHILLING TEFLON IMPROVES FERRITE ASSEMBLY

◊I was building a 1:1 balun to use in a homebrew balanced tuner. This is the current type balun that places 50 ferrite beads on Teflon cable. The beads were a tight fit for the most part. I put the cable in the freezer for about 30 minutes and even though it was Teflon and double shielded, it shrunk enough to allow the beads to slip on much faster. There were still a couple really tight beads. I set these aside and placed them on last to minimize having to push them down the cable very far. — *73, Charlie Liberto, W4MEC, 619 Hidaway Cv, Hendersonville, NC 28739-6915*, **w4mec@arrl.net**

HOSE REEL ROPE CARRIER

◊After a long day of working on a tower, one of the hardest things to do is rolling up the 200-400 feet of rope. To make this job easier I store my long ropes on an old hose reel, with wheels to help move it. I took a leaking hose reel that was to go out to the trash and cut off the hose connector. I attached the rope to the reel and start turning the handle to roll up the rope. I can get about 300 feet of ½ inch rope on the reel. — *73, Charles Stokes, WB4PVT, 494 Pamela Dr, Newport News, VA 23601-1723*, **wb4pvt@arrl.net**

ACCESSORY OCTOPUS

◊It used to be convenient to have a selection of jacks on the back of older transceivers that would provide easy access to a number of inputs and outputs. Those are now replaced by one or two DIN sockets to accomplish multiple functions. I find it inconvenient to hard-wire a DIN connector for a specific application, only to rewire it later when something new needs to be plugged into the radio.

I came up with the following adapter that makes the process more versatile. Wire pairs from several female RCA connectors are soldered to the appropriate pins on a male DIN connector, with all of the black wires soldered together then to the ground pin. Each RCA connector is labeled, for example, ALC, PTT, 13.8V, audio in and audio out (see Figure 6). If only a couple of them are needed, the others dangle harmlessly but remain available for future use. I suppose some might argue that these be shielded, but I figured the short lengths wouldn't invite trouble and in my application there's been no problem. — *73, Carl Solomon, W5SU, 7110 Fernmeadow Cir, Dallas, TX 75248*, **w5su@arrl.net**

CARL SOLOMON, W5SU

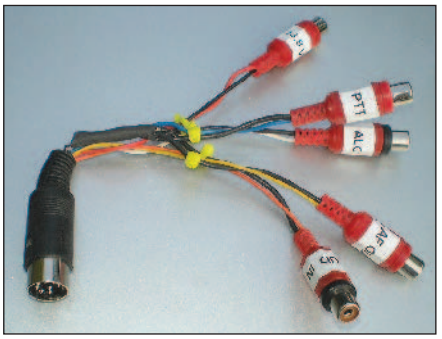


Figure 6 — A simple homemade adapter for the accessory DIN socket found on most current transceivers.

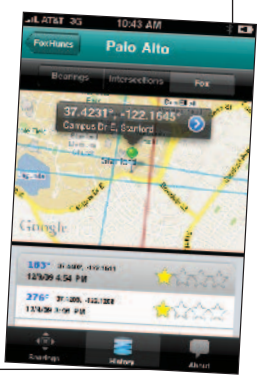
Hints and Kinks items have not been tested by *QST* or the ARRL unless otherwise stated. Although we can't guarantee that a given hint will work for your situation, we make every effort to screen out harmful information. Send technical questions directly to the hint's author.

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

New Products

FOXHUNT APP FOR iPHONE FROM W6EI

◊*FoxHunt* by Bob Iannucci, W6EI, is an app for Apple's iPhone that supports Amateur Radio direction finding activities. To use the app, point your iPhone 3GS toward the target and tap the on-screen button to record your position and heading. Move to another location and repeat the process. The two bearings allow FoxHunt to plot the probable location of the target on a map, and additional bearings increase accuracy. Once the target has been mapped, driving directions are available via the iPhone as well. For more information, visit **foxhunt.rail.com**.



Moonbounce from Arecibo Observatory

Last April hundreds of amateurs who had never had an opportunity to try operating Moonbounce finally got their chance.

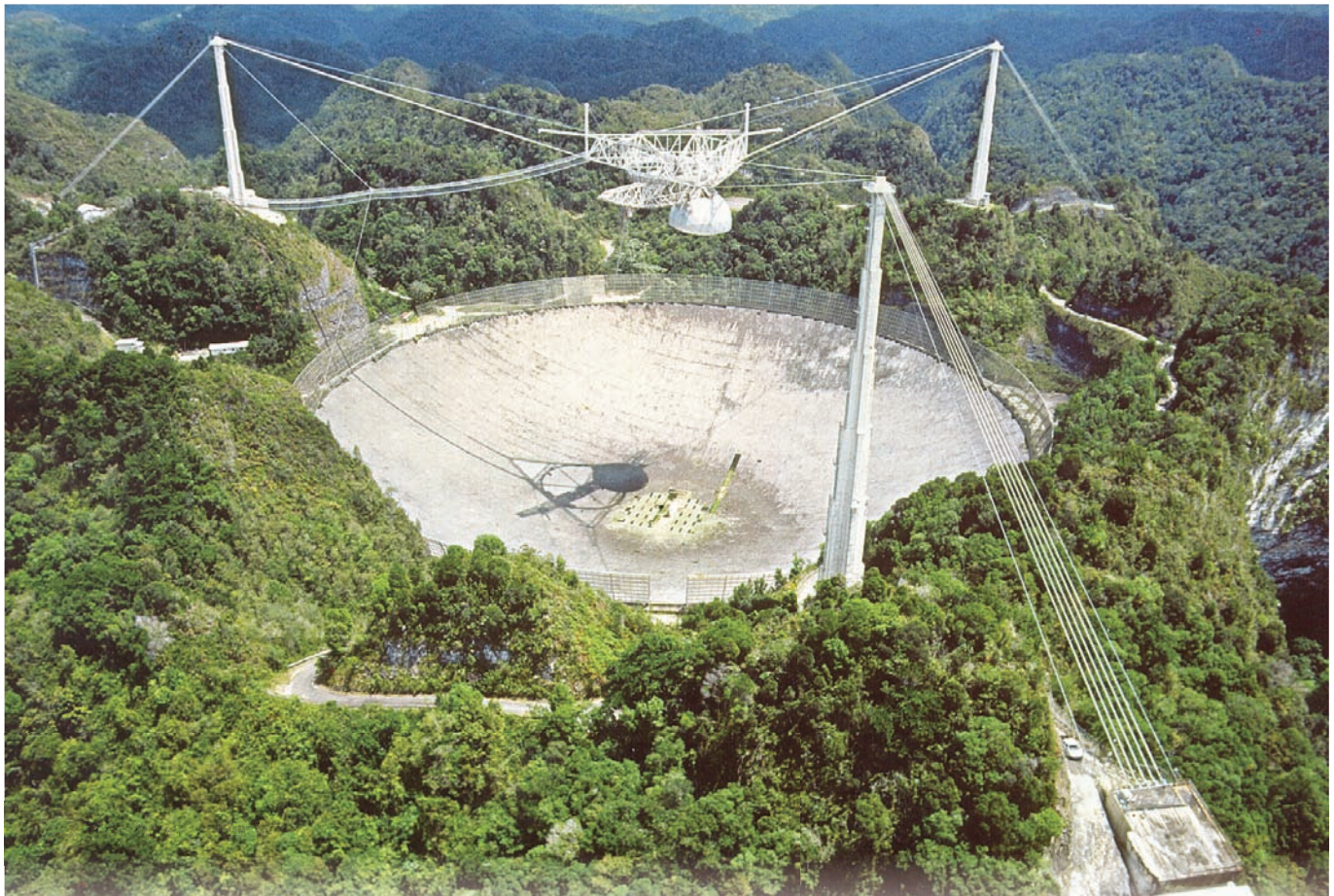
Joe Taylor, K1JT, Angel Vazquez, WP3R, and Jim Breakall, WA3FET

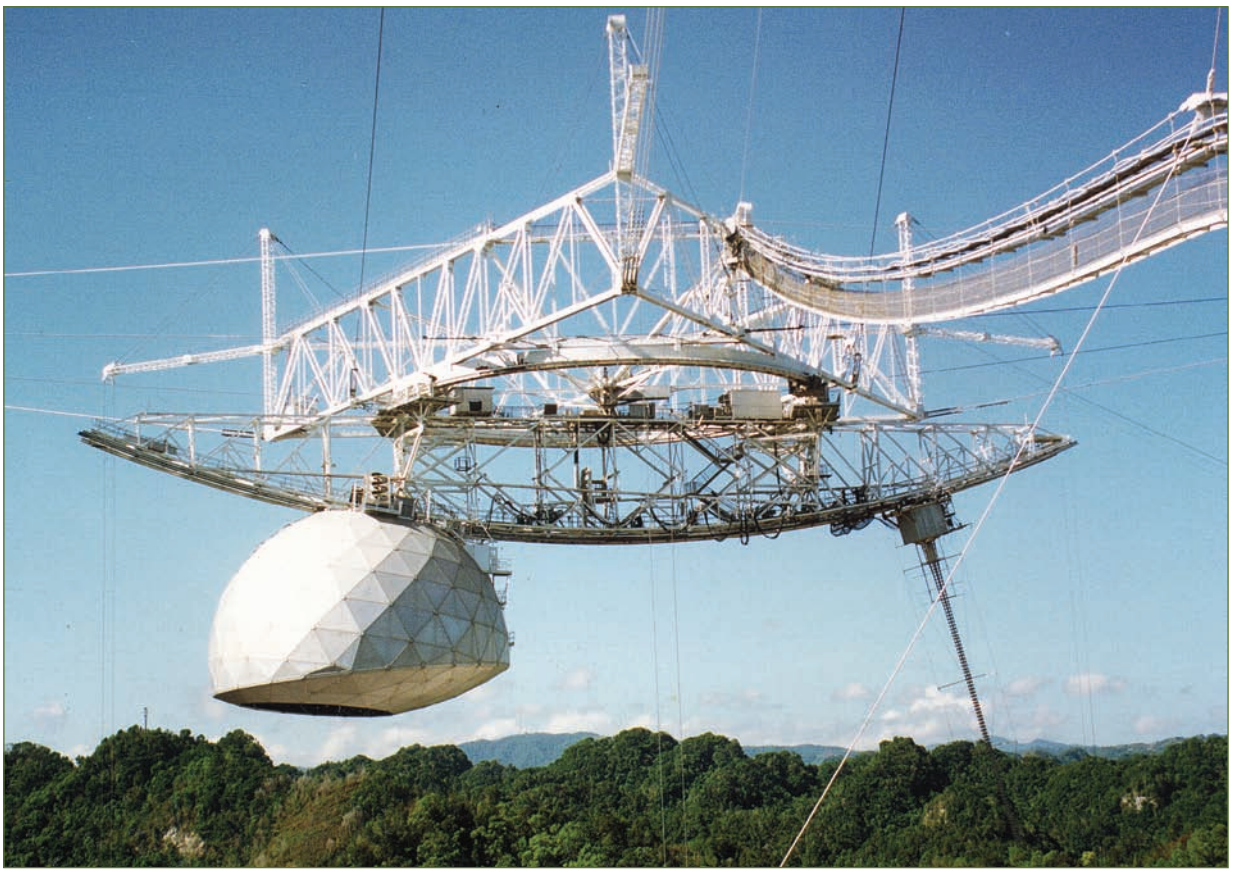
For nearly half a century the world's largest and most sensitive radio telescope has been the 1000-foot reflector of the Arecibo Observatory, in Puerto Rico. Operated by Cornell University under a cooperative agreement with the US National Science Foundation, the big dish is world famous for enabling pioneering studies of the Earth's atmosphere and ionosphere; of many objects in our solar system including planets, moons, asteroids, and comets; and of erupting stars, clouds of gas, pulsars, galaxies and quasars in much more distant parts of the universe.

Hardly surprisingly, a number of permanent staff members and visiting scientific users of Arecibo are licensed radio amateurs. The three of us are among this fortunate group, each enjoying an association with the Observatory spanning more than 30 years. In 1972 Joe, K1JT, brought specialized equipment to Arecibo that enabled detection of the first known binary pulsar. He has continued to make frequent trips to Arecibo, usually accompanied by a small group of research students, throughout his professional career. Jim, WA3FET, first arrived as a summer student in 1974. He later conducted research for his PhD at Arecibo, providing new results on absolute calibration of the telescope and its high power radar transmitter, and finishing his doctorate in 1983. He has been involved since then with designing antennas for the Observatory. Angel, WP3R, joined the technical staff as a telescope operator in 1977. Since then he has served as PC systems specialist and network administrator in the computer department, and most recently also as spectrum manager. Additional operators included our good friends Pedro, NP4A, and Angel, WP4G, who brought important operating and technical skills and EME experience to the group, and visitor Pat, AA6EG, who rounded out the team.

Needless to say, it was great fun for us and other members of the Arecibo Observatory Amateur Radio Club (AOARC) to put KP4AO on the air for 432 MHz EME (Earth-Moon-Earth, better known as *moonbounce*) over the long weekend April 16-18, 2010, using our all-time-favorite radio antenna. What a great QSO party it was! The telescope's huge forward gain, about 61 dBi at 432 MHz, guaranteed that even small stations could get into the game. Many hundreds of stations copied the KP4AO signal after its half-million mile round trip to the Moon and back — some using small handheld Yagis or even a dipole, and in at least one case a rubber flex antenna. The wall of stations responding to our CQs sounded like 20 meters during a

The 1000 foot antenna of the Arecibo Observatory.





The Arecibo feed-support system. The azimuth arm rotates about a central bearing; the "carriage house" (at right) and secondary reflector (inside radome, at left) move along the azimuth arm under computer control. In this way the telescope can be pointed to any direction within 20 degrees of the local zenith.

DX contest! Even with skillful, well-behaved operators spread out over 15 kHz and more, we had to work hard to pick call signs out of the din. Wideband real-time recordings have enabled us to copy hundreds of additional call signs, after the fact. A total of 242 lucky ones made it into the log with completed two-way QSOs, in about 8 hours of actual operation.

The Arecibo Antenna

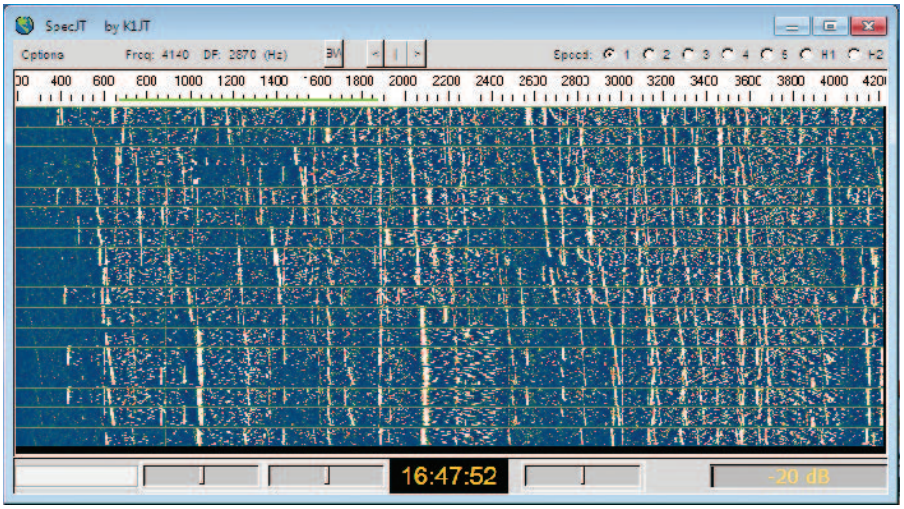
Imagine a conducting sphere 1740 feet in diameter, resting in a hole in the ground some 157 feet deep. Cut the sphere with a horizontal plane at ground level, and remove the top portion. What's left is a bowl-shaped reflector with the original radius of curvature, 870 feet, and a diameter of 1000 ft — just the shape and size of the Arecibo antenna. When construction began in 1962, most of the necessary hole in the ground was there already, thanks to the rugged "karst" geology of the region. The antenna's reflecting surface is made of some 39,000 perforated aluminum panels, each one individually adjustable, suspended from catenary cables and tied to concrete anchors in the ground. The measured surface of the dish conforms to the desired spherical shape with a root-mean-square accuracy of 2.2 mm.

Unlike most other radio telescopes and large antennas built for space communication, the Arecibo reflector does not move. However, its beam can be steered by moving the feed antennas. The feed support system is comprised of a circular azimuth track and banana-shaped, 328 foot long azimuth arm, which rotates about a central pivot. Steering in zenith angle is accomplished by moving the feed antennas along a track on the underside of the azimuth arm. The large geodesic radome encloses secondary and tertiary reflectors and switchable feed horns to cover the frequency range 1-10 GHz, plus a number of lower frequencies ranging down to 327 MHz. At the opposite end of the azimuth arm there is a rectangular "carriage house" supporting the 96 foot line feed for 430 MHz. This feed is essentially a leaky waveguide; the rings are spaced so as to provide optimum illumination of the primary reflector. Other low-frequency feeds, for 47 MHz, for example, can also be mounted on the carriage house. We used the 430 MHz line feed for our EME sessions.

The 430 MHz line feed.

Equipment Setup for 432 MHz EME

For operating convenience and to prevent disruption to scientific programs scheduled in other parts of each day, we installed all amateur equipment at ground level, near the control room in the main electronics build-



A screen shot showing signals in a 4 kHz passband during JT65B operation. Many dozens of signals are present and easily copied.

ing. For the necessary feed line, some 1500 feet long, we used the permanently installed WR2100 waveguide (0.04 dB loss per hundred feet) normally used for the 2.5 MW 430 MHz radar transmitter. Amateurs who use waveguide for their microwave stations will be amused by the sheer size of WR2100, with cross-section dimensions 21 × 10.5 inches.

To obviate potential problems of mismatched linear polarization angles, we elected to transmit and receive using right-hand circular polarization. A signal's sense of circularity is reversed upon reflection, so the most efficient reception would use left-hand circular polarization. However, the 3 dB loss for stations using linear polarization would be of minor importance, and there would be no problems with mismatched angles. Since we received only the cross-polarized signal in our own self-echoes, they were attenuated by some 15–20 dB; however, they were still S9+ in our receiver.

For extra flexibility we used two Kenwood TS-2000 transceivers — one for transmitting and one for receiving. The receive side included a GaAsFET preamplifier with noise figure 0.5 dB and equivalent noise temperature 35 K. The telescope beamwidth is only 0.15° at this frequency, less than ⅓ the size of the Moon's disk. Consequently, our system noise temperature was dominated by the Moon's surface temperature, about 210 K. Total system noise temperature including receiver noise, feed line, waveguide and rotary-joint losses, and antenna "spillover" was around 350 K.

We had two power amplifiers available — one using a 3CX800, and the other a solid-state unit built by F1JRD and donated by Freescale Semiconductor to the AOARC for scientific and educational purposes. As things worked out, we had problems with the tube amplifier and were not ready with the SSPA on the first day, so we ran the TS-2000 barefoot at about 35 W. On April 17 we started with 350 W from the 3CX800 amplifier, but after an arc-over we switched to the SSPA at 500 W. On the final day we used the 3CX800 again because a problem had developed in the 50 V power supply for the SSPA. Murphy tried his best, but we were well supplied with spares and servicing skills.

On the Air!

Notice of our scheduled operation had been publicized for only a few weeks, but the grapevine was so efficient that hundreds of stations were listening for us on 432.045 MHz at the time of our first Moon acquisition, 1645 UTC on Friday. A brief "Hellooo… Moon!" on SSB to check our echo was followed by a "CQ CQ from KP4AO, Arecibo Puerto Rico…," and a huge pile-up erupted. Fifteen SSB QSOs were made in the next few minutes; we then switched to CW and worked another 74 stations before our Moon window closed. It was disappointing not to have an amplifier ready for service on the first day, but for most of the calling stations it hardly mattered. We were delighted with the total of 89 QSOs made with 35 watts.

As shown in the following table, in Saturday's Moon window we increased the QSO rate to about 40 per hour. Altogether our log shows 242 QSOs with stations in 36 DXCC entities. The accompanying waterfall image made from our recordings of our JT65B operation gives a good impression of the number of stations calling.

	SSB	*CW*	*JT65*	*Total*
Friday	15	74	0	89
Saturday	75	31	0	106
Sunday	16	17	14	47
Totals	**106**	**122**	**14**	**242**

As had been planned and announced in advance, an hour of Sunday's window was allocated to the slower but extremely sensitive digital mode, JT65B. It was impossible to work more than a tiny fraction of the stations that were calling. We tried to pick out some of the weaker decodable signals, making a total of 14 QSOs in our final hour of Moon time.

Even with reasonably good signals in both directions, it is not possible in any mode to run an EME pileup at the QSO rates sometimes achieved by top contesters or DXpeditioners. An inevitable 5 second delay (twice the round-trip travel time to the Moon, at the speed of light) occurs between each station's standby and the first echoes heard from a QSO partner. Moreover, we wanted to respect the minimal-QSO standards generally used in the EME world, which include full exchange of both call signs, a signal report, and acknowledgments. We provided live video and audio streaming of the whole operation, and many viewers were amused by the screeches from tropical birds inadvertently sharing our transmitter room, as well as plenty of human noises from lookers-on. We hope these distractions have not caused a significant number of errors in logging the stations worked.

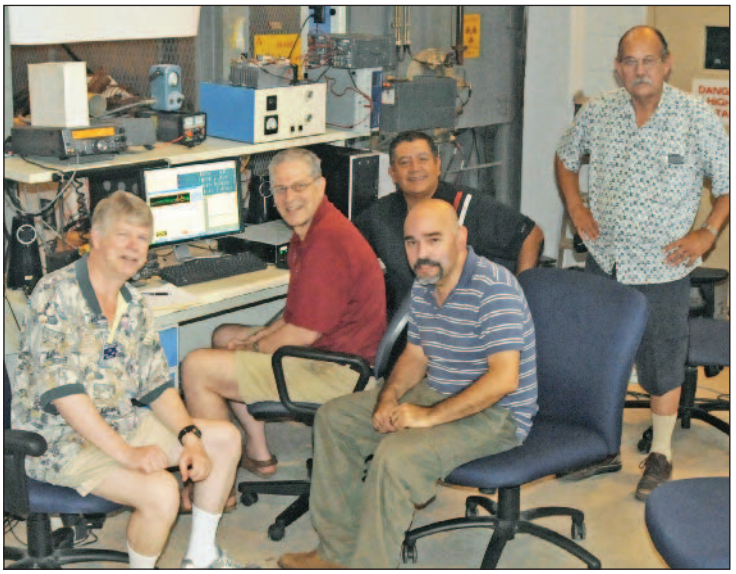
Angel, WP3R, connects LMR-900 feed line to a waveguide-to-coax transition, just outside the transmitter room.

Soapbox Comments

We could tell many more stories about the goings-on at Arecibo, but in many ways the most interesting ones will be told by operators at the other ends of our EME paths. Here are some selected (and lightly

edited) comments that we received after the event…

Persistence paid off...25 elements and a 100 W brick amplifier was enough for a QSO. — **WB2SIH**. Nice to listen to the KP4AO SSB signal with a simple station: 12-element Yagi, 0.5 dB LNA, homebrew converter and SDR receiver. Honest 55 to 57 signals. An awesome experience! — **PY3FF**. Very impressive on JT65B! Was sending every period, but my flea power of 50 W and a 16-element Yagi didn't cut it. — **E51WL**. Tried for hours on SSB and CW without success; was very surprised to make it with the tremendous pile up when you went to JT65! Huge signals here on my single 28-element Yagi. I suspect after this weekend more stations will be encouraged to have a go at 70 cm EME. — **G4ZFJ**. I called for a few minutes soon after your Moonrise, not really expecting to be heard through the pile. After about ten minutes — lo and behold! — the operator came back with "W4RBO 59." I almost fell out of my chair. — **W4RBO**. A 21-element Tonna with az/el pointed manually, SWR 2.5:1, 20 meters of coax, FT-817, no preamp. Signal was fantastic, peaking up to S3. — **HB9DRI**. Set up on the New Jersey shore with a single 12 element Yagi on a photo tripod, 15 feet of RG-8 into an FT-847. You were Q5 throughout on CW. — **W2KV**. Fifteen students built 4- and 8-element Yagis, all 1 meter or less in length. With the help of an 18 K preamp, copied your 35 W CW signal on every one! Then worked you easily using our 16×10-element array. — **WD5AGO**. Very strong signals! Made contact in SSB and also my daughter, SW8NAC (12 years old) made an SSB QSO. — **SV8CS**. FT736R and Mirage 100 W brick, KLM 432C18 circularly polarized satellite antenna. All modes copied here, but we couldn't bust the pileups. — **K7IP**. OSCAR 13 station, IC-7000, and home-design cross Yagi with 13+13 elements, 15 meters of 9913 coax. RST 419 in CW mode, JT65B tones clearly audible in speaker. — **LU8YD**. Too bad you didn't have a month of Moon time to work all the stations calling! — **NY2NY**. FT-857 and 100 W brick, single 11-element WA5VJB cheap Yagi on tripod, no preamp. Solid copy all day on Sunday at –11db on JT65B. — **W6OUU**. I'm sure that thanks to this event EME will see a big increase of activity in the future on CW and JT65. Many new stations have tasted blood! — **CT1HZE**. FT736R barefoot, no preamp, Cushcraft 719B on a 6 foot stepladder, 50 feet of LMR400. Copied on SSB, CW, and JT65B. — **NJØU**. Thanks for my first EME QSO in over 30 years! — **KØTV**. Feeling proud of being a ham! Using a 10-element Yagi and an FT-817, I desperately tried to contact KP4AO in JT65B, but didn't succeed. Nevertheless I felt like Jodie Foster in the movie *Contact!* — **LY2SS**. Used a 3-element Yagi on wooden picnic bench in back garden, pointed roughly towards the Moon, with preamp and about 20 meters of good quality coax to an ICOM R9000. Good copy in JT65B mode on Sunday! — **Chris (SWL in UK)**. Great fun listening to the fantastic signal and the pileup of stations calling. — **SM2CEW**. KP4AO peaked 57 on sideband; perfect copy, hardly a word missed. Used an 8-element Yagi, boom length 0.8 meters, with one of my own LNAs, 0.3 dB NF and 27 dB gain — **G4DDK**. OSCAR 10-class station with 436CP30 antenna, 150 W through 110 feet of Andrew FSJ4-50B. Solid copy on CW and JT65B. My first EME QSO on 70 cm, and hopefully not the last. — **W1ICW**. Nice to still find a thrill after 30 years of ham radio! — **9H1GB**.



The tired but happy operators are (left to right) WA3FET, K1JT, WP4G in front of WP3R, and NP4A. AA6EG was behind the camera.

Acknowledgments

Many people at the Arecibo Observatory worked hard to make this event successful. We especially wish to thank Israel Cabrera, KP4LCL, who loaned his TS-2000; Alfredo Santoni, who gave generously of his time and engineering skills; Dana Whitlow, K8YUM, who made the wideband recordings; Mike Nolan, Observatory Site Director, who granted us the necessary telescope time, and Pat Barthelow, AA6EG, who made the initial inquiry and suggested possible dates of operation.

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 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**.

Angel M. Vazquez, WP3R, is an ARRL member who was born in Arecibo, PR, but raised in Brooklyn, NY from the age of 2 until he graduated from CUNY with an Associate degree in Electrical Engineering. He achieved a First Class Radiotelephone FCC license and worked one year for WNYC as a Radio Engineer; in 1977 he moved to Puerto Rico and took a position at the Arecibo Observatory. Positions there have included Telescope Operator, Senior Telescope Operator, Spectrum Manager, PC Systems Admin, RFI Manager and Head of Operations. You can reach Angel at HC 3 Box 53995, Arecibo, PR 00612, or **angel@naic.edu**.

ARRL member Jim Breakall, WA3FET, was first licensed as WN3FET in 1965. He received BS and MS degrees from Penn State University and a PhD in Electrical Engineering and Applied Physics from Case Western Reserve. He worked at the Lawrence Livermore National Laboratory, mainly on development of the Numerical Electromagnetics Code (NEC) used to this day for antenna modeling, and taught at the Naval Postgraduate School in Monterey, CA. Presently he is Professor of Electrical Engineering at Penn State and works mainly on antennas, notably feed designs for the 1000 foot Arecibo dish. He is a frequent speaker at the Antenna Forum at the Dayton Hamvention, and has built two major contest superstations, K3CR and KC3R, near Penn State, and WP3R, on his farm in Puerto Rico near the big dish. His son is Jimmy Breakall, W3FET, who got his license at the age of 9. You can reach him at 225 Electrical Engineering East, Penn State University, University Park, PA 16802 or at **jimb@psu.edu**.

Photos of the Arecibo antenna and the feed-support system are courtesy of the NAIC — Arecibo Observatory, a facility of the National Science Foundation. Remaining photos are by WP3R, K8YUM and WP4G. QST

Amateurs in Arkansas Provide Support to Local Authorities after Flood Kills 20

JOHN LUTHER, W5LED

ARRL Section Manager and Section Emergency Coordinator J. M. Rowe, N5XFW (standing center with clipboard), briefs search teams on the status of the ongoing rescue operation.

JOHN LUTHER, W5LED

Search teams, accompanied by search and rescue dogs, set out on small boats to seek out victims of the flash flood that claimed 20 lives.

In the early hours of Friday, June 11, as many as 300 campers were taken unawares when 6-10 inches of rain fell in the rugged Ouachita Mountains, causing the normally quiet Caddo and Little Missouri rivers to overflow their banks during the night. Around dawn, floodwaters barreled into the Albert Pike Recreation Area, a 54-unit campground in the Ouachita National Forest, about 75 miles west of Little Rock. Cars were wrapped around trees and children's clothing could be seen scattered across several campsites. In all, authorities said that 20 people lost their lives; 18 of the 20 victims have been publicly identified, among them eight children age 7 or younger. Eight of the 18 were from Louisiana, seven were from Texas and three were from Arkansas. The Pike County Sherriff requested the assistance of Amateur Radio operators to assist with search and rescue operations, as well as communications support, at the site.

Later that afternoon, the Arkansas Department of Information Services and the Arkansas Wireless Information Network (AWIN, the statewide P25 digital trunked radio system on 700/800 MHz) included ARRL Arkansas Section Manager J. M. Rowe, N5XFW, in an Emergency Support Function 2 (Communications) Conference Call; Rowe also serves as the Arkansas Section Emergency Coordinator. "They said they were sending an SOW (Site on Wheels) and a COW (Cellular on Wheels) to augment existing infrastructure," he explained. "I was very concerned about the terrain and the signal propagation of those systems."

Despite temporary cell phone towers being installed, emergency personnel still needed help communicating in the remote Arkansas wilderness. According to Arkansas Section Public Information Coordinator Josh Carroll, N5JLC, the cellular towers and the cellular services that had been put in place were functioning, "but the problem is they're working for a certain portion of the affected area, and the area we're currently concerned with is still very spotty as far as cellular service and communications."

When Rowe arrived at the scene on Sunday, things were in high gear. "Many volunteer teams and individuals were searching the banks, debris piles and the water for victims," he told the ARRL. "The activity was being coordinated by Chief Deputy Sheriff of Pike County Jack Naron, KE5ZME, and County Deputy Emergency Manager Floyd Dunson, KC5BYB. We made plans for Monday, and I was tasked with finding ham operators capable of strenuous duty to be matched with search teams that did not have communications. There was no way to estimate the number of operators needed, because nobody knew how many spontaneous volunteer searchers there would be."

Rowe contacted Carroll, who quickly put together a release asking for operators who would match the criteria. "A call went out on the Central Arkansas UHF Society and the AR Link System repeaters Sunday night,"

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

Rowe said. "The response was exactly what I hoped: In-shape operators willing to traverse difficult terrain in a difficult situation in a difficult environment. That's a lot to ask for."

Howard County Search and Rescue Team (HCSAR) member Freda Davis, N5VFJ, said that the Howard County Office of Emergency Services (OES) requested that HCSAR be deployed to assist with the Little River flood search operations. "We arrived Saturday and assisted until the search teams were called off at 3 PM on Monday, June 14. Throughout the operation, HCSAR team members' skills were utilized in incident coordination, communications, map reading and search and rescue." Davis said that officials used the HCSAR Communications Van (SARCOM) as the Communications Center for the Langley Fire Station deployment area. Through the use of the SARCOM Van, team members, who were also ham radio operators, communicated with searchers on the area frequencies — Amateur Radio, police, fire, AWIN and ambulance — but found that the HCSAR Amateur Radio repeater on 146.925 MHz seemed in many cases to be the only way to communicate with rescuers.

On Monday, Rowe helped match operators with teams and single volunteers from Texas, Louisiana, Oklahoma, Virginia and Arkansas: "The ham response had been so good that we had more operators than was necessary. I am very proud of the ham community in Arkansas. I was particularly surprised by the number of fully outfitted teams that arrived from out of state. It turned out that they had someone from their community among the victims — they couldn't *not* come."

Rowe described the conditions in the search area as "awful. The heat index was above 100°F every day. Debris piles and downed trees were everywhere. One pile was about 200 feet long by 30 feet high. Vehicles were strewn over more than two miles of the river. Snakes and bugs had not taken any time off. It was also a very emotional thing, as each of us put ourselves in the position of the victims' families. Three searchers had to be rescued due to heat stress."

Rowe thanked everyone involved: "If I start thanking folks I will miss someone, and I don't want that, so forgive me. The Howard County Search and Rescue performed admirably, just by doing what they do. I want to commend them for their foresight in putting that repeater in the right location years ago. The Northwest Arkansas Task Force arrived ready to go. The guys from Bowie County in Texas had some great computer skills. The list goes on and on — all were absolutely committed and all were helping their neighbors. That's why I do ham radio, so I can help my neighbor."

FCC News

♦**FCC Dismisses California Ham's Petition to Amend Section 97.1**: In September 2009, Gordon Schlesinger, W6LBV, of San Diego, California, filed a *Petition for Rule Making* with the FCC, seeking to amend Section 97.1 of the Commission's rules to account for changes in technology and amateur practice since the rule was adopted. On June 8, 2010, the FCC dismissed Schlesinger's *Petition*. In his *Petition*, Schlesinger called Section 97.1 "outmoded and in need of revision due to changes in technology and practices, and that it diverges from the practical realities of the Amateur Service today." The Commission noted that the basis and purpose of the Amateur Service was not intended to reflect any particular technology or the practices of a particular time: "Rather, Section 97.1 is intended to provide guidance as to the accomplishments the Commission expects of the service and to assist in international negotiations affecting the service. Nothing in your *Petition* demonstrates that the Commission's expectations for the Amateur Service have changed or are not being met, or that the rule is in some way hampering international negotiations that affect the Amateur Service. Nor does your *Petition* identify any reason to revisit the Commission's decision in 1989 not to change the basis and purpose of the Amateur Service. Consequently, we conclude that the *Petition* presents no evidence meriting a rule change."

♦**FCC Upholds Decision to Revoke Amateur License of Convicted Indiana Ham**: Lonnie L. Keeney, KB9RFO, of Greencastle, Indiana, filed a *Petition for Reconsideration* in March 2010, asking that the FCC re-evaluate the revocation of his Amateur Radio license. Keeney — who in 2002 was convicted of child molestation, a Class C felony — was found by the FCC in February 2010 to be "lack[ing] the requisite character qualifications to be and remain a Commission licensee." Keeney appealed the decision, and on May 24, the FCC denied his *Petition* via an *Order on Reconsideration*, affirming the revocation of his Amateur Radio license. The FCC — pursuant to Sections 4(i) and 405 of the *Communications Act, as amended* and Section 1.106 of the Commission's Rules — denied Keeney's request to have his Amateur Radio license reinstated, concluding that he failed to establish a basis for reconsideration of the *Order of Revocation* and the relief he seeks under the circumstances presented is inconsistent with the Commission's procedural rules.

AMATEUR RADIO OPERATORS ACTIVE DURING SEVERE TORNADO BREAKOUT IN NORTHWEST OHIO

During the early overnight hours of Saturday, June 5 through Sunday, June 6, severe weather and tornadoes ripped across an area of northwest Ohio, laying a large path of destruction. ARES® and SKYWARN® groups in Erie, Huron, Sandusky and Wood Counties activated nets as early as 10:30 PM Saturday, with many not standing down until 4:30 AM the next day. Traffic on the nets was filled with reports of severe weather damage, flooding and downed power lines.

In Wood County, ARES Emergency Coordinator Bob Schumann, W8NYY, reported that the severity of the damage quickly became apparent with the frequency of the reports coming in during a 15 minute window shortly before midnight on Saturday. Tony Everhardt, N8WAC, and Assistant Emergency Coordinator Ed Brown, K8ZCS, gave on-site reports of severe damage to Lake High School, located in Millbury. Everhardt reported that he was able to see the funnel cloud only when electrical transformers began exploding and lighting up the sky. Brown added that there were broken natural gas lines and downed power lines in the area as well, requiring Schumann to recall weather spotters from the area for their own safety. Hams relayed continuous reports on the net of telephone poles and power lines down blocking roads; live electrical wires were an immediate danger.

During the early morning hours, Schumann spoke with Wood County Sheriff Mark Wasyslyshyn concerning the state of communications. Wasyslyshyn advised Schumann he was setting up a temporary command center across from the Lake Township Police Department; that building had been heavily damaged by the tornado.

TONY EVERHARDT, N8WAC

Local amateurs were called on to provide communications support after a tornado wiped out communications in northwest Ohio.

The sheriff and Schumann decided to deploy the Wood County Amateur Radio Emergency Service trailer, as the trailer had a supply of police band radios, as well as a generator and Amateur Radio equipment.

Early Sunday morning, Wasyslyshyn reported that communications had been restored to Lake Township via temporary equipment. Many Wood County ARES® members remained on standby in case they were needed at a later time. The nets stood down at approximately 4:30 AM.

Schumann said he is very proud of the work performed by the hams of Wood County, thanking them for their dedication: "It's my hope that their dedication was responsible for the reports that ultimately sounded the sirens, which indeed saved lives."

District Emergency Coordinator George Henzler, WB8HHZ, maintained contact with Ohio Section Emergency Coordinator Jack Sovik, KB8WPZ, during the time of the incident, as is outlined in the Ohio Section Emergency Response Plan. Sovik told the ARRL that "the professionalism of the ARES® members, working in conjunction with the National Weather Service and their SKYWARN program, as per the written *Memorandum of Understanding*, saved lives and kept the National Weather Service and the public appraised of the situation that was developing in the immediate affected areas."

IN FCC RULE MAKING PROCEEDING, ARRL SUPPORTS EMPLOYEE PARTICIPATION IN DRILLS

In March 2010, the FCC released a *Notice of Proposed Rule Making* (*NPRM*) (WT Docket No 10-72) that proposed to amend the Part 97 rules — specifically 97.113(a)(3) — governing the Amateur Radio Service. The new rules would provide that, under certain limited conditions, Amateur Radio operators may transmit communications on behalf of their employers during government-sponsored emergency and disaster preparedness drills. While current rules provide for Amateur Radio use during emergencies, the rules prohibit communications where the station licensee or control operator has a pecuniary interest, including communications on behalf of an employer, except for government-sponsored drills for which a waiver has been granted. The *NPRM* asked for comments from interested parties. On May 24, the ARRL filed its initial comments and on June 7, filed its reply comments. The ARRL's filings reflect the position by the Board of Directors at its January 2010 meeting.

While the ARRL said in its comments that it supports the FCC's proposal to "facilitate Amateur Radio operations during government-sponsored emergency preparedness and disaster readiness drills and tests," it advocates that the drills and exercises in which Amateur Radio licensee-employees may transmit communications on behalf of their employers "need not and should not be limited to Government-sponsored emergency communications drills and exercises. Instead, all *bona fide* emergency communications drills and exercises involving Amateur Radio should be subject to the same regulatory requirements."

The ARRL proposed a slight revision to the proposed rule change set forth in the *NPRM*: The ARRL's proposed wording includes some *very specific language* for the revised Section 97.113(a)(3) that will:

- Accommodate the specific needs of Amateur Radio licensees who are employees of entities that actively participate in organized, bona fide emergency communications and disaster readiness drills and tests.
- Permit effective and seamless emergency and disaster relief communications preparedness drills and exercises incorporating Amateur Radio.
- Protect the Amateur Service to some extent against potential commercial exploitation by business entities in place of other, more appropriate radio services.
- Protect Amateur Radio licensees who are employees against pressure from their employers to conduct inappropriate communications utilizing their Amateur Radio licenses.

As such, the ARRL proposed that the Commission should modify the rule, but *only* subject to the following specific provisions:

- The emergency preparedness and disaster readiness drills and tests during which an employee who is an Amateur Radio licensee may provide communications on behalf of the licensee's employer should not be limited to government-sponsored drills and tests.
- The transmissions made by Amateur Radio licensees pursuant to the exception should be at all times limited to those necessary to participation in emergency preparedness and disaster drills that include amateur operations for the purpose of emergency response, disaster relief or the testing and maintenance of equipment used for that purpose, and for no other purpose.

The ultimate beneficiary of Amateur Radio communications is the public. But in its comments and reply comments, the ARRL stressed that the Amateur Service should not be exploited "as an inexpensive, flexible alternative to the Land Mobile Radio Service, the General Mobile Radio Service, or Commercial Mobile Radio Service facilities."

ARRL FILES COMMENTS WITH FCC REGARDING SPREAD SPECTRUM ISSUES

In response to a 2006 ARRL *Petition* regarding spread spectrum issues, the FCC released a *Notice of Proposed Rule Making* (*NPRM*) on March 16 (WT Docket No 10-62), proposing to amend Part 97 to facilitate the use of spread spectrum communications technologies. The Commission seeks to do this by eliminating the requirement that amateur stations use automatic power control (APC) to reduce transmitter power when the station transmits a spread spectrum (SS) emission, as well as reducing the maximum transmitter power output when transmitting a SS emission. The ARRL filed comments on this matter on June 14, 2010.

In its comments, the ARRL requests that the FCC proceed with the following proposals in the *NPRM*:

- To delete the APC requirement of

Section 97.311(d) of the Commission's rules.

■ To move the power limit for SS communications from Section 97.311 to 97.313(j) of the rules.

■ If the record developed in comments in response to the *NPRM* supports the proposed power reduction from 100 W PEP output power to 10 W, as proposed, then to implement that power reduction, subject to revisiting the matter at a later date if the reduction proves a substantial disincentive to expanded SS experimentation in the Amateur Service.

The ARRL's 2006 *Petition* proposed the deletion of Section 97.311(d) of the Commission's rules, save for the first sentence thereof. "The effect of this would be to eliminate an automatic power control provision for Amateur Radio SS communications," the ARRL stated in its comments. "The *NPRM* proposes that relief, but at the same time, as something of a tradeoff, proposes to reduce the maximum transmitter power output when an amateur station is transmitting an SS emission, from a maximum of 100 W to a maximum of 10 W PEP transmitter output power."

The ARRL maintains that proposed deletion of the APC requirement for amateur SS communications is timely and necessary, stating that the ARRL's *Petition* showed that the APC requirement has, since it was first imposed in 1997, "been impractical of compliance; unnecessary in order to protect other Amateur Radio operations or the operation of any licensed radio service sharing certain Amateur Radio allocations; and it has served as an unintended, but effective deterrent to Spread Spectrum experimentation in the Amateur Service."

BOY SCOUTS OF AMERICA REVIVE FOUR MERIT BADGES — INCLUDING SIGNALING

In keeping with Boy Scouts of America's centennial theme — *Celebrating the Adventure, Continuing the Journey* — four retired badges have been brought back for its 100th anniversary. The effective date for earning these new merit badges — Carpentry (1911-1952), Tracking (formerly Stalking, 1911-1952), Pathfinding (1911-1952) and Signaling (formerly Signaler, 1910-1992) — was April 1, 2010; requirements must be completed no later than December 31, 2010. The contemporary merit badges closely resemble the original designs of their counterparts, but with a gold border, immediately identifying it as a 2010 historic merit badge. These four merit badges may be used toward a Scout's rank advancement.

The BSA said that the overall goal of the program is for a majority of registered Boy Scouts to earn one or more of the merit badges during the centennial year, 2010. "The badges offered have a history that can be traced back to the origins of the BSA," according to the BSA Web site. "The original requirements are being used, as well as supported by scanned pages of the early merit badge pamphlets, so a Scout can view what a Scout 100 years ago used, giving Boy Scouts the hands-on opportunity to experience the exciting past of Scouting while learning how our world has changed in that 100 years."

"The Signaling merit badge is a great way to encourage hams who are already involved in Scouting to mentor this limited-time badge in their Troop and perhaps in other ways, such as camps," said ARRL Rocky Mountain Division Director Brian Mileshosky, N5ZGT; Mileshosky is the chairman of the ARRL's ad hoc Committee on Scouting. "Hams — and especially clubs, that have more resources and volunteers — who are not involved in Scouting at the present time but want to assist a Troop with earning the Signaling merit badge — should contact their local BSA Council to inquire about Scoutmasters in their area to contact and offer their assistance."

Hams who offer assistance should be prepared with knowledge of the badge, the timeframe in which it is being offered, why it's being offered and what the requirements are, Mileshosky advised: "Once the relationship between a club and a troop is established, it can evolve from offering the Signaling badge and then move to the Radio merit badge, then Jamboree On the Air (JOTA) and then a Technician licensing class." Hams who volunteer to work with Scout troops can expect are required to submit to a criminal background check.

The requirements for the Signaling merit badge are the original requirements as written in 1911:

■ Make an electric buzzer outfit, wireless, blinker or other signaling device.

■ Send and receive in the International Morse code, by buzzer or other sound device, a complete message of not less than 35 words, at a rate of not less than 35 letters per minute.

■ Demonstrate an ability to send and receive a message in the International Morse code by wigwag and by blinker or other light signaling device at the rate of not less than 20 letters per minute.

■ Send and receive by semaphore code at the rate of not less than 30 letters per minute.

■ Know the proper application of the International Morse and Semaphore Codes: when, where and how they can be used to best advantage.

■ Discuss briefly various other codes and methods of signaling that are in common use.

SECTION MANAGER NOMINATION NOTICE

To all ARRL members in the Eastern Massachusetts, Missouri, Nebraska, New York City-Long Island, Northern New York, South Carolina, Southern New Jersey, West Central Florida and Western Pennsylvania 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 September 10, 2010. If more than one member is nominated in a single section, ballots will be mailed from Headquarters on or before October 1, 2010, to full members of record as of September 10, 2010, which is the closing date for nominations. Returns will be counted November 23, 2010. Section Managers elected as a result of the above procedure will take office January 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 January 1, 2011. If no petitions are received from a section by the specified closing date, such section will be resolicited in the January 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*

Section Manager Nomination Resolicitation

Since no nomination petitions were received for the Santa Clara Valley Section Manager election by the nomination deadline of March 5, nominations are hereby resolicited. See above for details on how to nominate. QST

Nominees Sought for ARRL Board of Directors

If you're a full ARRL member in one of the following five divisions and are interested in playing a part in the League's democratic organization, here's the opportunity. Nominations are open for the offices of director and vice director for the 2011-2013 term in the Pacific, Rocky Mountain, Southeastern, Southwestern and West Gulf divisions.

ARRL Divisions

The policies of the League are established by 15 directors who are elected to the Board on a geographical basis to represent their divisions and constituents (see page 15 of any recent *QST* for a list of the divisions, directors and vice directors). These 15 directors serve for three-year terms, with five standing for election each year.

Just as in national or state politics, ARRL voters/members have the privilege and responsibility to decide that they like the actions of their incumbent representatives and support them actively for reelection or to decide that other representatives could do a better job, and to work for the election of those persons. Vice directors, who succeed to director in the event of a midterm vacancy and serve as director at any Board meeting the director is unable to attend, are elected at the same time.

How to Nominate

1. *Obtain official nominating petition forms*. This package consists of a cover letter; a reprint of this election announcement; blank Official Nominating Petition forms and Candidate's Questionnaires for the offices of director and vice director; a copy of the ARRL Articles of Association and Bylaws; and an informational pamphlet for candidates.

Any full member residing in a division where there is an election may request an official nominating petition package. You don't need to be a candidate to request the forms. Your request for forms must be received by the Secretary *no later than noon Eastern Time on Friday, August 13, 2010*. There are separate forms for director and vice director nominations.

2. *Submit petition with statement of eligibility and willingness to serve*. Official forms bearing the *signatures of 10 full members of the division* and naming a full member of the division as a candidate for director or vice director, must be submitted, with a statement *signed by the candidate* attesting to his or her eligibility, willingness to run and willingness to assume the office if elected. These documents must be filed with the secretary *no later than noon Eastern Time on Friday, August 20, 2010*. Only original documents can be accepted; *no facsimiles of any kind are acceptable*. On Monday, August 23, 2010, the secretary will notify each candidate of the names and call signs of each other candidate for the same office. Candidates will then have until Friday, September 3, 2010, to submit 300-word statements and photographs, if they desire these to accompany the ballot, in accordance with instructions that will be supplied.

3. *Ethics and Elections Committee to certify eligibility*. In accordance with the Bylaws, an Ethics and Elections Committee, composed of three directors not subject to election this year, is responsible for the conduct of the election. This year, the Ethics and Elections Committee consists of Tom Frenaye, K1KI; Cliff Ahrens, KØCA, and Greg Widin, KØGW.

Call for Nominations

Nominations are open for director and vice director in the five divisions mentioned above for the three-year term beginning at noon January 1, 2011.

The nominee must be at least 21 years of age and have been licensed and a full member of the League for a continuous term of at least four years immediately preceding nomination. No person is eligible whose business connections are of such nature that his or her influence in the affairs of the League could be used for his or her private benefit or would materially conflict with the activities or affairs of the League. The primary test of eligibility under this portion of the Article shall be full compliance with the Articles, Bylaws and Rules and Regulations of the League relating to ethics, elections and conflicts of interest.

Balloting Will Follow

If there is only one eligible candidate for an office, he or she will be declared elected by the Ethics and Elections Committee. Otherwise, ballots will be sent to all full members of the League in that division who are in 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 HQ by noon Eastern Time on Friday, November 19, 2010. A group of nominators can name a candidate for director or vice director, or both, but there are no "slates," as such. Each candidate appears on the ballot in alphabetical order. If a person is nominated for both director and vice director, the nomination for director will stand and that for vice director will be void. A person nominated for both offices does have the option, however, of declining the higher nomination and running for vice director if he or she wishes. Because all the powers of the director are transferred to the vice director in the event of the director's death, resignation, recall, removal outside the division or inability to serve, careful selection of candidates for vice director is just as important as for director.

Absentee Ballots

All ARRL members licensed by the FCC, but temporarily residing outside the US, are eligible for full membership. Members overseas who arrange to be listed as full members in an appropriate division prior to September 10, 2010, will be able to vote this year where elections are being held. Members with overseas military addresses should take special note of this provision; in the absence of information received to the contrary, ballots will be sent to them based on their postal addresses. Even within the US, full members temporarily living outside the ARRL division they consider home may have voting privileges by notifying the Secretary prior to September 10, 2010, giving their current *QST* address and the reason that another division is considered home. If your home is in the Pacific, Rocky Mountain, Southeastern, Southwestern or West Gulf division but your *QST* goes elsewhere, let the ARRL Secretary know as soon as possible, but no later than September 10, 2010, so you can receive a ballot from your home division.

The Incumbents

These people presently hold the offices of director and vice director, respectively, in the divisions conducting elections this year:

Pacific — Bob Vallio, W6RGG, and Jim Tiemstra, K6JAT

Rocky Mountain — Brian Mileshosky, N5ZGT, and Dwayne Allen, WY7FD

Southeastern — Greg Sarratt, W4OZK, and Jeff Beals, WA4AW

Southwestern — Richard Norton, N6AA, and Marty Woll, N6VI

West Gulf — Dr David Woolweaver, K5RAV, and John Thomason, WB5SYT

For the Board of Directors:

May 19, 2010

David Sumner, K1ZZ

Nome to Golovin Snowmachine Race

Dennis Weidler, KL1OE
PO Box 1307
Nome, AK 99762

The days between the start of the Iditarod sled dog race in Anchorage and the finish in Nome are filled with a variety of activities in this small northwest Alaska community. One of the most interesting regional events is the Nome to Golovin snowmachine race. (We don't call them snowmobiles in Alaska.) Snowmachine racers from as far away as Kotzebue, 120 air miles to the north, converge on Nome on the first Saturday after the start of the Iditarod. This year, the date was March 13.

The National Weather Service posted an official air temperature of 20 below zero at race time and that was 8° warmer than it was just a few hours earlier. Yet by arctic Alaska standards, it was a clear, sunny day and perfect for the annual Nome-Golovin Snowmachine Race. The 20 below temperature can create unearthly windchills when racers approach speeds of 90 mi/h. As is the tradition, the local Seward Peninsula Amateur Radio Club (SPARC) provided race communications for the event.

At high noon, there were 65 racers lined up on the Norton Sound ice directly in front of Nome, a community of just under 4000 souls in northwestern Alaska. Four classifications, including 00 to 600 cc, 601 cc and up, fan cooled and a women's division made up the race roster.

Earlier in the day, the local, portable ham shack, built on sled runners, had been transported down to the ice and placed in position at the start/finish line (see Figure 1). From here, each racer's start and finish were communicated by Carl Emmons, KLØFP, from his track-equipped pickup (see Figure 2) and Nate Perkins, KL3NP, who was stationed in the ham shack. Race starts were announced on the public-address speaker mounted on top of the shack to the large crowd that had formed. The same information was transmitted through the club's repeater system to the race headquarters at the Nome Volunteer Fire Hall where Kimberly Carter, KLØNA, transcribed the information onto the leader board (see Figure 3).

DENNIS WEIDLER, KL1OE

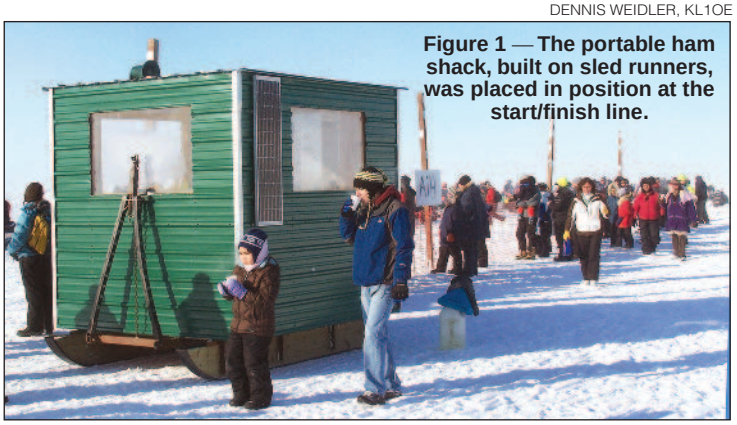


Figure 1 — The portable ham shack, built on sled runners, was placed in position at the start/finish line.

DENNIS WEIDLER, KL1OE

Figure 2 — Carl Emmons, KLØFP, communicated from his track-equipped pickup during the race.

DENNIS WEIDLER, KL1OE

Figure 3 — Kimberly Carter, KLØNA, transcribed the information onto the leader board at the Nome Volunteer Fire Hall.

SPARC had also positioned club members at various checkpoints up and down the race course, all the way to the native village of Golovin some 75 air miles away. As racers passed each checkpoint, operators would report and confirm the racer's location and condition. That meant spotting SPARC members at outposts such as Farley's Camp, Safety Roadhouse, Topkok, Timber and the village of White Mountain — none of which were accessible by any means other than a snowmachine. In addition to providing race communications, the SPARC team provided valuable safety coordination from their vantage points. Breakdowns, injuries and even fires are often part of this race where conditions can change dramatically.

By the race's end, there were three requests for helicopter rescue and the local National Guard Blackhawk was dispatched. The injured racers were transported back to Nome and the Norton Sound Regional Health Corporation facility. Without race communications provided by SPARC, critical medevacs such as these may have been seriously delayed. As it turns out, none of

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

the racers were seriously injured and all were treated and released.

At one time, near the end of the race, SPARC member Jim Stimpfle, KLØLL, aided an injured racer and helped him get into the cabin at the remote Topkok checkpoint. Here the Blackhawk touched down and transported the racer back to Nome. All in all, it was a great race and the SPARC team provided critical communications to race officials and medical staff. The overall winner was Mike Morgan who completed the 200 mile round trip from Nome to Golovin and back in 2 hours, 21 minutes and 32 seconds.

Many years ago, SPARC installed a series of repeaters located strategically throughout the Seward Peninsula. That may account for the fact that there is a higher percentage of the population who are licensed hams in Nome and the Seward Peninsula than nearly anywhere else. Weekend snowmachiners, hunters, hikers and four-wheelers know they have an extra measure of safety when they venture out, regardless of the season.

WILLIAMSON COUNTY (TEXAS) WINLINK NET

James Russell, NQ5L, **nq5l@arrl.net**

Williamson County (Texas) has invested heavily over the last 5 years in bringing online a significant installation of Winlink resources. Our goal is to provide an in-depth capability of e-mail over radio for the various agencies our ARES® organization serves. My purpose is not to present a discourse on the Winlink system or its capabilities, but to outline some of the operational aspects of what we have done with the system.

We have found that there is a unique advantage to using a mix of voice along with e-mail over radio capability of Winlink. This has been used effectively in both drill situations as well as in real deployments in support of our served agencies.

While a separate radio "room" or area is valuable in reducing background noise for the radio operators as well as keeping the voices on the radios from interfering with the activity in an Emergency Operations Center (EOC), several of our EOCs do not have that type of layout. Field command centers are even less likely to have such audio separation.

So what works well to keep radio "chatter" to a minimum is to send most of the details by e-mail and then make sure the e-mail is opened and acted upon with short voice messages. For example, sending a request for bed status to all of the county hospitals is easily done with an e-mail addressed to each of the installations in the hospital as one e-mail with multiple addressees. Then a voice announcement is made on the net with verbal confirmation from each hospital that they have received and understood the e-mail request. It's neat, simple and a very effective way to operate.

One of our challenges has been getting most, if not all, of our ARES participants up to speed on running a Winlink station and passing e-mail traffic. We encourage our members to set up a simple terminal node controller (TNC) and radio for VHF packet operation and to use that station on a regular basis.

To help members with this, we conduct a weekly "net" by e-mail. The check-ins are counted as part of our Sunday night ARES training net and stations "checking in" are recognized on the net just as voice check-ins are recognized. The difference is that a station can "check in" anytime during the week, not just on the Sunday night net.

They do this by sending one or more e-mails by radio through our system of 14 packet radio message server (RMS) stations in the county. Most of these are located in the county's hospitals where we have RMS stations running 24 / 7. A few are located at individuals' home sites where they have significant tower installations that give us good coverage. Because of the number of available stations, we maintain a high level of effective coverage with lots of redundancy. And with the weekly net, we have an effective group that is used to sending e-mail over radio ready for deployment.

THE BRASS POUNDERS LEAGUE AWARD COUNTS

Radio amateurs active in public service deserve recognition for their commitment of time, energy and demonstrated skills.

Traffic handlers are no exception and for decades the monthly Brass Pounders League (BPL) award has represented a major symbol of peer recognition. The points earned are reported on the honor system and totals are published in Field Organization Reports of *QST*.

The veracity of these reports should be based upon close adherence to the BPL point system: one point for each message in proper format sent and received. One point is awarded for a message delivered to a third party (if the operator also received the message). A "bonus" point is given for each message originated from a third party for sending on an operator's station.

BPL totals reported recently seem to suffer from misunderstandings about how the messages are counted for this award. Two examples should suffice:

- Messages "originated" by an operator and sent to a third party addressee (typically another radio amateur) should only be counted toward BPL as one point (message sent) — not two points (message originated and sent).
- Operators of digital MBO (mail box) stations reporting BPL points should only count messages physically handled by the operator, not those that are automatically posted and relayed through the MBO facility.

Details on how the BPL traffic count system works are published in "Chapter Ten: Counting Net Traffic" of the *ARRL Public Service Communications Manual* (**www.arrl.org/public-service-communications-manual**).

This Month in Contesting

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

AUGUST WARM-UPS

"Woah, oh, what I want to know, where does the time go?" — Robert Hunter

Just last week, I was preparing for the June VHF QSO Party. Now it's August, and summer is winding down. That means the big contest season will be upon us soon…sooner than you may think.

One of the things good contesters do at this point is to review their stations and make needed adjustments before the "season" begins. August provides numerous opportunities to test those station modifications and adjustments with events that fall outside the eye of many a casual operator. Let's take a look at these August events that can help you assess your station's status, as well as being fun in their own right.

For the HF Crowd

The first contest in August to try is the North American CW QSO Party, which takes place on Saturday, August 7. It's only 12 hours long and features a simple exchange: your name and state or province. You can work stations once per band and states/provinces per band are the contest multiplier. There's a 100 W power limit, so it's a great event for the smaller station. If your fist is a little rusty, hang out in the higher portions of the CW band (above .050) and you will find stations sending slower CW. You can also call CQ at a slower speed yourself; the Golden Rule of CW is to not send faster than you can copy. Other operators will slow down for you.

The weekend of August 14-15 is one of the most challenging contests on the calendar: The Worked All Europe CW Contest. Sponsored by the Deutscher Amateur Radio Club, this event allows European stations to ask non-Europeans for segments of their log, or QTC. If asked for a QTC, you can send details of up to the last 10 stations you worked. This gives both you and the European stations extra points. Managing QTCs is a major strategic component of this contest and adds a new spin on your standard "5NN" contest exchanges. QTC information is sent in a very precise order; be sure to read the official rules at **www.waedc.de/** for tips on how to send QTC. Sending information in the correct order and waiting for confirmation from the DX station that your first piece of QTC was correctly received before sending the next QTC is vital! Your CW will get a good workout for this event.

The third weekend in August also offers a major event for the digital mode folks: The SARTG WW RTTY Contest. Everybody works everybody, and the exchange is a signal report and a sequential serial number beginning with 001. This event features three distinct times of operation: 0000-0800 UTC Saturday, 1600-2400 UTC Saturday and 0800-1600 UTC Sunday. This ensures all serious competitors get some sleep and also allows the more casual operator to do other things with their weekend.

Saturday the 21st also features the SSB version of the North American QSO Party. It features the same rules as the CW version, only using your microphone instead of your keyer.

Lastly, on Sunday, August 22, the second ARRL Rookie Roundup will be held. This event will be on SSB, just like the first "RR" held back in April. Aimed at the newly licensed, this event gives a low-key introduction to contest-style operating. See the announcement on page 80 in this issue for more details.

Riding the Ultra-Highs

For the VHF+ operator, August is a good month to branch out and try something new. August 7-8 features the ARRL August UHF Contest. While most VHF+ contests include 6 and 2 meters, the lowest frequency allowed during the August UHF Contest is 220 MHz. The most popular band is 432 MHz and many of the "DC-to-light" radios feature at least 432 MHz. This event draws a lot of mobile operation (Rovers) and hilltoppers, too. Club Competition is allowed, as it was for the first time last year, so numerous VHF clubs across the country are combining their efforts in a bid for the club gavel.

August 21-22 also features the first leg of the ARRL 10 GHz and Up Contest. While this contest is beyond the reach of the average new ham (you're not likely to have 10 GHz gear just lying around), the challenges the microwave bands offer can be very rewarding. The contest period for both weekends starts at 6 AM local time Saturday and runs until midnight local time Sunday. QSO points are awarded based on the distance of a QSO and operating from several locations during the contest period is encouraged. SSB is the mode commonly used, although there is some CW as well. Power levels are relatively low compared to HF; most stations run several hundred *milliwatts*; a station running a few watts is considered a "Big Gun." Antennas are usually dishes, like those used for receiving satellite TV.

Many QSOs are completed on the microwave bands by bouncing signals off of other objects, such as mountains, buildings, even raindrops! You can also get lucky and catch a good tropo opening; in the 2007 contest, a QSO of 907.2 miles was made on 10 GHz on the West Coast between California and Mexico.

If you're curious about operating on the UHF bands but don't have much experience, consider joining a VHF club. There are numerous regional clubs throughout the US and Canada, such as the Pacific Northwest VHF Society, New England Weak Signal Group, Mt Airy VHF Club, Northern Lights Radio Society, Southeastern VHF Society and Central States VHF Society. Others specialize in microwave operations, such as the North Texas Microwave Society and the San Bernardino Microwave Society. A wealth of expertise and information can be gained by learning from "The Experts."

Conclusions

We all want to be ready for the coming contest season. Along with maximizing your station and double-checking all of your antennas and feed lines, few things offer better analysis of real-world performance than…well, performance in the real world. Enjoy these contests for the great events they are and see how well you and your station perform. By the time October rolls around, you will have worked out the bugs and be ready to go for the Contest Season. Hope to see you on the bands soon!

Operating Tip of the Month

Be a good guest! *If somebody is nice enough to let you operate at their station, be considerate of their hospitality. Unless these things are specifically discussed beforehand, be as self-sufficient as possible: bring your own food and drink, a sleeping bag and a towel. Be nice to your host's family when you see them. Inconsiderate operators rarely get asked to be a guest op again.*

CONTEST CORRAL

in association with the *National Contest Journal*

AUGUST 2010

Start and Finish	HF	VHF+	Contest Title	Phone	CW	Digital	Exchange	Sponsor's Web Site
Aug 1, 1200Z - Aug 1, 2359Z	1.8-28		European HF Championship	✘	✘		RS(T), last two digits of 1st year licensed	lea.hamradio.si/~scc/euhf/euhfc.htm
Aug 1, 1300Z - Aug 1, 1630Z	3.5-14		South Africa DX Contest	✘			RS and serial	www.sarl.org.za
Aug 6, 0230Z - Aug 6, 0300Z	1.8-14		NS Weekly Sprint		✘		Serial, name, and S/P/C	www.ncccsprint.com/rules.html
Aug 7, 0000Z - Aug 7, 2359Z	160-28	50	TARA Grid Dip Contest			✘	Name and grid square	www.n2ty.org/seasons/tara_grid_rules.html
Aug 7, 0001Z - Aug 8, 2359Z	28		10-10 Summer Phone QSO Party	✘			Call, name, 10-10 number, S/P/C	www.ten-ten.org
Aug 7, 1800Z - Aug 8, 1800Z		**220+**	**ARRL UHF Contest**	✘	✘	✘	**Grid square**	www.arrl.org/contests
Aug 7, 1800Z - Aug 8, 0600Z	**1.8-28**		**North American QSO Party**		✘		**Name and state**	ncjweb.com
Aug 8, 0000Z - Aug 8, 2359Z	1.8-28	50	Straight Key Weekend Sprint		✘		RST, QTH, name, member number	www.skccgroup.com/sprint/wes
Aug 11, 1100Z - see Web site	3.5-14		CWops Mini-CWT Test		✘		Name and member number or S/P/C	www.cwops.org/onair.html
Aug 14, 0000Z - Aug 15, 2359Z	3.5-28		Worked All Europe		✘		RST and serial (see Web for QTC rules)	www.waedc.de
Aug 14, 1200Z - Aug 15, 1200Z	1.8-28	50	Keymen's Club of Japan Contest		✘		RST and JA pref/dist or continent	www.jarl.com/kcj
Aug 14, 2300Z - see Web site	1.8-28	50-440	Maryland-DC QSO Party	✘	✘	✘	Maryland County/City or S/P/C	mdcqsoparty.w3vpr.org
Aug 14, 2000Z - Aug 14, 2200Z	1.8-28		Feld-Hell Monthly Sprint			✘	RST, Feld-Hell member nr or age, S/P/C	www.feldhellclub.org
Aug 15, 1800Z - Aug 15, 2359Z	**3.5-28**	**50**	**ARRL Rookie Roundup**	✘			**Both calls, name, check, S/P/XE or "DX"**	www.arrl.org/contests
Aug 21, 6 AM - Aug 21, 12 AM		**10G+**	**ARRL 10 GHz and Up Contest**	✘	✘	✘	**6-character grid locator**	www.arrl.org/contests
Aug 21, 0000Z - Aug 22, 1600Z	3.5-28		SARTG WW RTTY Contest			✘	RST and serial	www.sartg.com/contest/wwrules.htm
Aug 21, 0800Z - Aug 22, 0800Z	1.8-28		Russian District Award Contest	✘	✘		RS(T), serial or Russian district	rdaward.org/rdac1.htm
Aug 21, 1500Z - Aug 21, 1800Z	1.8-28		Silent Key Memorial Sprint		✘		RST, S/P/C, QRP ARCI mbr nr or pwr	qrparci.org
Aug 21, 1800Z - Aug 22, 0600Z	**1.8-28**		**North American QSO Party**	✘			**Name and state**	ncjweb.com
Aug 21, 2000Z - Aug 23 0200Z	1.8-28	50,144	New Jersey QSO Party	✘	✘		Serial and NJ county or S/P/C	www.qsl.net/w2rj
Aug 28, 0700Z - Aug 29, 2200Z	1.8-28		Hawaii QSO Party	✘	✘	✘	RS(T) and HI location ID or S/P/C	www.karc.net
Aug 28, 1200Z - Aug 29, 1159Z	3.5-28		YO DX Contest	✘	✘		RS(T), serial or YO district	www.hamradio.ro
Aug 28, 1200Z - Aug 29, 1159Z	3.5-28		SCC RTTY Championship			✘	RST, 4 digit year first licensed	lea.hamradio.si/~scc/rtty/rtty.htm
Aug 28, 1400Z - see Web site	3.5-28	50,144	Kansas QSO Party	✘	✘	✘	RS(T) and KS county or S/P/"DX"	www.ksqsoparty.org
Aug 28, 1600Z - Aug 29, 0400Z	3.5-28		Ohio QSO Party	✘	✘		Serial and S/P or "DX"	www.ohqp.org
Aug 29, 0400Z - see Web site	3.5-28		ALARA Contest	✘	✘		RS(T), serial, ALARA nr, name	alara.org.au
Aug 29, 1400Z - Aug 29, 1600Z	3.5-14		South Africa DX Contest		✘		RS and serial	www.sarl.org.za

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

In the September/October "Contesting 101"

Kirk, K4RO, discusses call sign and exchange databases — what they are, how they work and why to use (or not use) them.

"Contesting 101" can be found in the *National Contest Journal*, published six times per year. For subscription information, visit **www.arrl.org/ncj**.

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AUGUST 2010 W1AW QUALIFYING RUNS

W1AW Qualifying Runs are 10 PM EDT Wednesday, August 4 (0200Z August 5) and 4 PM (2000Z) Thursday, August 19. The West Coast Qualifying Run will be transmitted by station K9JM on 3590 and 7047.5 kHz at 9 PM PDT Wednesday, August 11 (0400Z August 12)(10-40 WPM). Unless indicated otherwise, speeds are from 10-35 WPM.

2010 ARRL DX CW Contest Results

Here comes the sun!

Nate Moreschi, N4YDU
n4ydu@yahoo.com

Note: The ARRL would like to thank Scott Robbins, W4PA, for his service in writing up the contest results for the past several years. Scott's purchase of Vibroplex is keeping him busy these days and we wish him well. At the same time, we welcome Nate Moreschi, N4YDU, to the stable of ARRL contest results authors. — *Ed.*

With contesters starved for sunspots, it doesn't take many spots to get people excited. Apparently it doesn't take much to make the bands a whole lot more interesting. Contesters received some reprieve from low solar activity as the sun was sprinkled with a few spots on February 20 and 21 for the 2010 ARRL DX CW Contest. The net result was improved conditions, more fun, higher scores and more time in the operating chair. Without further delay, let's get to the results.

W/VE Single Operator

The W/VE Single Operator, High Power (SOHP) category always produces a tough battle and 2010 was no different. This time around VY2ZM (MAR) powered his impressive Prince Edward Island station to 5,549,292 points for first place. K3CR (WPA) was just a smidge behind after tallying 5,514,120 points for second place. That's only 0.06 percent difference. But also nearby was the strong outing from VY2TT (MAR) with 5,218,695. VY2ZM set the pace with 4656 QSOs, but K3CR nearly made up for the QSO gap with 424 multipliers (25 more than VY2ZM). VY2TT found 4557 QSOs and 387 multipliers. K1RX (NH) clawed his way to a fourth-place finish with 4.98 million, followed by an impressive western 4.7 million total from N2IC in New Mexico.

N1UR (NH) continues to be a Single Operator, Low Power (SOLP) superstar. Ed's 3 million total earned him number one for W/VE for the fifth straight year. Ed may have to expand his shack to support all of his plaques. Not far behind Ed was another SOLP stalwart, K1BX (NH). Art's 2.8 million resulted in a runner-up finish, while N5AW (TX) fashioned an impressive 2.19 million from Texas for third place. Marv continues to post strong results, despite not being on the East Coast. W3EF (MDC) and N4YDU (NC) rounded out the top five respectively for the SOLP category.

K2DM (NNJ) was the only Single Operator, QRP (SOQRP) entry to cross the 1k QSO line (1021). George's QSO total, combined with 272 multipliers resulted in the top spot with 828k points. K3PH (EPA) took second place with 681k, followed by 551k from W9WI (TN). Western stations NØKE (CO) and N7IR (AZ) battled through the East Coast stations and finished fourth and fifth respectively to complete the top five SOQRP entries.

W/VE Single-Operator, Assisted

K3WW (EPA) pocketed his third consecutive Single Operator, Assisted (SOA) title after fashioning a healthy 6.1 million points. NN3W (MDC) drove the N3HBX super station to a solid 5.64 million points for second place, but totaled a category high of 480 multipliers. K3WW had 452 multipliers, but kept the QSO rate high with 4537 QSOs (NN3W finished with 3986 QSOs). AA3B (EPA) was third with 4.69 million, while W2RE (ENY) was fourth (4.32 million) and K2NG powered K2R to a fifth place finish with 4.1 million.

W/VE Multioperator

It's no secret that there is a huge Multi-operator, Multi-Transmitter (M/M) rivalry among K3LR (WPA), W3LPL (MDC) and KC1XX (NH). This year, Team K3LR (K3LR, K3UA, N6AN, N2NC, N2NT, N3SD, N6MJ, KL9A, NØAX, W2RQ, N3GJ) snapped W3LPL's stellar streak of three ARRL DX CW wins. The K3LR team tallied 398 more QSOs and three more multipliers for a final tally of 15.7 million points. The W3LPL squad amassed 14.92 million, as the KC1XX crew manufactured a strong 14.77 million total. W2FU (WNY) and KM1W (EMA) rounded out the top five in the M/M category. This category is growing in popularity as more teams are putting up highly competitive scores. Making the top five is quite a challenge.

COURTESY WARD SILVER, NØAX

Helping K3LR take the top spot in Multi-Multi, WRTC-2010 teammates Chris, KL9A, and Dan, N6MJ, topped the competition with the highest score on 20 meters of any US or VE multi-operator station.

After finishing second in 2009, the N3RS (EPA) team took the top W/VE spot for Multioperator, Two Transmitter (M/2) with a score of 9.91 million. N3RS was piloted by N3RS, N3RD, N2SR, W8FJ, NG7M and W7CT. K8AZ (OH) finished second in the category with 8.87 million. KB1H (CT), W4RM (VA) and KØTV (NH) finished third, fourth and fifth respectively to cement the top five slots.

The Multioperator, Single-Transmitter (M/S) category was a tight competition as well. The K9RS team (K9RS, N3DXX and W2ID) (EPA), had 260 fewer QSOs than KT3Y (VA) but a hefty multiplier total of 492 (46 more than KT3Y) that gave them

US

Single Operator, High Power

Call	Score
VY2ZM	5,549,292
K3CR (LZ4AX, op)	5,514,120
VY2TT	5,218,695
K1RX	4,984,317
N2IC	4,757,745
K1ZZ	4,702,365
K5ZD	4,586,838
W9RE	4,552,119
WC1M	4,413,225
VX3AT (VE3AT, op)	4,398,198

Single Operator, Low Power

Call	Score
N1UR	3,015,015
K1BX	2,728,446
N5AW	2,194,335
W3EF	2,136,897
N4YDU	1,820,169
N9CK	1,792,296
WØUO	1,352,520
K9QVB	1,278,720
W1JQ	1,241,136
WW3S	1,230,390

Single Operator, QRP

Call	Score
K2DM	828,240
K3PH	681,000
W9WI	551,736
NØKE	473,850
N7IR	461,025
N1TM	442,758
N8II	432,216
N5DO	422,451
W6JTI	422,379
KT8K	330,624

Single Operator, 10 Meters

Call	Score
NN1N	9,990
K4WI	9,486
W3EP	9,072
W2RR (WA2AOG,op)	5,625
N3LL	5,625
K4CWW	3,960
K2SZ	3,234
AD5MN	2,709
W5MK	2,304
WB2AMU	2,160

Single Operator, 15 Meters

Call	Score
N4PN	430,986
K9NW	389,052
K4FJ	351,390
W4NZ	307,125
K6TA	296,100
W9XT	291,582
K2EK	275,094
WØEWD	273,024
K8AJS	269,895
KE9I	257,484

Single Operator, 20 Meters

Call	Score
W1MU	710,478
KU1CW	611,388
VE6WQ	602,604
N4TB	366,336
W2AW	260,304
KR2AA	259,524
W9YYG	218,757
N4IJ	151,050
WR2G	121,506
WA1FCN	114,945

Single Operator, 40 Meters

Call	Score
W8JI (VE7ZO, op)	804,996
K9ZO	526,140
N3RR	440,283
K8LV	427,230
N4TZ	425,505
N4UA	324,972
W2EG	284,850
K9OM	275,652
VE1DT	110,352
W4JKC	103,458

Single Operator, 80 Meters

Call	Score
N2MF	251,241
K2XA	216,909
KU2M	185,592
W5ZN	154,128
WØUCE	134,754
NØNI	120,984
K9AY	120,510
KØSR	114,381
W2MF	103,086
N6SS	71,478

Single Operator, 160 Meters

Call	Score
W4ZV	74,028
K4PI	56,160
K1LT	52,224
K9FY	35,739
K5RX	30,876
W3GH	24,795
N6TR	24,336
K3JT	18,585
KØKT	17,136
K2YR	13,770

Single Operator, Assisted

Call	Score
K3WW	6,100,644
NN3W	5,639,040
AA3B	4,698,864
W2RE	4,323,402
K2R (K2NG, op)	4,141,200
K1AR	4,046,841
W3UA	3,567,348
N3AD	3,346,620
WW2DX	3,206,964
W8MJ	2,720,268

Multioperator, Single Transmitter

Call	Score
K9RS	6,283,332
KT3Y	6,006,282
W3BGN	5,934,510
K2QMF	4,351,590
VE3UTT	3,459,855
VE3FU	3,032,778
VE3YAA	2,900,448
K1KP	2,768,688
NK7U	2,739,240
K9SD	2,675,580

Multioperator, Two Transmitters

Call	Score
N3RS	9,911,574
K8AZ	8,879,598
KB1H	7,853,664
W4RM	7,206,510
KØTV	5,614,767
W5WMU	5,217,084
N6RO	5,080,389
W7RN	4,632,576
NØIJ	3,987,645
N7AT	3,422,934

Multioperator, Unlimited Transmitters

Call	Score
K3LR	15,769,038
W3LPL	14,920,698
KC1XX	14,775,654
W2FU	12,919,050
KM1W	12,916,500
K1TTT	11,311,596
NR4M	10,920,855
NY4A	10,495,185
K5GO	9,901,605
WE3C	9,636,264

DX

Single Operator, High Power

Call	Score
ZF2AM (K6AM, op)	5,932,161
KH7B (K4XS, op)	4,827,501
8P3A (VE3DZ, op)	4,601,490
KH6J (KH6ND, op)	4,437,180
CT1JLZ (OK1RF, op)	3,625,671
CR6K (CT1ILT, op)	3,621,594
GM7R (GMØNAI, op)	2,615,220
V48M (W2OX, op)	2,572,596
TM6X (F5VHY, op)	2,442,177
DL1IAO	2,392,500

Single Operator, Low Power

Call	Score
VP9/W6PH	3,090,924
J88DR (G3TBK, op)	2,599,842
PS2T (PY2NY, op)	2,073,150
XE2S	1,469,952
AN2A (EA2AYD, op)	1,433,649
LU5FF	1,407,663
CO2WF	1,191,096
PJ4LS	962,352
GØLZL	816,525
KL2R (N1TX, op)	759,024

Single Operator, QRP

Call	Score
F5MUX	1,185,444
OK2BYW	360,639
HB9BMY	289,800
DK1YY	250,509
HA8BE	213,426
CT7/LZ3ND	173,535
LZ2RS	162,495
YO8WW	151,404
LY2T	147,465
AO7AAW (EA7AAW, op)	136,032

Single Operator, 10 Meters

Call	Score
LU1HF	261,606
PY2BK	166,911
HK1X	154,062
PU2MTS	125,832
LW8DQ	120,213
PY2SEX	108,414
LW7DX	84,456
J39BS	84,036
L73D (LW6DW, op)	74,889
KH6ZM	72,432

Single Operator, 15 Meters

Call	Score
CE1/K7CA	411,120
HK1KYR	396,180
CW5W (CX6VM, op)	385,215
PY3VK	309,420
PY2ZXU	298,980
KH6MB	266,040
OK1FPS	191,700
F6KNB (F6IRA, op)	190,275
9A5X	187,797
IR1R (IK1HJS, op)	185,142

Single Operator, 20 Meters

Call	Score
GM3POI	330,600
F6ARC	324,264
EA8CMX (OH2BYS, op)	315,237
TF3CW	306,210
DP4K (DK3DM, op)	278,100
OH8L (OH8LQ, op)	276,120
S5ØK	273,528
9A3TR	265,002
SN7Q	262,314
E73W (E73O, op)	258,774

Single Operator, 40 Meters

Call	Score
C6APG (K4PG, op)	317,361
IR1Y (IK1YDB, op)	300,900
HQ9R (WQ7R, op)	300,420
HB9FAP	295,362
OM2VL	275,412
DJ2QV	274,860
YU1LA	271,080
F5OGL	265,323
OK1Z	249,747
OM5ZW	249,660

Single Operator, 80 Meters

Call	Score
C6AKQ (N4BP, op)	254,880
GIØKOW	171,171
F2DX	170,487
DL6FBL	167,265
SN3A (UU4JMG, op)	142,680
OM3RM	119,886
E71A	118,614
E74IW	113,679
DJØMDR	113,568
DR4A (DK5PD, op)	112,572

Single Operator, 160 Meters

Call	Score
C6AUM	123,291
KV4FZ	113,100
V31YN (DJ4KW, op)	112,347
ON4UN	79,530
OM3BH	67,872
OL7M (OK1DF, op)	62,496
TF4M	59,730
XE2WWW	58,035
PA3FQA	49,131
LY2IJ	48,048

Single Operator, Assisted

Call	Score
V31RR (AA4NC, op)	4,830,750
DF7ZS (DK8ZB, op)	2,216,781
OT2A (ON6CC, op)	1,998,684
S57DX	1,893,630
IKØYVV	1,567,104
S53M (S53ZO, op)	1,548,774
PA5KT	1,312,245
YL2KO	1,270,152
S59ABC (S51DS, op)	1,207,440
UA6LV	1,129,779

Multioperator, Single Transmitter

Call	Score
P4ØL	6,395,118
V31TP	5,661,000
P49V	5,438,826
YN2WW	5,427,540
TM6M	4,256,118
TX4T	4,228,035
C6AWL	3,866,010
IR4X	3,393,144
IR4M	3,329,328
EE5E	3,230,028

Multioperator, Two Transmitters

Call	Score
6Y1LZ	9,295,686
PJ4X	8,061,108
CR2X	6,960,195
J38XX	6,903,621
EF8M	6,860,133
CR3L	5,816,448
LX7I	4,247,040
OM7M	4,074,000
EF8N	3,106,944
YT3M	2,874,327

Multioperator, Unlimited Transmitters

Call	Score
PJ2T	9,684,555
KP2M	7,106,148
KH6LC	6,682,245
9A1A	4,867,023
HG1S	3,535,560
LZ9W	2,948,166
JA3YBK	2,910,993
RX3APM	1,683,462
JA1YPA	1,460,625
PY2TEL	9,516

the win with a total of 6.28 million points. KT3Y was second with 6.0 million, followed by 5.93 million from the team at W3BGN (EPA). K2QMF (NLI) finished fourth, as VE3UTT (ON) took the fifth spot.

W/VE Single-Band Winners

W4ZV (NC) took the top W/VE 160 meter spot again this year with a 74k total. N2MF (WNY) cracked 1k QSOs on 80 meters for 251k and a first place finish. On 40 meters, a band that produced a lot of excitement, VE7ZO made it a memorable trip to Georgia to operate the W8JI super station. He took the top spot on 40 driving W8JI to 804k points, 2291 QSOs and 118 multipliers. Twenty meters, always a staple in a DX contest, was led by the 704k performance from W1MU (ME). W1MU finished with a bottom line of 2010 QSOs and 118 multipliers. Fifteen meters was way more active than the past several years. The 15 meter excitement helped N4PN (GA) tally 1327 QSOs and 109 DX entities (430k points) for the top US/VE spot. Ten meters showed glimmers of hope here and there, but remained quite tough. NN1N ground it out on 10 for a total of 9.9k points (91 QSOs, 37 multipliers) for first place on 10. Maybe a few sunspots will push 10 meters back to a powerful band next year.

DX Single Operator

ZF2AM (K6AM operating) raced his way to a total of 5.9 million for the top spot in the Single Operator, High Power (SOHP) category. He cruised to the win despite a strong fight from KH7B (4.8 million) and 4.6 million from 8P3A (VE3DZ operating). Finishing fourth in the category was KH6J (KH6ND operating) at 4.4 million and in fifth place was CT1JLZ (OK1RF operating) with 3.625 million. Just missing the top five was CT1ILT, operating as CR6K with 3.621 million points.

VP9/W6PH took his annual trip to Bermuda and soared to a cool 3.09 million points for the number one Single Operator, Low Power (SOLP) DX entry. J88DR (G3TBK operating) tallied 2.59 million for second place, followed by 2.0 million from PS2T (PY2NY operating). Taking fourth place was XE2S with 1.46 million followed by 1.43 million from AN2A (EA2AYD operating).

F5MUX dominated the Single Operator, QRP (SOQRP) category with 1.18 million points and 1944 QSOs. OK2BYW (360k) was second and HB9BMY (289k) was third. DK1YY (250k) and HA8BE (213k) rounded out the top five.

North Carolina's AA4NC flew to Belize to operate the V31MD DX Villa for the contest. It turned out to be a memorable event as Will grabbed the top spot from outside of the US in the Single Operator, Assisted (SOA) category signing V31RR. His 4.83 million points more than doubled the total of his nearest competitor. Taking sec-

Continental Leaders By Category

Continents/Category Name	Call	Score
Africa		
Single Operator High Power CW	5H3EE (DL4SM, op)	1,054,668
Single Operator Low Power CW	EA8OM	510,504
Single Operator 40 Meters CW	5C5W (CN8KD, op)	102,660
Single Operator 20 Meters CW	EA8CMX (OH2BYS, op)	315,237
Single Operator 15 Meters CW	EA8CQW	17,544
Single Operator Assisted CW	EA8/EA4SV	93,330
Multioperator Two Transmitter CW	EF8M	6,860,133
Asia		
Single Operator High Power CW	JF1NHD	1,097,280
Single Operator Low Power CW	JI1RXQ	554,772
Single Operator QRP CW	JA6GCE	111,618
Single Operator 160 Meters CW	JE1SPY	720
Single Operator 80 Meters CW	JH1AEP	28,854
Single Operator 40 Meters CW	JA6SHL	68,250
Single Operator 20 Meters CW	JA7FTR	183,048
Single Operator 15 Meters CW	JI7NUF	123,708
Single Operator 10 Meters CW	JE2OTM	27
Single Operator Assisted CW	JS3CTQ	887,400
Multioperator Single Transmitter CW	RTØC	1,400,256
Multioperator Two Transmitter CW	JAØJHA	2,379,723
Multioperator Unlimited CW	JA3YBK	2,910,993
Europe		
Single Operator High Power CW	CT1JLZ (OK1RF, op)	3,625,671
Single Operator Low Power CW	AN2A (EA2AYD, op)	1,433,649
Single Operator QRP CW	F5MUX	1,185,444
Single Operator 160 Meters CW	ON4UN	79,530
Single Operator 80 Meters CW	GIØKOW	171,171
Single Operator 40 Meters CW	IR1Y (IK1YDB, op)	300,900
Single Operator 20 Meters CW	F6ARC	324,264
Single Operator 15 Meters CW	OK1FPS	191,700
Single Operator Assisted CW	DF7ZS (DK8ZB, op)	2,216,781
Multioperator Single Transmitter CW	TM6M	4,256,118
Multioperator Two Transmitter CW	CR2X	6,960,195
Multioperator Unlimited CW	9A1A	4,867,023

Continents/Category Name	Call	Score
North America		
Single Operator High Power CW	ZF2AM (K6AM, op)	5,932,161
Single Operator Low Power CW	VP9/W6PH	3,090,924
Single Operator QRP CW	C6ASB (AKØM, op)	8,883
Single Operator 160 Meters CW	C6AUM	123,291
Single Operator 80 Meters CW	C6AKQ (N4BP, op)	254,880
Single Operator 40 Meters CW	C6APG (K4PG, op)	317,361
Single Operator 20 Meters CW	V31RI (DL6RAI, op)	230,631
Single Operator 15 Meters CW	XE1CT	45,570
Single Operator 10 Meters CW	J39BS	84,036
Single Operator Assisted CW	V31RR (AA4NC, op)	4,830,750
Multioperator Single Transmitter CW	V31TP	5,661,000
Multioperator Two Transmitter CW	6Y1LZ	9,295,686
Multioperator Unlimited CW	KP2M	7,106,148
Oceania		
Single Operator High Power CW	KH7B (K4XS, op)	4,827,501
Single Operator Low Power CW	VK2AYD	140,790
Single Operator 80 Meters CW	ZL1AZE	6,399
Single Operator 40 Meters CW	ZM2B (ZL2BR, op)	144,246
Single Operator 20 Meters CW	VK3TDX	42,312
Single Operator 15 Meters CW	KH6MB	266,040
Single Operator 10 Meters CW	KH6ZM	72,432
Single Operator Assisted CW	ZL1BYZ	717,240
Multioperator Single Transmitter CW	TX4T	4,228,035
Multioperator Two Transmitter CW	ZM1A	2,732,307
Multioperator Unlimited CW	KH6LC	6,682,245
South America		
Single Operator High Power CW	P43JB	781,488
Single Operator Low Power CW	PS2T (PY2NY, op)	2,073,150
Single Operator QRP CW	YW2LV (YV5YMA, op)	116,532
Single Operator 40 Meters CW	PY1NB	205,320
Single Operator 20 Meters CW	PY2LSM	174,876
Single Operator 15 Meters CW	CE1/K7CA	411,120
Single Operator 10 Meters CW	LU1HF	261,606
Single Operator Assisted CW	P4ØLE (K2LE, op)	842,688
Multioperator Single Transmitter CW	P4ØL	6,395,118
Multioperator Two Transmitter CW	LU3DY	933,504
Multioperator Unlimited CW	PJ2T	9,684,555

ond was DF7ZS (DK8ZB operating) with 2.2 million and third went to OT2A (ON6CC operating) with 1.99 million points. S57DX finished fourth (1.89 million) as IKØYVV was fifth (1.56 million).

DX Multioperator

For US operators, there's usually a bevy of loud signals coming from the Caribbean on any given band if not multiple bands. It yields easy multipliers for a lot of stations. This year, as in many years past, US stations could count on bagging PJ2T on several bands. PJ2T (NØVD, NØYY, WØCG, N1ZZ, NP2L, W8AV, W8TK, W9SN and WA9S operating) posted an impressive 9.68 million total for first place in the DX Multioperator, Multi-Transmitter (M/M) category. The PJ2T team logged 9212 QSOs and 353 multipliers. KP2M was second with 7.1 million, followed by the solid outing from the Pacific gang at KH6LC with 6.68 million. 9A1A and HG1S are both powerful European stations and often among the first EU signals to come through as the bands are opening. 9A1A was fourth with 4.86 million and HG1S finished fifth with 2.94 million.

The super team assembled at 6Y1LZ (K1LZ, K3JO, NU5Y, N8BO, K9MMS and KØDXC operating) galloped to the top DX Multioperator, Two Transmitter (M/2) spot with 9.29 million. The team, led by K1LZ, also featured 15-year-old rising radio star KØDXC. CR2X was second with 6.96 million, followed by 6.9 million from J38XX. EF8M tallied 6.86 million for fourth place and CR3L rounded out the top five with 5.8 million.

Aruba is typically a popular spot for DX contesting. The P4ØL squad (W6LD and WØYK operating) racked up 6.39 million points from P4-land for first place in the DX Multioperator, Single Transmitter (M/S) category. The team tallied 6195 QSOs and 346 multipliers to beat out second place V31TP. V31TP finished with 5595 QSOs and 340 multipliers. P49V was third with 5.43 million as YN2WW was fourth with 5.42 million and TM6M was fifth (4.25 million). TX4T has an impressive

W/VE Region Leaders By Category

Table lists call sign, score and power (A = QRP, B = Low Power, C = High Power).

Northeast Region
(New England, Hudson and Atlantic Divisions; Maritime and Quebec Sections)

VY2ZM	5,549,292	C
K3CR (LZ4AX, op)	5,514,120	C
VY2TT	5,218,695	C
K1RX	4,984,317	C
K1ZZ	4,702,365	C
N1UR	3,015,015	B
K1BX	2,728,446	B
W3EF	2,136,897	B
W1JQ	1,241,136	B
WW3S	1,230,390	B
K2DM	828,240	A
K3PH	681,000	A
N1TM	442,758	A
AA1CA	313,110	A
K8CN	312,228	A

Southeast Region
(Delta, Roanoke and Southeastern Divisions)

N4CW	2,375,724	C
WJ9B	1,970,892	C
K1GU	1,917,816	C
K4SSU (NA4BW, op)	1,400,376	C
AC8Y	1,336,392	C
N4YDU	1,820,169	B
NA4K	1,094,820	B
WD4AHZ	1,010,394	B
K5KLA	942,858	B
N9CM	930,618	B
W9WI	551,736	A
N8II	432,216	A
WA8WV	190,512	A
W5JBV	181,350	A
K4ORD	174,168	A

Central Region
(Central and Great Lakes Divisions; Ontario Section)

W9RE	4,552,119	C
VX3AT (VE3AT, op)	4,398,198	C
VE3EJ	4,298,322	C
K8GL	3,093,717	C
N8AA	3,007,872	C
N9CK	1,792,296	B
K9QVB	1,278,720	B
N9CO	1,050,225	B
VE3RTU	933,504	B
W9OA	905,682	B
KT8K	330,624	A
K8ZT	328,527	A
WB8RTJ	226,512	A
W9IP	111,321	A
NA4D	92,967	A

Midwest Region
(Dakota, Midwest, Rocky Mountain and West Gulf Divisions; Manitoba and Saskatchewan Sections)

N2IC	4,757,745	C
K5MR	3,170,646	C
NEØU	1,215,768	C
K6XT	1,207,560	C
KØDEQ	1,164,267	C
N5AW	2,194,335	B
WØUO	1,352,520	B
KTØK	901,299	B
NAØN	704,106	B
VE5ZX	608,805	B
NØKE	473,850	A
N5DO	422,451	A
NØUR	261,126	A
NDØC	194,535	A
WF4U	188,958	A

West Coast Region
(Pacific, Northwestern and Southwestern Divisions; Alberta, British Columbia and NWT Sections)

K7GK	2,444,940	C
KO7AA	2,222,283	C
K6XX	2,011,212	C
K7RL	1,911,627	C
W7VJ	1,315,467	C
KE7X	1,116,435	B
N6RV	563,730	B
WN6K	434,682	B
AF6EV	330,990	B
K7JE	306,138	B
N7IR	461,025	A
W6JTI	422,379	A
W6QU (W8QZA, op)	285,012	A
K7HBN	136,611	A
K7GO	57,810	A

Sponsored Plaque Winners

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

Plaque Category	*Plaque Sponsor*	*Winner*
Great Lakes Division Single Operator	North Coast Contesters	K8GL
North America Single Operator Low Power	John Patterson WCØW/V31TP	VP9/W6PH
Hudson Division Single Operator High Power	HVCDX and AARA John Naberezny, WE2F Memorial	W2XL
Europe Single Operator QRP	William Parker, MD - W8QZA	F5MUX
W/VE Single Operator High Power	Frankford Radio Club	VY2ZM
W/VE Single Operator Low Power	Andy Faber, AE6Y	N1UR
W/VE Single Operator QRP	Tod Olson, KØTO	K2DM
W/VE Single Operator Assisted	Harold Ritchey, W3WPG Memorial	K3WW
W/VE 1.8 MHz	Jerry Rosalius, WB9Z	W4ZV
W/VE 21 MHz	Carl Luetzelschwab, K9LA	N4PN
W/VE 28 MHz	Green River Valley, IL ARS	NN1N
World Single Operator High Power	North Jersey DX Association	ZF2AM (K6AM, op)
World Single Operator Low Power	Jim Stevens, K4MA	VP9/W6PH
World Single Operator QRP	Jerry Griffin, K6MD	F5MUX
World Single Operator Assisted	Southern California DX Club	V31RR (AA4NC, op)
World Multioperator Two Transmitters	Tom De Meiss K2TD Memorial	6Y1LZ
World Multioperator Unlimited	H. Stephen Miller NØSM	PJ2T
World 1.8 MHz	Fred Race, W8FR, In Memory of DL1FF	C6AUM
World 14 MHz	Jeff Hartley, N8II	GM3POI
World 21 MHz	Caribbean Contesting Consortium PJ2T	CE1/K7CA
Pacific Division Single Operator Low Power	Central California DX Club Inc, W6MEL	AF6EV
Asia Multioperator Single Transmitter	Yankee Clipper Contest Club	RTØC
Europe Single Operator High Power	Jim George, N3BB	CT1JLZ (OK1RF, op)
North America Single Operator High Power	Potomac Valley Radio Club	ZF2AM (K6AM, op)
Japan Single Operator Low Power	Western Washington DX Club	JI1RXQ

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

Top Dogs

Since a contest is all about score, it's fun to ask "Who got the most?" Whether you're interested in the most countries or the most contacts — here are the highest band totals for US and VE single-op, all-band dogs:

160 — VY2ZM with 314 QSOs and 57 entities
80 — K1RX with 821 QSOs and AA1K with 83 entities
40 — VY2TT with 1502 QSOs and K5MR with 94 entities
20 — K1RX with 1690 QSOs and N2IC with 107 entities
15 — N2IC with 1351 QSOs and N1LN with 109 entities
10 — N2IC with 73 QSOs and K3CR (LZ4AX operating) with 31 entities

Woof! These operators did all their own hunting (no spotting network assistance) and were busy on the other bands, as well. In fact, VY2ZM, K3CR, VY2TT, K1RX and N2IC finished in places one through five for W/VE Single Operator, High Power!

What about the most QSOs and multipliers in any category? We thought you'd never ask…

160 — W4ZV (SO-160) with 399 QSOs and K3LR (M/M) with 74 entities
80 — KC1XX (M/M) with 1409 QSOs and 95 entities
40 — W8JI (VE7ZO operating SO-40) with 2291 QSOs and W3LPL (M/M) with 127 entities
20 — K3LR with 2719 QSOs and tied with KC1XX at 131 entities
15 — K3LR with 1985 QSOs and 123 entities
10 — K3LR with 196 QSOs and 60 entities

There are your targets for next year — release the hounds!

Even if your call sign is not in that top echelon, you can still hunt for a single-band DXCC. There were plenty made on these bands: 29 on 40 meters, 52 on 20 meters and 34 on 15 meters.

total from the Pacific with 4.22 million points. Many US stations managed to put TX4T in the log on 10 meters, as well.

DX Single Band Winners

For DX Single Operator, Single Band entries, the strategy is straightforward — point the antennas in the direction of US/VE, work multipliers and run stations. C6AUM took full advantage of being close to the US and earned first place on 160 meters with 123k points. On 80 meters, N4BP operated as C6AKQ to push another C6A station to a single-band title. C6AKQ tallied 254k points. Why not make it another victory from the Bahamas on 40 meters? C6APG (K4PG operating) scored 317k points to edge out IR1Y (300k) for the 40 meter crown. Twenty meters was a different story. GM3POI logged 1903 QSOs and 53 multipliers for 330k points — just in front of a 324k performance from F6ARC. CE1/K7CA scored 411k on a strong 15 meter band with 2286 QSOs and 60 multipliers for the top 15 meter slot. On 10 meters, LU1HF nestled his way into many logs for 261k, 1495 QSOs and 59 multipliers for first place on 10.

Continental Roundup

Contesting results are typically skewed based on what part of the world you are, operating from. A continental breakdown can better show relative performances.

In Africa for 2010, 5H3EE was first for SOHP. DL4SM did a fine job operating from 5H3. In SOLP EA8OM took the top African spot. EA8/EA4SV was first in Africa for SOA while EF8M (EA8CAC, RD3AF, K4ZA, RZ3AZ, EA8ZS and W2GD operating) was the best African M/2 entry.

JF1NHD was the top SOHP entry running on all bands from Asia. In the SOLP category JI1RXQ was first. JA6GCE was first for SOQRP and JS3CTQ was the best SOA participant. The RTØC team (RWØCF, RWØCN, RWØCR, RZØCQ, UAØCA, UAØCC, UAØCDX and UAØCO operating) took the M/S title, as JAØJHA (JAØQNJ, JHØKHR and JHØUSD operating) was the best M/2 station and JA3YBK (JG3KIV, JG3MRT, JG3WDN, JH4NMT, JR4ISF, JF4FUF and JS1PWV operating) was the leading M/M entry.

Europe is bread and butter for many US stations, especially on the East Coast. The high level of activity from Europe produces some hefty battles. CT1JLZ (OK1RF operating) was the top SOHP entrant, as AN2A (EA2AYD) was first in SOLP. F5MUX cruised to a European SOQRP title, while TM6M (F1AKK, F5TTU and F8DBF operating) was first in the M/S column. CR2X (OH2BH, OH2MM and OH2PM operating) was best in M/2 followed by the first place M/M effort from the 9A1A (9A2DQ, 9A5W, 9A6A, 9A7R, 9A8W and 9A9A operating) team.

From NA, many of the continental leaders were also world leaders. ZF2AM was first in SOHP, followed by the first place outing in SOLP from VP9/W6PH. C6ASB (AKØM operating) cranked his station to gold in SOQRP. V31RR (AA4NC operating) took the top shelf in SOA, followed by the M/S win from V31TP (WCØW, K5PI and K5NZ operating). 6Y1LZ was the frontrunner in M/2 and KP2M (K3CT and K3TEJ operating) was the top M/M from North America.

KH7B garnered first place in the SOHP battle, while VK2AYD took top SOLP honors. The TX4T (F6BEE, FO8RZ and VE2TZT operating) expedition was the best M/S, followed by the top M/2 performance from ZM1A (ZL1AIH, ZL3CW, ZL1GO and ZL1BHQ operating). KH6LC (with AH6RE, KØAV, KH7Y, N6DA, N6KB, NH6V, W6NV and W6SC) cruised to an Oceania M/M triumph.

South America can be a tough place to win a continent title from due to the very powerful and competitive Caribbean contingent. P43JB captured first place in the SOHP category and PS2T (PY2NY operating) was first for SOLP. YW2LA was first in SOQRP as P4ØLE (K2LE operating) was the best SOA entry. For the multioperator ranks, P4ØL was first in M/S, LU3DY (LU1DZ, LU3DAT, LU5FZ, LU6EF, LU6UO, LW2DX and LU7DSU operating) was first in M/2 and PJ2T was first for M/M.

Next Year

With solar cycle 24 on the rise, 2011 could prove to be even more exciting. Start preparing for next year now. Maximize comfort in your shack to make operating even more enjoyable. Play around with that new antenna idea, build a new station accessory or finally purchase that missing piece of equipment to give you a winning edge. Sharpen your CW skills and prepare for an exciting 48 hour event on February 19-20 in 2011. QST

Dig Deeper

For the ARRL DX CW searchable database, online records and full line scores, check out the ARRL Contest Branch Web page at **www.arrl.org/contests**.

2010 ARRL 10 GHz and Up Contest

August 21-22 (first weekend) and September 18-19 (second weekend).

- 6 AM local time Saturday through 12 Midnight local time Sunday.
- One of the most challenging events on the contest calendar, the 10 GHz and Up Contest tests your ability to communicate over long distances on the microwave bands. Portable operation is not only allowed, it's encouraged! If you're an experimenter, this event is definitely for you!

COURTESY RAY PERRIN, VE3FN

- E-mail logs to **10ghz@arrl.org**, or send paper logs to 10 GHz Contest, ARRL, 225 Main St, Newington, CT 06111. All logs must be received by 0000 UTC on Tuesday, October 19, 2010.

Complete rules may be found at **www.arrl.org/contests**.

2010 ARRL September VHF QSO Party

1800 UTC Saturday, September 11 through 0259 UTC Monday, September 13

COURTESY MIKE FAHMIE, WA6TZY

- September is a good month for tropo on the VHF+ bands and QSO opportunities abound! Enjoy the end of summer with a weekend on the "ultra-highs" and work hundreds of miles on 6 meters and up. The contest "exchange" is your grid square.
- Grab your rig and head for the hills, operate as a rover from multiple grids or keep things local and operate from home. Join in on the VHF+ fun this weekend!
- Send Cabrillo-formatted logs to **septembervhf@arrl.org**. Paper logs go to September VHF, c/o ARRL, 225 Main St, Newington, CT 06111. All logs must be received by 0300Z Wednesday, October 13, 2010.

Complete rules may be found at **www.arrl.org/contests**.

The 2010 ARRL International EME Competition

It's MOONBOUNCE time!

Three weekends of activity and fun!
September 4-5: 2.3+ GHz
October 2-3: 50-1296 MHz
October 30-31: 50-1296 MHz

0000 UTC Saturday – 2359 UTC Sunday each weekend

■ Becoming active in EME has never been easier! Many stations are working DX on 2 meters and up with only 100 W and a single long-boom Yagi. You too can bounce a signal off the moon using good ol' CW or try the JT65 sound card mode by K1JT (free download at **www.physics.princeton.edu/pulsar/k1jt**). Certificates awarded to all stations that submit a log with at least one contact!

■ Complete rules may be found at **www.arrl.org/contests**

■ Logs must be received at ARRL HQ no later than 2359Z Tuesday, November 30, 2010. Send electronic logs to **emecontest@arrl.org**; paper logs to EME Contest, ARRL, 225 Main St, Newington, CT 06111 USA.

COURTESY PETROS GIOGKATZIS, SV3AAF

The ARRL August Rookie Roundup

Sunday, August 15, 2010 1800 UTC through 2359 UTC

Mode: SSB, 80-6 Meters

COURTESY PAUL VEAL, NØAH

Anna "Sparks" Veal, WØANT, all ready to sparkle in the 2010 Rookie Roundup.

■ The Rookie Roundup is for hams licensed for 3 years or less to gain operating experience in a contest environment. In the "RR," Rookies work everybody while non-Rookies work only Rookies. All Rookies who submit a score will receive a certificate.

■ Complete information about the Rookie Roundup and reporting your score online can be found at **www.arrl.org/rookie-roundup**.

W3UR

HOW'S DX?

Malyj Vysotskij Island

On Thursday May 27, 2010 Russian Prime Minister Vladimir Putin met with Finnish Prime Minister Matti Vanhanen in Lappeenranta, Finland. One of the subjects of their meeting was a new lease of the Saimaa Canal and the surrounding area. The original 50 year lease was agreed to on September 27, 1962, which eventually gave Amateur Radio operators the DXCC entity of Malyj Vysotskij Island.

MVI Amateur Radio History

Malyj Vysotskij Island is located 28˚ 34" East and 60˚ 38" North at the mouth of the Saimaa Canal, which was built in 1856. The 1 mile long and ¼ mile wide island was leased from Russia to Finland in 1962. Shortly afterward Finnish DXers realized they found another new DXCC country almost in their backyard, so to speak. The OHs sent "thorough documentation" to then ARRL Assistant Communications Manager Bob White, W1CW. On November 17, 1970 White wrote back to SRAL (Finnish Amateur Radio Society) President Armas Valste, OH2NB, agreeing to preapprove Malyj Vysotskij Island to be added to the DXCC list upon the initial operation. It was shortly after W1CW's letter to the Finns that the ARRL Awards Committee agreed with the new country status and a few months later the DX Advisory Committee was created.

Eighteen years later, the Finns and Russians were finally able to maneuver through the many obstacles and obtaining all the needed paperwork to put together the first ever East-West DXpedition from Malyj Vysotskij Island. "The initial operation from the new entity, with the specially assigned call 4J1FS, was launched July 7, 1988," remembers John Ahlbom, OH5NZ, one of the three Finns who made up the six man team. MV Island was approved by the DXAC in late 1988, for operations beginning with the first operation of 4J1FS in July of that same year.

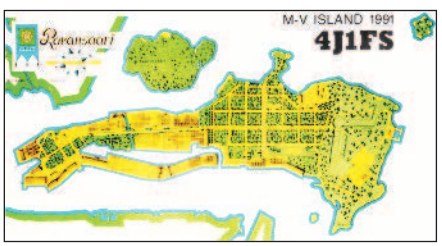
It was agreed from the very beginning that there would more or less be an even number of operators from UA and OH. Later non Finnish or Russian operators were able to go, counting as the western contingency. The first DXpedition team was made up of OH2BH, OH2RF, OH5NZ, UR2AR, UW3AX and UZ3AU. In 96 hours and with one radio they made 14,765 contacts, with the first one going to SM3EVR on 20 CW.

The QSL card from the first activation of Malyj Vysotskij Island.

Activity Continues

Less than a year later 4J1FS was QRV again, this time in May 1989 with about 41,000 contacts made by K7JA, OH1EH, OH2BH, OH2BU, OH2JA, OH6DD, UA1ALZ, UA6HZ (N2WW), UR2AR, UW3AX and UZ3AU. This would be the first of multiple DXpeditions introducing various modes and bands.

The third DXpedition took place in May 1991 and was on for 6 days making around 27,000 contacts and introducing 18 and 24 MHz contacts as well as 50 MHz and RTTY. The team was made up of five each from Finland and Russia. The following year 13 Finns and 9 Russians were there during the last week of May and first week of June making an amazing 74,495 QSOs in a fortnight.



The QSL card of the DXpedition that activated Malyj Vysotskij Island in May 1991.

Later in 1992 was the first fall DXpedition with a shiny new 4J1FW call sign. During the June 1997 DXpedition two calls (OH5AB/MVI and R1MVI) were used by a team of seven UA operators and five OH boys. A 9 day operation took place in July 1999, first under the call R1MVA, with 65,336 QSOs and then R1MV during the IARU contest, with an additional 8025 contacts.

Later that year during the CQ WW SSB DX Contest R1MVZ was QRV in the multi-multi category, with a few days of activity beforehand. A large W6 group was part of the team joining the Russian and Finnish operators. As a training mission for the WRTC 2002 event, R1MVI was on the air in May 2002 with several participants who would be on 2 months later inside the Golden Ring of Helsinki. They made 22,700 QSOs in 9 days.

After a schedule failure in August 2004 a Russian team with one Finn made it there several weeks later in September for a very short operation as R1MVI. The last DXpedition took place in November 2005 and included the CQ WW CW. Heavy concentration was put into the low bands as R1MVW and R1MVC made nearly 37,000 QSOs.

Deletion

As was mentioned in the beginning of this article the new agreement, which is now expected to begin later this year, no longer includes the lease of Malyj Vysotskij Island (or Ravansaari as the Finns call it). The lease expiration is a change to the original condition by which MV Island was added to the DXCC list.

The DXCC Deletion Criteria rule a) states "An Entity may be deleted from the List if it no longer satisfies the criteria under which it was added. However, if the Entity continues to meet one or more currently existing rules, it will remain on the List."

So once the new agreement is put into action possibly later this year, MV Island will no longer meet the original criteria that put it on the DXCC list. So after 12 years, at least 11 DXpeditions and well over 300,000

Bernie McClenny, W3UR ♦ 3025 Hobbs Rd, Glenwood, MD 21738-9728 ♦ w3ur@arrl.org

The May 1992 activation QSL card.

QSOs it looks as though MV Island will be added to the deleted DXCC list. This could be the first deleted DXCC Entity since the DXCC 2000 rules went into effect at 2359Z on March 31, 1998.

POSSIBLE NEW (OLD) COUNTRY?

In early 2011 Southern Sudan plans to hold a referendum to decide whether to continue to be part of Sudan or chose independence as a separate nation. The referendum is part of the Naivasha Agreement or Comprehensive Peace Agreement (CPA) of January 2005, which was signed by the Sudan People's Liberation Movement (SPLM) and the Khartoum Government in the north. Most of our readers will probably remember the DXCC Country STØ – Southern Sudan, which was on the DXCC list between May 7, 1972 and December 31, 1994. As per the DXCC rules a DXCC entity that has been "deleted from the List may be returned to the List in the future, should they requalify under this criteria. However, an entity requalified does so as a totally new Entity, not as a reinstated old one." Watch your favorite DX publication for the latest news on this one.

DX NEWS FROM AROUND THE GLOBE

1S — SPRATLY ISLANDS

A large scale DXpedition is in the works for Pag-asa Island, Spratly Islands in early January of next year. The international team currently has 25 members with five more openings. The team has requested the call sign DXØDX via the PARA to the NTC. Activity is expected on 1.8 through 28 MHz as well as 6 and 2 meters and 70 and possibly 23 cm on CW, SSB, RTTY and digital modes. Plans are to be on the air January 6-22. The current multinational list of operators includes 4F1OZ, 4F8BOF, DU1EV, DV1DIN, DV9XO, EA1DR, EA2TA, EA3NT, F4BKV, JA8BMK, K5YY, N6HC, N6OX, SMØMDG, VK2FXGR, VK2GR, VK3FGRC, VK3FNIK, VK3FT, VK3FY, VK3FZ, VK3PC, VK6YS, VK8NSB and W6KK. Next month team member Chris, VK3FY, will be traveling to Palawan, Philippines to view the team's ship. The team plans to set up a Web site (**www.dx0dx.com**) in the future. They are looking for sponsors.

8Q — MALDIVES

G7COD is now in Angola and QRV as D2AK. Andrew says, "I commenced operation on the 7th May 2010 from the Ilhe Do Cabo approximately 50 metres from the beach in the capital, Luanda, and expect to be here for the next 12 months. I will be very active, operating on HF most days for the entire duration of my stay." Andrew has an ICOM IC-7000 transceiver, 100 W output; an MFJ 929 tuner and resonant inverted Vs. He will be QRV 80-10 including 30, 17 and 12, SSB and CW. Here are his target frequencies, plus or minus 10 kHz.

SSB 7.063, 14.190, 18.133, 21.253, 24.953 and 28.500 MHz.

CW 3.503, 7.003, 10.103, 14.003, 18.073, 21.003, 24.893 and 28.003 MHz.

QSL direct only, with SAE and $2, no IRCs, to this address: Andrew Kitchen, 4 Dairy Cottage, Newton Hall Farm, Bank Newton, Skipton, North Yorkshire, BD23 3NT, England - UK.

"Any cards received direct with insufficient postage will not be returned. QSL cards will be returned approximately every 3-4 months when I return to the UK." Also, Andrew has a Web site: **www.d2ak.freewebspace.com**.

A2 — BOTSWANA

Frosty, K5LBU, is planning another Botswana (A2) expedition **(www.qsl.net/a25-2010/index.html)**. This one will be October 20-November 4. Some operators likely to be part of it are IØZY (A25ZY), IK1MDF (A25DF), IZ5MMB (A25MB), K5LBU himself (A25CF), KD5TAN (A25AN) and K5ZOL. The plan is to operate 160-6 with six stations and be in the CQWW SSB Contest October 30-31 using the A25HQ call sign. If you work the other call signs, the ones each individual operator has, QSL bureau or direct to the **QRZ.com** address. QSL A25HQ via K5LBU. Logs will be updated on Club Log (**www.clublog.org**) every day if Internet access makes it possible.

CYØ — SABLE ISLAND

Updating the October Sable Island expedition, the dates are now set for October 22-November 1. An online QSL request system will be set up as a second option. For further updates, here is their Web site: **www.cy0dxpedition.com**. QSL via NØTG.

DX GATHERINGS

Don't forget this year's Seventh Maritime DX Forum, which is sponsored by the Halifax Amateur Radio Club and held in Halifax, Nova Scotia, Canada. This year's event will take place August 6-7. Last year's main speaker Martti Laine, OH2BH, was unable to make it due to health issues but is doing much better and will be there this year. Other speakers include Tim Duffy, K3LR; Dick Frey, K4XU; Tim Ellam, VE6SH, and Geoff Bawden, VE4BAW. Complete details about this great gathering can be found at **www.halifax-arc.org/mdf**.

The 58th annual W9DXCC Convention and Banquet will be held September 10-11 in Elk Grove (suburb of Chicago), Illinois at the Holiday Inn. As of press time the exact schedule had not been posted but should be available by the time you read this at **www.w9dxcc.com**.

Mark your calendars for the 2011 WØDXCC Convention, which will be held in Leavenworth, Kansas on July 23, 2011. The event will be sponsored by the Kansas City DX Club (**www.kcdxclub.com**), the Missouri DX/Contest Club (**www.k4sx.com/mdcc.html**) and the Lebanon Amateur Radio Club (**www.lebanonarc.com**). Some details have been posted on the ARRL Web site at **www.arrl.org/hamfests/w0dxcc-convention**.

FH — MAYOTTE

Lionel, F5PSA (ex TJ3SL) reports he is now on the Indian Ocean island of Mayotte and will be QRV as FH8ND until August 15. He has an FT-897 running 80 W into a dipole and plans to be QRV on 3.5 through 50 MHz on SSB. QSL cards should go to F1OKV either via the bureau or direct.

S7 — SEYCHELLES

S79SAL, Seychelles Islands, will be QRV July 17-31. Juan Carlos, EA2RC, will join Marq, CT1BWW, on Mahe, AF-024, to operate. As reported earlier CT1BWW's call will be S79BWW. QSL direct or bureau to CT1BWW. Both operators are members of what they call the "DXciting Group."

XU — CAMBODIA

XU7ATM **(www.qrz.com/db/XU7ATM)** in Cambodia plans to be active August 10-17 on all HF bands, mainly RTTY but also SSB. Laurent will be equipped with a tribander up 22 meters and wires and a FT-897 100 W radio. QSL via F8ATM, direct or bureau. He will try to upload to LoTW as often as possible if he can find an Internet cafe near his operating location.

WRAP UP

A special thanks to KE3Q, OH2BN, OH5NZ and *The Daily DX* for helping to make this month's column possible. Until next month, see you in the pileups! — *Bernie, W3UR* QST

W3ZZ

THE WORLD ABOVE 50 MHz

Meteor Communication

It has been some time since this column formally addressed meteor scatter (MS) communication. This is a timely subject since August is the month with what is usually the year's best meteor shower, the Perseids. While MS has been covered in detail many times before in *QST* both in this column and particularly with some excellent feature length articles, as time passes new blood enters the VHF ranks and repeating some of this information would serve a valuable purpose.

This month I want to cover what meteors are, how they can support long distance VHF+ contacts and some of the operating approaches to using meteors to work stations you cannot normally hear.

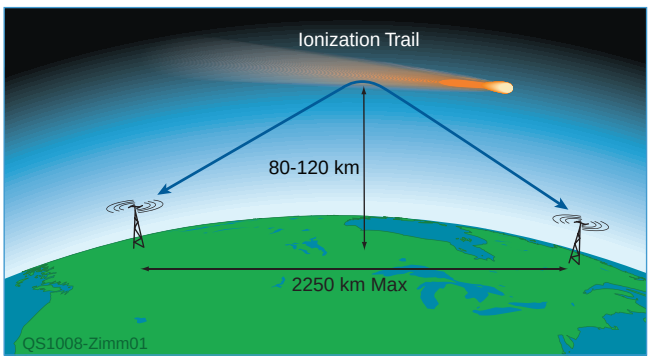


Figure 1 — A schematic view of a meteor scatter signal traveling between point A and point B on the Earth's surface. The signal is refracted (bent) by the trail of ionized gas produced by the meteor roughly in the E region of the ionosphere.

The Essence of Meteors

The Earth encounters many hundreds of millions of meteors as interplanetary debris traveling through its orbit around the Sun. Most meteors are mere specks of dust, rocky material or metal. As they enter the atmosphere at speeds ranging from 11-72 km/s at approximately the height of the ionospheric E-layer (80-120 km) they interact with air molecules and vaporize, emitting heat, light and ionizing the gas through which they pass. This ionized gas forms the reflecting layer that supports communication, although most meteors do not produce enough ionization to support VHF contacts. This ionization is obviously of short duration and extent, and dissipates rapidly. Occasionally a larger meteor survives the entire trip through the atmosphere and strikes the ground as a meteorite.

There are two types of meteors, random and shower. Random meteors, the ones we encounter every day as we pass through space, exhibit two characteristics: They are much more numerous in the late spring/early summer in June and July and are at a minimum in midwinter. Secondly, they appear at much higher rates at 0600 local time (LST) when the Earth is rotating into the debris and sweeping up slower meteors than at 1800 LST when Earth is rotating away from the debris and thus encountering only meteors fast enough to overtake it. As noted below, even though rates are relatively small there are enough meteors to support contacts if you use a communications mode that can deal with the extremely short periods of ionization.

Some of this interstellar debris is associated with comets that travel in highly elliptical orbits about the Sun while crossing the Earth's orbit. All the while the comet is shedding material especially near perihelion; some meteor swarms are associated with comets that have disintegrated. These encounters are called meteor showers. Because of their geometry, meteor showers appear to be coming from a specific point in the sky — called the radiant — which is named for the constellation in which it is located. Thus the Perseids appears to emanate from a point within the constellation Perseus and is associated with the comet Swift-Tuttle.

When the parent comet is close to the Earth's orbit the shower can intensify and become a meteor storm. Some meteor showers are mediocre until this happens and then they blossom into an event that you will remember for a lifetime such as the Leonids in November 2001, which returns every 33 years. Likewise the Perseids in August 1992 displayed the characteristic of a meteor storm. These are rare occurrences so enjoy them while you can!

This Month

*August 1	Moderate EME conditions
August 7-8	August UHF Contest
August 12-13	Perseids meteor shower peaks at 2330Z/Aug12-0200Z Aug13
August 12-14	14th International EME Conference
*August 15	Moderate EME conditions
August 21-22	ARRL 10 GHz and Up Contest
*August 29	Moderate EME conditions

*Moon data from W5LUU

Mechanics of a Meteor Scatter Contact

Whether you use random meteors or shower meteors the object is to bounce a signal off the ionized column of gas produced by a meteor as it burns up in the ionosphere. The straightforward geometry is represented in Figure 1. Given that the ionized gas is at E-layer heights the maximum contact is of the order of 1400 mi/2250 km.

The idea is to send a transmitted ray up to the E-layer and have it reflected or, more accurately, refracted by the ionized gas. The ionized gas supports contacts at lower frequencies better than higher frequencies. Thus a signal that can be refracted for almost a minute at 10 meters will be refracted for maybe only 15 seconds at 6 meters and a second or two at 2 meters. All of this is dependent on the speed and size of the meteor.

The relatively rare meteors that produce decent ionization are said to be "overdense"

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while the majority of meteors either produces nothing or a very weak "underdense" signal, which is only milliseconds in duration. These days it is possible to transmit all the information required for a contact in this very short period of time as described below. If you listen with your own ears these very short bursts may sound only like a ping. Also realize that the reflection is off a moving column of ionized gas so many reflections exhibit some amount of Doppler shift.

Each meteor shower has a specific geometry based on its radiant that favors different directions at different times of day. This geometry has been known for a long time and is covered in detail for different major showers in Bain's 1974 article.[1] Shower meteors tend to have similar groups of velocities and thus support contacts over somewhat different distances than other showers: Faster meteors burn up higher in the E layer and generally support longer contacts.

Making Contacts: Timed Transmissions

Historically, until the turn of the century MS contacts were made either on <200 lpm (letter per minute) CW or SSB. Yes, some years before that high speed CW 3-5 times that speed became popular in Europe but it never achieved much traction in the US (see the bibliography for a description of High Speed CW (HSCW)). Since FSK441, a four-tone FSK digital mode optimized for very weak, very short duration bursts, was developed by Joe Taylor, K1JT, at the turn of the century, most MS work has been done by digital (see the bibliography).

Either way, the procedure for making contacts is the same: a series of accurately timed transmissions that progressively provide more and more information culminating in confirmation of the other station's information. In the US the westernmost station transmits for the first period and the easternmost for the second period. Each transmission on analog is usually 15 seconds long and on digital is 30 seconds long.

The procedure is as follows (see Table 1): You start with both calls. When one station hears both calls, on his next transmission he sends both calls and a report. On analog this is a signal report and usually uses the "S" system. S2 means I got enough to copy your information but just barely. Since this is usually the case on MS, most people say "S2" for a report. On digital the report is a two digit number, the first being the length of the burst (usually 2 for up to 5 seconds) and the second being the RST signal strength (often 6). Grid squares are sent by portables and during contests.

[1]See the bibliography WA50_0810_Bib.doc, at **www.arrl.org/qst-in-depth**.

Table 1

A Stylized Meteor Scatter Contact Between W3ZZ and KM5PO on FSK441, the Most Common Mode Used Today

	STATIONS		
	W3ZZ	*KM5PO*	*Action*
Step 1	KM5PO W3ZZ	W3ZZ KM5PO	W3ZZ calls KM5PO; both calls displayed
Step 2	KM5PO 26 W3ZZ	W3ZZ 25 KM5PO	Both stations receive calls and transmit reports (26/25)
Step 3	R25 R25	R26 R26	Both stations receive their + report (R26/R25)
Step 4	RRRRR	RRRRR	Both stations transmit Rogers (RR) to acknowledge contact
Step 5	R73 R73	R73 R73	Contact complete

When one copies the calls and a report, one sends his call and the report. Once you have copied both calls and the report you send "Roger report" (that is, R26) and then when you hear his Roger you send a string of Rogers (RRRRR). Although this is not required because RRRRR means that he has copied everything and, of course, you know that you have copied everything by that time, it is customary to send "R73" to indicate that the contact is complete.

With random meteors and underdense signals FSK441 has distinct advantages over any analog mode in terms of efficacy. The exact mechanics of operating FSK441 are beyond the scope of this column but have been highly developed and are covered in detail in some excellent references in the bibliography. If bursts are longer and more frequent, such as occur at shower peaks or during any kind of meteor storm, analog modes are preferable even today because you can complete an entire contact on one meteor. Random contacts are difficult either way but are easier on analog than digital although there are specific procedures to improve one's chances on digital.

Making Contacts By Band

Six and 2 meters are the primary VHF MS bands. MS provides a ready means of working stations out to 2250 km on both bands. For random meteors digital is preferred but on either band all you need is about 100 W and a modest antenna maybe with a 15 foot boom. Long Yagis can be somewhat counterproductive because their main lobes subtend only a smaller part of the sky and one never knows from what direction a random meteor may come.

MS is a lot easier on 6 meter. Random contacts on analog are readily made daily in the local mornings around dawn and a little later. FSK441 is especially powerful and reliable on 6 meters. Two meters is less reliable even on FSK441 but still modest stations with indoor antennas make contacts on digital. The greatest challenge is on 222 MHz. Yes there is (barely) enough ionization to support contacts on 222 but it isn't easy. In the days prior to FSK441 I worked over a dozen MS contacts during showers on 222 SSB, many new states like ND, SD, KS, TX, IA and MN, all but the latter with 100 W. Joe Taylor tells me he has had reasonable success with FSK441 on 222 so I will now have to try it.

Bottom Line

MS provides an effective way to increase your VUCC and state totals. We now have extremely powerful software from K1JT that vastly improves our chances for making contacts using weak underdense bursts. I would note that many MS newcomers in the last decade use only digital and have never heard a signal with their own ears refracted off a meteor. That is too bad because they miss one of the most exciting facets of VHF radio. The mechanics of digital operation just do not allow one to work W7XU randomly on 2 meters in South Dakota during a meteor storm, tell him to change frequency to 222.100 MHz and then work him there, all on the same meteor. Now that's a memory I won't forget — ever!

This column is just an overview, especially for FSK441. For those who want more information, refer to the bibliography.

ON THE BANDS

6 meters. The summer E_s season is off to a good start. Particularly interesting are the long distance contacts reported even this early in the season. In addition to my correspondents I am indebted to the DXSherlock (**www.vhfdx.net**), **dxworld.com** and OH8X (**www.radioarcala.com**) propagation reflectors; to Dave, N7DB, for the many Pacific Northwest reports and to Bob, ZL4AAA, for FM and TV reports. Let's take a look.

South America and Caribbean. Lots of

openings to the south in May. On May 1 Dave, N3DB (FM18) worked FG and on May 2 worked FM, PJ, YV, KP2, 4 and OA4TT. On May 3 *The Daily DX* reports 18 countries to the south of the US available. Rich, K1HTV (FM18) and Kevin, VE3KH (FN03) worked their fair share. Rich, WW3ZZ (FM18) worked TI and Joey, W5TFW (EM41) worked VP9. Ed, VP9GE (FM72) had >100 grids in the US, east to southern Spain and north to FN07 (report via Chris, W3CMP). On May 3-4 Julio, NP3CW (FK68) made >100 Qs with the US east and southeast coasts. On May 6 and 10 Jon, NØJK, notes many spots for HC8GR/B. The 10th was a good day for Jack, OA4TT (FH16) throughout the US with lots of WØ and as far north as northern New England and VE1. Specifically, NØJK; John, W5UWB (EL17); Tim, NWØW (EM47), and N3DB report OA4TT Qs. On May 11 Bob, K6QXY (CM88) worked Jack (7478 km). Andy, K1RA (FM18) reports plenty of Caribbean into his mobile on the 14th. On May 23 Johnny, KE7V (CN87) worked 9Y4. Dave, N3DB, was into HI, YN and TI on the 24th; PZ, 8P and V4 on the 28th, and HK on the 30th. Bob, W3BTX (FN00) worked deep into the Caribbean on May 24.

Transequatorial (TEP). Maarten, N1DZ (FN41) worked LU on May 3.

Hawaii. Dave, N7DB (CN85) worked KH7T on May 5 and reports that the entire Pacific Northwest (PNW) worked KH6 on May 24. Bob, K6QXY, sends an extensive report including KH6 contacts or beacons heard on May 5, 10, 11, 12, 13, 22, 24 and 27. Steve, VK3OT, notes that JE1CUS worked KH6SX on May 25.

Europe and Africa. May 14 was a big day for D44TD Cape Verde (HK86no) working as far west as K5SW (EM25) and throughout the East and Midwest including Russ, K4QI (FM06) and N3DB. After a slow start Channels 2-6 from Canada were reported in CT on May 27 but only a few contacts from CT to VO/VE2 on 6 meters. N3DB worked CT1HZE on May 28 and FL reported I and central EU. High latitude aurora early on May 29 suppressed E_s but as it abated conditions through the auroral zones improved markedly. VP9GE worked OZ, G and PA later in the day (tnx W3CMP). By the 30th Steve, NN4X (EL98) got CT, CT2, EA6 and EA and VP9GE worked EA and CT. TV DXer, Mr Cooper, in Portugal watched TV Channel 2 in Dubai ~6000 km away.

May 31 was one of the more outstanding transatlantic May days in recent memory. Bill, K4CIA (FM05) was the first Q in the US to the highlighted E4X DXpedition followed by much of the East and Midwest including AC4TO, K3CB, N3DB, K4QI and W3ZZ. Barry, NS7DX (DM26) in NV heard him and was heard but no Q. Among the many reports Owen, K3CB (FM18) worked 8 European/African/Asian countries; K4QI worked 11, N3DB had 6 and W5UWB had G and GU. A TV DXer in Sussex, England watched Channel 3 in eastern Canada. NØJK notes some very long contacts to Europe from the south including OA4TT to YO9HP (12,004 km) on May 25; YN to G (~8600 km) on May 16.

Japan and Asia. Barry, NS7DX (DM26) worked Han, JE1BMJ, on the traditional late (06-0700Z) path on May 22. Charlie, VR2XMT, heard some W7 beacons that day but made no US Qs (thanks W3BTX). On May 26 Jay, KØGU (DN70) worked Han as did stations in TX, CA and VE7. *The Daily DX* reports JA into the Southwest from 0030-0200Z May 27. Han, JE1BMJ (QM05) initiated the early SSSP opening May 26 (2245-2349Z) with Terry, K4RX (EM70); Ken, AC4TO (EM70); Dave, W9DR (EL86) and KA9CFD (EN40). Gene, KL7/KB7Q (BP40) worked into VE6, 7 and CN87 on the 25th and into CA, the PNW, Midwest and Southeast on the 30th including AC4TO and Lance, W7GJ (DN26).

Domestic. US/US contacts get short shrift this time due to space constraints. The band was open most days in May. Coast-to-coast double hop was noted on almost half the days with some auroral E across the top tier of states and numerous openings from the PNW, which sometimes is left out of the E_s fun. Sean, KX9X, activated W1AW May 4 on 6 meters to the tune of >70 Qs. Roger, K6LMN, has returned from a mobile trip through 20 grids in 6 states in the Midwest.

2 Meter and VHF+ Tropospheric Ducting. Ed, VP9GE, reports E_s signals from FL on 2 meters (probably N4TUT) on May 4 but no contacts. May 30 Bob, N3LL (EM86tx) worked K5WFT (EM03) and was heard by K7AEH (DN17) (double hop!!) but no contact. May 2 Mark, K1MAP (FM14ux) worked KØVXM (EL98pj on 10 GHz (841 km). On May 7 Vic, WB4SLM (EM82) worked XE2OR (DL98) on 2 meters and well into TX including W3XO/5 (EM00) on 222 and W5UWB (EL17) on 2 meters-70 cm.

HERE AND THERE

August UHF Contest. This annual contest, conducted on all bands from 222 MHz up, starts 1800Z August 7 and ends 1800Z August 8. This contest needs all the activity it can get so please send in your log if you participate. Full rules appear at **www.arrl.org/august-uhf**.

Perseids Meteor Shower. The Perseids, the subject of this month's column, can have >100 meteors/hr traveling at 60 km/s. The peak this year should fall somewhere between 2330Z August 12 and 0200Z August 13.

ARRL 10 GHz and Up Contest. The first weekend of this high microwave contest starts at 0600 local time August 21 and runs through midnight local time August 22. Operate any 24 hours. You can use 144.260 for a liaison frequency. Rules are at **www.arrl.org/10-ghz-up**.

14th International EME Conference. For the first time since 2004 the International EME Conference is being held in the US August 12-14 in Dallas, Texas at the Westin at DFW Airport. The sponsors are the North Texas Microwave Society, W5LUA, VE4MA and WA8RJF. This is the premiere EME event of the year with technical activities geared to both new and experienced EMEers and attendees from all over the world. The last US-based conference in 2004 was very interesting and this one also looks excellent. More information is available at **www.ntms.org/eme**. QST

VHF/UHF Century Club Awards

Compiled by Sharon Taratula
Administrative Manager

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

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

50 MHz

100

1708	WA5TRX
1709	W4EJ
1710	KZ2I
1711	9A2EY
1712	N1LF
1713	KØMFI
KØMFI	125
9A2EY	150
WA5IPS	200
K5KDX	275
W3TEF	300
K5RLA	450
N8KOL	600
AE5B	675
AA7A	775

144 MHz

100

AA7A	650

222 MHz

50

N8KOL	90

432 MHz

50

NØLL	110

1296 MHz

25

160	K3AX(EM92)
N8KOL	35

10 GHz

5

194	W4WSR

Satellite

100

194	K7CWQ
195	XE2MWY
196	WA4HFN
197	9A2EY
WA4NVM	425
K8YSE	550

QST

SPECIAL EVENTS

Contact these stations and help commemorate history. Many provide a special QSL card or certificate!

Jul 15-Jul 16, 1700Z-0200Z, W8C. Manchester, MI. Chelsea Amateur Radio Club. Manchester Chicken Broil. 14.250. Certificate. Chelsea ARC, PO Box 43, Chelsea, MI 48118. **wd8iel.net/chibro.htm**

Jul 17, 1600Z-2359Z, NI6IW. San Diego, CA. USS *Midway* (DV41) Museum Radio Operations Room. Independence Day and WAVES Birthday 1942. SSB 14.320 7.250 D-STAR 012C 2m/7cm SOCAL rptrs. QSL. USS *Midway* Museum Radio Room, 910 N Harbor Dr, San Diego, CA 92101. **kk6fz@arrl.net**

Jul 24-Jul 25, 0800Z-0500Z, W8P. Warren, OH. Warren Amateur Radio Association. Packard Car Show. 14.325 7.235. Certificate. Jacqueline Clay, PO Box 809, Warren, OH 44482. **www.w8vtd.org**

Jul 24-Jul 25, 1500Z-1500Z, WØVHQ. Sanborn, IA. Northwest Iowa Amateur Radio Club. Sanborn Railroad Days. 50.130 28.360 14.250 7.225. QSL. Randy Hogan, KCØZTR, 601 W 4th St, Sanborn, IA 51248. *Operating from an historic Railroad Caboose; come join us!* **www.qrz.com/db/w0vhq** *or* **www.niarc.com**

Jul 28-Aug 1, 1300Z-2100Z, W9ZL. Oshkosh, WI. Fox Cities Amateur Radio Club Inc. EAA Airventure 2010 — World's Largest Airshow & Fly-in. 14.250 7.270 52.550 FM 146.520. Certificate. FCARC Airventure 2010, PO Box 2346, Appleton, WI 54912. **www.fcarc.us**

Jul 29-Aug 4, 1800Z-1800Z, W9AWE. Mendon, IL. Western Illinois Amateur Radio Club. Adams County Fair. 14.250 7.250. QSL. Western Illinois Amateur Radio Club. QSL, PO Box 3132, Quincy, IL 62305. **www.w9awe.org**

Jul 31-Aug 1, 1400Z-2200Z, K4CG. Alexandria, VA. Mount Vernon Amateur Radio Club. The 220th Birthday of the US Coast Guard. 14.250 10.110 7.270. QSL. US Coast Guard TISCOM, 7323 Telegraph Rd, Alexandria, VA 22315. **k4us@mvarc.com** *or* **www.mvarc.com**

Jul 31-Aug 1, 1400Z-2359Z, WF4RC. Mursfreeboro, NC. Franklin Amateur Radio Club. Watermelon Festival. 7.245. Certificate. Christopher Hanslits, 6238 Fire Tower Rd, Zuni, VA 23898. **www.qrz.com/wf4rc**

Aug 1-Aug 8, 0100Z-2359Z, W7QF. Merchantville, NJ. International Lighthouse-Lightship Organization. International Lighthouse Week. 21.370 14.270 7.270 3.970. QSL. ARLHS, 114 Woodbine Ave, Merchantville, NJ 08109-1854. *This is a worldwide event.* **illw.co.uk**

Aug 1-Aug 8, 0100Z-2359Z, K2JXW. Merchantville, NJ. Amateur Radio Lighthouse Society. National Lighthouse Day (Aug 7). 28.370 14.270 7.270 3.970. QSL. James H. Weidner, 114 Woodbine Ave, Merchantville, NJ 08109-1854. **administration@illw.org**

Aug 5-Aug 7, 1300Z-2200Z, K4L. Sapelo Island, GA. Kennehoochee Amateur Radio Club. Sapelo Island IOTA NA-058 and ILLW USA-738, USA-1014. CW 3.530 7.030 10.115 14.040 18.098 21.040; SSB 3.755 7.160 14.260 18.128 7.250 14.250 21.350 28.450. QSL. Neil Foster, N4FN, PO Box 1245, Marietta, GA 30060. **www.w4bti.org**

Aug 5-Aug 7, 2000Z-1859Z, N9T. Ashland, WI. Lake Effect Amateur Radio Club. North Country Trail Association Convention. 14.250 14.070 PSK. QSL. Lake Effect ARC / N9T, 36 Southfork St, Marquette, MI 49855. **www.lakeeffectarc.info/Events2010/N9T-2010.htm**

Aug 7, 0900Z-1700Z, KMØBSA. Fayette, MO. Central Missouri Radio Association. 100 Years of Scouting in America. 14.300 14.240 7.250 7.200. QSL. Central Missouri Radio Association, PO Box 283, Columbia, MO 65205. *From Central Methodist University.* **www.k0si.net**

Aug 7, 1300Z-2330Z, WB9SA. Rantoul, IL. BSA Space Jam-4. 100 Years of Scouting. High altitude balloon w/cross band repeater and ATV Sat/Comm Packet HF. QSL. Brian Walker, K9BKW, 1458 N 700 E, Veedersburg, IN 47987. **www.spacejamboree.com**

Aug 7, 1400Z-2100Z, WØR. Red Wing, MN. Hiawatha Valley Radio Club. Red Wing River City Days Celebration. 147.300 21.300 14.250 7.200. QSL. Bill Eichenlaub, 1966 Launa Ave, Red Wing, MN 55066. **eichenlaubw@gmail.com**

Aug 7, 1500Z-2000Z, K8LEW. Lewiston, MI. Lewiston Area Amateur Radio Club. Timberfest: Celebrating Lewiston's Timber Heritage. 14.250 7.250 3.850 146.460. QSL. LAARC, PO Box 83, Lewiston, MI 49756.

Aug 7-Aug 9, 1600Z-0100Z, N6P. Point Reyes National Seashore, CA. Valley of the Moon Amateur Radio Club. Point Reyes Lighthouse Activity. 14.270 7.270; PSK 14.070 7.070. QSL. Ken McTaggart, N6KM, 402 4th St E, Sonoma, CA 95476. **vomarc.org**

Aug 7-Aug 14, 0000Z-0000Z, N6L. Mineral, CA. K6LSN. Lassen Volcanic National Park Anniversary. 40 20 m WARC bands multiple modes. Certificate & QSL. K6LSN, 5921 Cedars Rd, Redding, CA 96001. **lassenbirthday.blogspot.com**

Aug 11-Aug 15, 0800Z-1500Z, W9S. Sycamore, IL. Kishwaukee Amateur Radio Club. 54th Annual Northern Illinois Steam Power Show & Threshing Bee. 14.268 7.042 7.268 3.988. Certificate. Bob Yurs, W9ICU, 1107 Commercial St, Sycamore, IL 60178. **w9icu@w9icu.com**

Aug 12-Aug 14, 1400Z-1900Z, K9T. Rock Island, IL. Green River Valley Amateur Radio Society. Tugfest. 28.410 21.300 14.309 7.185. Certificate. Harold Swanson, 2519 29th Ave, Rock Island, IL 61201. *Annual rope pull across Mississippi River between Port Byron, IL and LeClaire, IA.* **k9pvz@arrl.net**

Aug 12-Aug 22, 0000Z-0000Z, WØISF. Truro, IA. Madison County DX Club. Iowa State Fair. 146.520 14.225 7.225. QSL. Mark Mease, 2989 Truro Rd, Truro, IA 50257. *Operating at various times during fair*. **mmease@netins.net**

Aug 14, 0200Z-2300Z, KE6WDX. Springville, CA. Porterville Amateur Repeater Association. KE6WDX Summer Cooldown. 14.290 7.175 3.825 145.310 - 100 PL. QSL. Porterville ARA, Special Event Station, 23433 Ave 184, Porterville, CA 93257. **www.ke6wdx.org/events.html**

Aug 14, 0930Z-1700Z, W8TNX. Newark, OH. Central Ohio Operators Klub Extra - Novice. John Clem: Youngest Army NCO at age 12. 7.240. Certificate. W8TNX, 1010 Blacks Rd SE, Hebron, OH 43025. *Will be in LoTW*. **www.cooken.org**

Aug 14, 1400Z-2300Z, WC5C. Azle, TX. Tri-County Amateur Radio Club. Activation of Pelican Island TX050L. 28.350 21.350 14.250 7.250. QSL. David Johnson, KB5YLG, 820 Wood Ln, Azle, TX 76020. *Annual Island activation Special Event/US Islands Awards Program.* **wc5c@arrl.net** *or* **www.wc5c.org**

Aug 14-Aug 15, 0600Z-0600Z, N7C. Window Rock, AZ. Navajo Amateur Radio Club. Navajo Code Talkers Day. 14.265 7.265. QSL. Herbert Goodluck, PO Box 3611, Window Rock, AZ 86515. **n7hg@citlink.net**

Aug 14-Aug 15, 1200Z-0000Z, W1H. Hagerstown, MD. Antietam Radio Association. Hiram P. Maxim original W1AW Commemoration from City where Hiram Rests in Rose Hill Cemetery, Hagerstown, Maryland. 14.290 7.178 3.902. QSL. Page Pyne, WA3EOP, 204 N Locust St #2S, Hagerstown, MD 21740.

Aug 14-Aug 15, 1420Z-1800Z, K9EAM. Green Bay, WI. Green Bay Mike and Key Club. Tall Ships Festival. 14.260 7.260 3.880. QSL. David Catalano, N8KQS, 2937 Beth Dr, Green Bay, WI 54311. *Celebrating the arrival of the large masted ships of years ago*. **www.k9eam.com**

Aug 17, 1600Z-2359Z, NI6IW. San Diego, CA. USS *Midway* (DV41) Museum Radio Operations Room. USS Nautilus, first ship to reach geographic North Pole submerged 1958; Birthday Navy Dental Corps 1912; US Coast Guard Birthday 1790. SSB 14.320 7.250 D-STAR 012C 2m/7cm SOCAL rptrs. QSL. USS *Midway* Museum Radio Room, 910 N Harbor Dr, San Diego, CA 92101. **kk6fz@arrl.net**

Aug 21, 0900Z-1800Z, KØARF. Saint Cloud, MN. KØARF. Split Rock Lighthouse Turns 100 — IL/LW. 14.270. QSL. L. Scott Hall, 3001 8 St N, Saint Cloud, MN 56303.

Aug 21-Aug 22, 1200Z-2200Z, K8FBN. Fairborn, OH. Upper Valley Amateur Radio Club. 29th Annual Sweet Corn Festival. 14.070; 75 40 20 SSB and PSK31. QSL. K8FBN, 36 E Routzong Dr, Fairborn, OH 45324.

Aug 21-Aug 22, 1600Z-1600Z, W2GSB/LH Fire Island, NY. Great South Bay Amateur Radio Club. Lighthouse/Lightship Weekend at the Fire Island Lighthouse. 14.225 7.175 3.850 14.070 PSK. QSL. W2GSB/LH, PO Box 1356, West Babylon, NY 11704. **www.gsbarc.org**

Aug 27-Aug 28, 1600Z-1200Z, K4Y. Tompkinsville, KY. Monroe County Amateur Radio Group. Old Mulkey Meeting House, burial site of Hannah Boone. 28.415 14.260 7.215 3.945. QSL. Old Mulkey Meeting House, 38 Old Mulkey Park Rd, Tompkinsville, KY 42167. **kd4qhg@yahoo.com**

Aug 28, 1200Z-2000Z, W4OVH. Manassas, VA. Ole Virginia Hams. Second Battle of Manassas. 146.970 14.225 7.225 3.825. QSL. Ole Virginia Hams, PO Box 1255, Manassas, VA 20108. **www.w4ovh.net**

Maty Weinberg, KB1EIB ♦ Special Events ♦ events@arrl.org

Aug 28, 1400Z-2100Z, W5B. Madison, MS. Jackson Amateur Radio Club. Andrew Jackson Council BSA Celebrating 100 Years of Scouting. 14.240 7.238 3.862. QSL. Bill McLarty, KM5GE, 2728 Quail Run, Jackson, MS 39211. *Rescheduled from April due to tornado.* **msham.org**

Aug 28, 1500Z-2300Z, W8JXN. Jackson, MI. Cascades Amateur Radio Society. Cascades Civil War Muster. 14.225. Certificate. CARS, Inc, PO Box 512, Jackson, MI 49204. **www.w8jxn.org**

Aug 28, 1600Z-2200Z, KF5HDN, Deming, NM, Mimbres Valley Radio Club. 31st Annual Great American Duck Races. 14.270 . Certificate. David Jorgensen, WD5COV, 18645 Cortez Rd SE, Deming, NM 88030. **www.qrz.com/db/KF5HDN**

Aug 28-Aug 29, 1400Z-2000Z daily, K5R. Hammond, LA. Southeast Louisiana Amateur Radio Club. Hurricane Katrina & Rita 5th Anniversaries. 14.250 7.250. QSL. SELARC/K5R, PO Box 1324, Hammond, LA 70404. **www.selarc.org**

Aug 28-Aug 30, 0000Z-0000Z, W9IMS. Indianapolis, IN. Indianapolis Motor Speedway Amateur Radio Club. Indianapolis MotoGP. 21.340 14.240 7.240 3.840. Certificate & QSL. Indianapolis Motor Speedway ARC, PO Box 18495, Indianapolis, IN 46218-0495. **www.w9ims.org**

Aug 29, 1400Z-2100Z, KØASA. Hanover, KS. Crown Amateur Radio Association. Hollenberg Pony Express Station Festival, 150th Anniversary of the Pony Express. 14.260 14.050 7.050 3.050. Certificate & QSL. Crown Amateur Radio Association, 11551 W 176th Terr, Olathe, KS 66062. **www.arrlmidwest.org/ponyexpress.html**

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 **Oct** *QST* would have to be received by **Aug 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 June 10. You can view all received Special Events at **www.arrl.org/special-events**. QST

In The July/August 2010 Issue:

■ Dick Jansson, KD1K, explains the operation of "Heat Pipes" as cooling technology, especially as it was used on the AMSAT-OSCAR 40 satellite. Heat pipe cooling systems are showing up in today's computers, and Dick suggests that we might be able to use these devices for cooling the transistors in solid state amplifiers.

■ Oleg Skydan, UR3IQO, examines "True TLT H-Mode Mixers." These switching mixers use transmission line transformers rather than conventional transformers. Oleg provides the details for this improved mixer scheme, in which he achieved third order intercept point (IP3) performance on the order of +40 dBm or above across the HF range.

■ Jim Koehler, VE5FP, describes his experiments with "The Shunt Method for Crystal Parameter Measurement." Jim's technique provides a reliable, accurate way to measure crystal *Q*, motional resistance, R_m, and parallel capacitance, C_P.

■ Harold Kinley, WA4GIB, describes how to solve several impedance matching problems by using Nathan Iyer's free Smith Chart computer program in "Using *QuickSmith* — Part 1."

■ Robert Zimmerman, VE3RKZ, describes one of his antenna experiments in "A 20 Meter Sleeve Dipole Without the Sleeve." Bob uses a feed line choke consisting of a coaxial cable coil and a resonating capacitor at one end of the dipole to block antenna current from flowing back down the outside of the shield. Since the coaxial cable feed line comes into one end of the dipole, this antenna looks like an end-fed wire.

■ Jon Wallace describes another "Amateur Radio Astronomy Project." This time we learn about his "Total Power Radio Telescope." Jon describes the hardware he built to create a radio map of the sky — after 10 years of data collection!

■ Dick Kolbly, K6HIJ, reviews Tom Y. Otoshi's book, *Noise Temperature Theory and Applications for Deep Space Communications Antenna Systems*. Dick points out that this book title may not sound like it would be of much interest to Amateur Radio operators, but it contains a wealth of information for microwave weak signal experimenters.

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

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Strays

WHILE THE BANDS WERE DEAD…

◊While tuning around and hearing nothing, a random thought popped in my mind. I wondered what would be the longest word that is a "Morse Palindrome," that is, for which the sequence of dots and dashes is the same forward and backward.

The first one I could think of, probably the shortest, was AN, ·−−·.

Ignoring inter-letter spacing, a Morse Palindrome will sound the same sent forward or backward. How about a three letter MP? Well, of course any simple palindromic word, such a MOM or ROTOR would qualify, but can you come up with some others?

Here are some of three and four letters: EGG FIRE SHE USED

Then I wondered, what is the longest (English) word? This was too much for a mental exercise; I needed help. So I created a short computer program to search through an online dictionary of 53,000 words, generate the code for each, reverse the code and compare. The answer was an 11 letter word: INTERPRETED. Runners-up at 10 are BOTTOMMOST and WINTERTIME.

I suppose I'll have to wait 11 years for another such great discovery — the bands are now alive! — *Bill Johnson, W3FI*

QST congratulates…

◊Dr Jim Kennedy, K2PHD, who has been selected as an Executive Advisory Board Member of the American Board of Information Security and Computer Forensics of the American College of Forensic Examiners International.

DXCC Honor Roll

Bill Moore, NC1L
Awards Branch Manager

The DXCC Honor Roll is earned by DX Century Club members who submit confirmation for contacts reached within the numerical top 10 of the overall number of entities on The ARRL DXCC List. There were 338 entities on the DXCC list for this period with 329 being required for the Honor Roll. The period for this list is from January 1, 2009 through December 31, 2009. The boldface number indicates the total current DXCC credits. The number next to the call sign represents an individual's overall total.

MIXED

338 – Top of the Honor Roll
4X1FQ/378
4X4DK/389
4X6KA/345
4X6UO/344
7L1WII/342
9A1CCY/338
9A1R/344
9A2AA/367
9A2EU/344
9A4A/371
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K8MFO/336
KP4BJD/341
LA7AJ/337
N5ZM/333
OH2BU/335
VA3DX/333
W4PK/339
W5BPT/333
W8DCH/335

332
DJ5JK/334
IK8CNT/337
JA1JAN/338
JA1KQX/336
JA3AUQ/338
JR2KDN/334
SM5FUG/337

331
DL4MCF/335
EA6NB/334
I4FTU/336
JA1WSK/331
JA3EMU/337
JA3MNP/337
K7XB/336
K8PYD/331
LA5XGA/333
N3UN/337
VE3XO/335
WØBV/333
W3YX/332

330
F6HUJ/336
G4BWP/335
K2YG/335
OH2DW/334
OZ7GI/336
SM5DJZ/334
WØLSD/331
W2FXA/336
WB8YJF/333
WT8S/331

329
F5NBU/333
GØARF/335
I5ICY/335
I5IGQ/335
JA8RJE/331
JL1UXH/329
KØEU/331
K3KO/329
K7PI/333
W4DKS/329
W4EP/335
WA9CVK/332

WB8IMY

ECLECTIC TECHNOLOGY

Making iPhone, iPod and iPad Connections

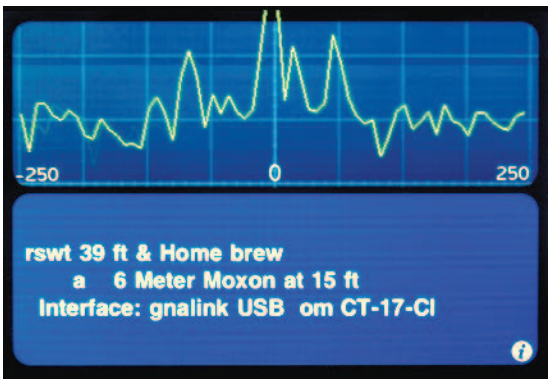
In the April 2010 Eclectic Technology column I provided an abbreviated list of Amateur Radio apps for the iPhone, iPod Touch and iPad. Some of these apps such as *iPSK31* and *iRTTY* not only provide the means to decode signals from your radio, you can use them to *transmit* as well. The trick is making the proper connections between the "idevice" and your transceiver.

These incredibly popular gadgets make their audio input and output connections through a single ⅛ inch four-conductor jack. Compatible four-conductor plugs are not common, but they *are* available if you spend the time to hunt them down on the Internet. One example is a four-conductor plug and cable assembly available from DigiKey (part number CP-354S-ND) at **www.digikey.com**. At only $6 it is a bargain when you consider that you won't have to wire the plug itself. I used such a cable to create my own multipurpose adaptor by soldering two inline ⅛ inch stereo jacks to the appropriate wires. One jack is for audio output from my iPod Touch; the other is for the iPod audio input. This gives me convenient access to the audio input/output lines for whatever purpose I desire.

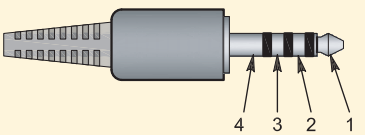
To build an adaptor, you need to know which sections of the four-conductor plug are used for the signal pathways. That's why I've included the handy diagram in Figure 1. A quick continuity check with a VOM will tell you which wires attach to each plug section. Unless you want to switch your radio manually between transmit and receive, you'll also need an interface that will sense when audio is being sent from your iPhone, iPad or iPod and switch your transceiver accordingly. The VOX interface described by Skip Teller, KH6TY, in the June 2009 *QST* ("A Sound Card Interface for FM Transceivers," page 30) is ideal for this purpose.

With my adaptor harness and Skip's VOX interface I've managed to enjoy several PSK31 conversations with my iPod Touch.

My homebrew adaptor separates the iPod/iPhone/iPad audio channels and makes external connections easy.



***iPSK31* by IW2NDH for the iPhone, iPod Touch or iPad.**



4 pin 3.5 mm (1/8 inch) plug

Pin Number	Pin Name	Description
1	Tip	Left Audio Out
2	Ring	Right Audio Out
3	Ring	Common/Ground
4	Sleeve	Audio In

QS1008-Eclec01

Figure 1 — Pin assignments for the Apple iPhone/iPod Touch/iPad headphone plug.

The primary challenge is typing quickly on a tiny touch-screen keyboard. Fortunately, PSK31 is slow enough that I can hunt-and-peck successfully with my stubby fingers. I've also plugged in a computer microphone headset for a little fun with the iTunes *EchoLink* app.

Spray-On Semiconductors

As long as we're talking about the ever-shrinking world of handheld electronics, it is interesting to note that major strides have been made toward making organic thin-film transistors phenomenally easy and inexpensive to manufacture. Recent developments will likely lead to a host of new devices, including radios, that are inexpensive enough to be *disposable*.

For more than 50 years silicon has been the foundation of semiconductor manufacturing. It is plentiful and inexpensive. Your typical large-scale integrated circuit has millions of silicon transistors crammed into a microscopic area and the manufacturing process behind these high-performance chips is well established.

But the electronics industry has been pursuing the use of organic materials to create semiconductor products — materials that would require less power, cost less and do things silicon devices cannot, such as bend and fold. If manufacturers could perfect cost-effective organic semiconductors, we might see mind-boggling applications such as low cost solar cells and even video displays that could be *sprayed onto a surface just like paint*.

A research team at the National Institute of Standards and Technology has brought this idea to reality. They've found that a commonly used organic transistor material known as poly(3-hexylthiophene), or P3HT, works well to create spray-on transistors. They already manufactured entire arrays of sprayed-on transistors using P3HT. The results of their work were published earlier this year in *Applied Physics Letters*. QST

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

K2TQN

VINTAGE RADIO

Jack Irwin, Marconi Wireless Man

Shortly after Marconi invented radio he started to build stations on land and aboard ships. By using wireless, ships would no longer be cut off from the rest of the world while out of sight of land. During the very early days others were attracted for various reasons to join the wireless world. One of these was James Gordon Bennett, owner and publisher of the *New York Herald* newspaper. He was convinced that wireless would be useful to his newspaper.

At his direction, in August 1901 the Marconi Company built a station for him at Siasconset, on the island of Nantucket. Another station was installed aboard the *Nantucket Lightship No 66* 42 miles away, which would become the first point of contact for ocean liners bound for New York.

On August 16, 1901 the Cunard liner *Lucania* sailing from Liverpool was the first inbound transatlantic liner to contact the US from mid-ocean. The first message was received at the lightship and relayed by wireless to the Siasconset station, then by telephone to the *Herald* office in New York. This message took about 30 minutes to be delivered, which was blinding-fast speed for those times. The *Herald* exchanged news stories with the *Lucania* and the world became a little smaller that day.

In 1904 and 1907 the station was enlarged due to the increased work load. The station's call letters were MSC (for Marconi Siasconset). Sometime around 1906 Jack Irwin was assigned there as one of the four operators. Later that year a young 18 year old immigrant from Russia was assigned there as an office boy. His name was David Sarnoff. Irwin trained him to be an operator so that he could be relieved at times for shipboard duty. (David Sarnoff later became the founder and president of the Radio Corporation of America.)

Collision and CQD

Just before 4 AM on January 23, 1909 while on the graveyard shift Irwin heard a weak call for help: CQD CQD ATTENTION ALL STATIONS. DISTRESS. THE REPUBLIC RAMMED BY UNKNOWN STEAMER 175 EAST OF AMBROSE LIGHT. LAT 40.7, LON 70. It was from the White Star liner RMS *Republic* 60 miles away, which had just been rammed by the Italian liner *Florida* and was sinking. Irwin quickly took charge and contacted the *Baltic* and several other nearby ships, which all headed toward the *Republic* in thick fog. Six people were killed in the crash, three from each ship, but 1500 people were successfully rescued. The wireless operator aboard the *Republic* was Jack Binns who was also quite a hero.

HAGLEY MUSEUM AND LIBRARY

Operator David Sarnoff at the Siasconset station in 1908.

For an excellent and accurate portrayal of this important use of wireless, you will want to see the PBS movie *Rescue at Sea*, parts of which were filmed at the New England Wireless and Steam Museum (**www.newsm.org**) in Rhode Island. The wireless room movie set with real Marconi equipment is on exhibit there. The video can be purchased at **www.pbs.org**.

LIBRARY OF CONGRESS

The Siasconset wireless station built on Nantucket for the *New York Herald*.

Visit **www.rms-republic.com** for more on the sinking of the *Republic*. For an interesting story about the Siasconset wireless station visit **www.nha.org/history/hn/HN-fall90-wireless.htm**. For more about Jack Binns, the wireless operator aboard the RMS *Republic*, visit **www.jackbinns.org**.

K2TQN COLLECTION

Jack Binns (left) and Jack Irwin meet after CQD rescue.

The reason I started the column in this way was to introduce you to Jack Irwin, a radio operator I have been researching for more than 7 years now. Jack made more history, which I will write about in next month's column. One hundred years ago this October he made history by using wireless to call CQD himself from an airship to a ship at sea. Again the rescue was successful but I'm ahead of myself. The story about how he got to the point where he needed to be rescued is really interesting.

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MORE AWA CONFERENCE NEWS

Dates: August 17-21, 2010

Tuesday evening, August 17, starting at 7 PM K2TQN will be presenting Don Mix's WNP 1923 adventure on the schooner *Bowdoin* to the North Pole. In a sense I'll be opening the festivities there with my talk, which will be followed by an evening of radio related movies presented by the AWA. The first will be PBS's *Empire of the Air*. The "AWA Cinema Pub" will have food and beverages available for purchase. So if you're just arriving you can attend the Don Mix presentation and movie while having your food and beverages.

On Wednesday August 18, the huge estate auction of Larry Babcock, renowned New York State collector, occupies the better part of the day. Afterward there will be an evening pizza party under the convention's huge outdoor tent and the AWA Museum Campus will have an open house. The museum is nearby and is a "must see." Please take time to visit it.

The AWA flea market opens Thursday, August 19, at 6 AM. At 11 AM the forums start inside the hotel with many well-known hams making presentations. They include Bart Lee, Tom Perera, Bill Holly, Bill Burns, Gil Schlehman, Marc Ellis, Tim Walker and Carole Perry. Also speaking are Mike Adams, Morgan Blanchard, Robert Murray, Bruce MacMillan, Lauren Peckham and Felicia Kreuzer.

The AWA flea market continues on Friday, August 20, at 6 AM. At 8 AM there is a book fair inside the hotel with hundreds of old radio collector books and magazines. At 10 AM the presentations start again till the 6 PM social hour and finally, at 7 PM, the annual AWA Awards Banquet featuring keynote speaker Carole Perry of The Radio Club of America. She will discuss her program of bringing ham radio into the public school system. Beginning at 9 PM the Old Equipment Contest room is open for viewing.

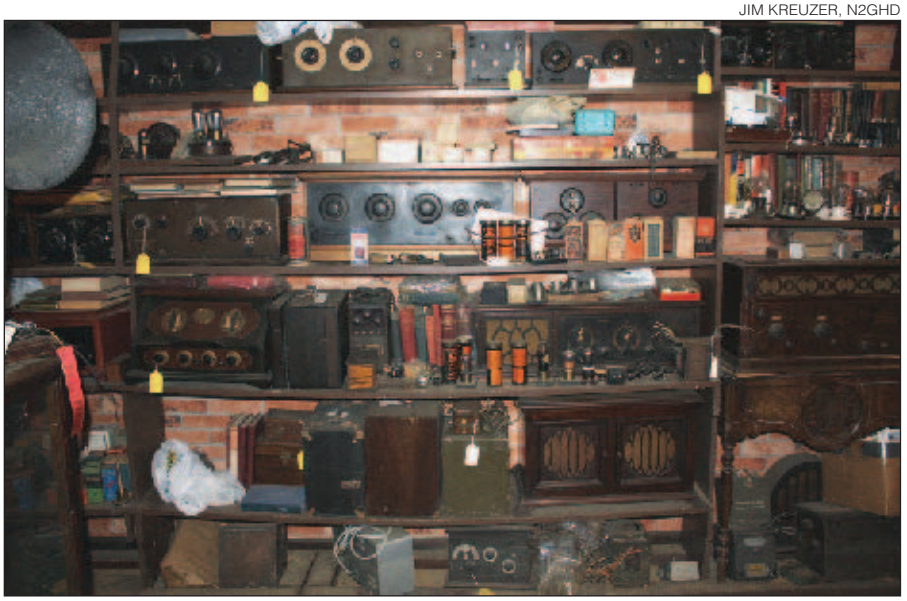
On Saturday, August 21, the second and regular AWA auction starts at 8 AM inside the hotel. Also on Saturday morning outside, the AWA flea market continues and is joined by the Rochester Amateur Radio Association in a joint hamfest. This is a fully ARRL sanctioned event with free admittance and reduced flea market space prices.

"This year's AWA convention promises to be one of the larger events in recent times," said Event Chairperson Roy Wildermuth, W2IT. "There are 4½ days of nonstop radio collecting, fellowship and just plain fun. I hope you will be able to attend."

The conference location is the RIT Inn and Conference Center (**www.rit.edu/ritinn**), 5257 West Henrietta Rd, West Henrietta, NY 14586, tel 585-359-1800.

The schedule was taken from preliminary information. Some times might change. For more and up-to-date information, and a schedule of events please visit **www.awaconference.org**. You can also visit my Web page **www.k2tqn.com**, which will have easy to click links for all the AWA activities and those mentioned in this column. — *K2TQN*

JIM KREUZER, N2GHD



A small portion of the AWA Babcock Estate Auction.

JIM KREUZER, N2GHD

Another group of lots from the AWA Babcock Estate Auction.

W1GHZ

MICROWAVELENGTHS

Microwave System Test

The North East Weak Signal Group (NEWS) usually does 10 GHz and 24 GHz system tests at the annual club picnic in July. It is probably no coincidence that stations performing well in the systems test tend to do well in the summer contest season. Those who say, "Why bother, it worked fine last year" sometimes find a problem while in a remote location, where repairs are harder.

Most of us run basic checks at home, to make sure there is output from the transmitter and the receiver can hear a signal. Those with test equipment may measure power output or receiver noise figure. But it is hard to be sure that the system radiates all available power and really hears weak signals. By running group tests of complete stations, we are able to do side-by-side comparisons — if the guy next to you hears a signal that you don't, you know something is wrong.

Figure 1 shows the lineup of 10 GHz stations under the pavilion at a recent picnic. After we finish testing, we not only have confidence that our own systems are working, but also that the stations at the other end are working as well. (And we've had a good meal at the picnic — grilled, not microwaved.)

These 10 GHz stations display a real diversity of system design and packaging, and are a source of new ideas. I take lots of pictures to capture these ideas — you've seen some of them in this column.

MDS

For receive testing, we borrowed the idea for Minimum Discernable Signal (MDS) from the San Diego Microwave Group.

To test for MDS, we set up a distant signal source, a few hundred feet away. Farther would be better, but we are limited to a baseball field at the site. The setup is similar to an antenna range, with the source antenna close to the ground.

We start with a fairly strong signal. After everyone has a chance to peak up on the signal, the signal level is reduced 1 dB at a time. When you can no longer hear it, then you have found the MDS for your system. The actual numbers are not meaningful — we make no attempt at true calibration. We record the MDS level of each station for comparison, but this isn't a contest. You decide how well your

Figure 1 — Microwave stations lined up for system test at NEWS group picnic.

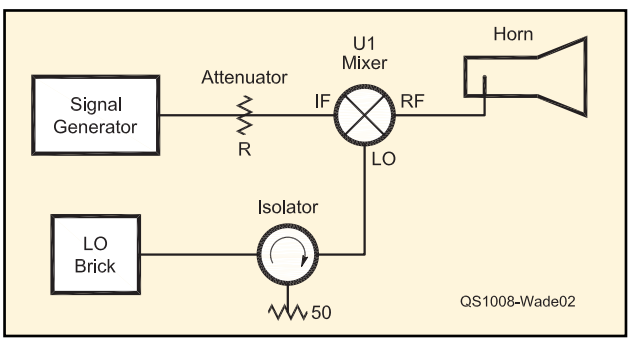


Figure 2 — Block diagram of the test signal generator.

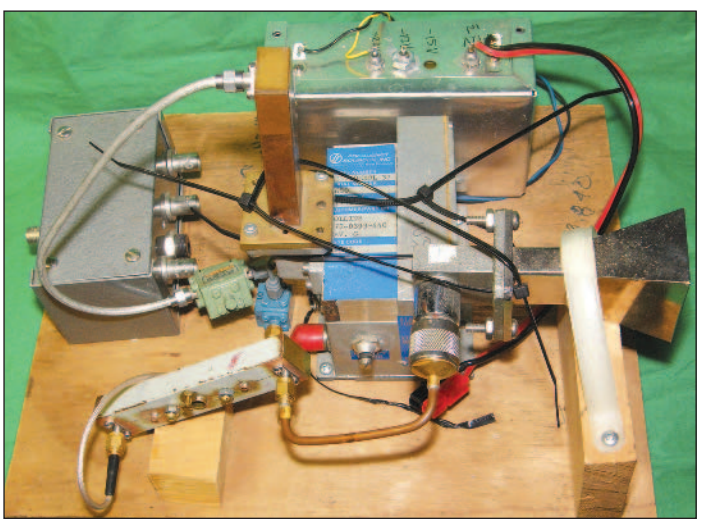


Figure 3 — Photo of test signal generator— no fancy packaging.

Paul Wade, W1GHZ ♦ 161 Center Rd, Shirley, MA 01464 ♦ w1ghz@arrl.org

system works and whether you can hear as well as the best stations. As a double check, the frequency is moved a few kHz, then the signal level is increased 1 dB at a time starting at the level where the last station lost signal. If you weren't kidding yourself, you should be able to find it at the same level as before. Usually, it takes a few more dB to find a signal, typically, 2 to 5 dB more.

Test Equipment

The test signal is implemented with a mixer, a local oscillator and a signal generator with calibrated attenuator at a lower frequency, not a common IF frequency. Thus, any strong spurious signal is at a frequency not likely to be heard by any of the microwave systems. The output is radiated by a small horn with a pattern broad enough to provide everyone with a similar signal level. A block diagram is shown in Figure 2, with a photo of the 10 GHz mixer, brick oscillator and horn antenna attached to a board in Figure 3.

Radiated Power

An advantage of this implementation is that the test mixer can also be used for receiving, to detect signals radiated by the microwave systems. We use a lower-frequency spectrum analyzer but any calibrated receiver would do. The S meters in ordinary transceivers will not do, since they are notoriously inaccurate.

What we do for radiated power is to have one station at a time transmit a carrier and record the indicated level. Again, the levels are only for comparison, with no attempt made at true calibration. They just show that station A is *x* dB stronger than station B, but *y* dB weaker than station C.

System Performance

After completing both MDS and radiated power testing, each station has an idea how he or she compares with similar stations. Of course, some have bigger antennas or higher power transmitters, so better performance should be expected from them. But there are also eye-openers, when a station performs better, or significantly worse, than expected.

For the latter, there is an opportunity to go back and make improvements before the next operating activity.

Since these tests are performed in the field, not at home, they also confirm that the equipment still performs after being packed up and transported. Most of us have seen things that didn't survive a trip in the back of a vehicle.

At one of our annual picnics, Steve, N1JFU, made a video of the testing. It may be seen on YouTube: **www.youtube.com/watch?v=5kjFXX-h4tk**.

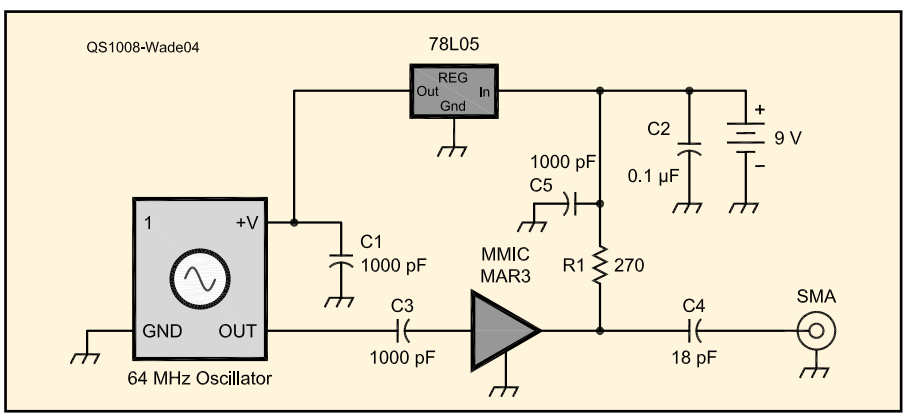


Figure 4 — Schematic diagram of a simple microwave signal source.

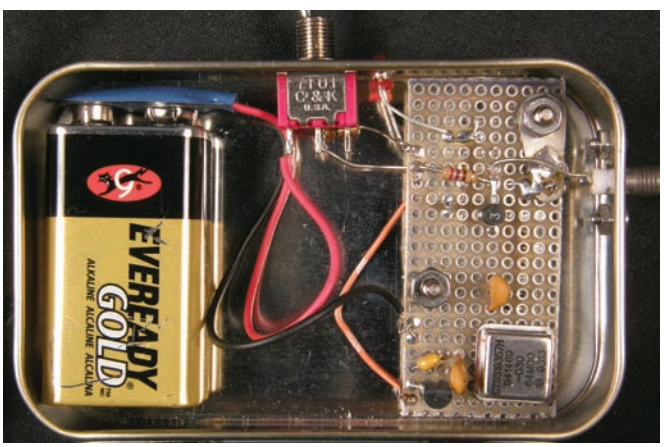


Figure 5 — The simple signal source is built on perfboard and packaged in an Altoids tin.

Rover Confidence

Even if the equipment checks out at home and performs well at the club system tests, how can we have confidence that it still works at a remote location, where there are no local stations for a signal check?

For the transmitter, we can check for radiated power with a simple detector like those shown in the January "Microwavelengths."[1] With a simple antenna like a small horn or log periodic array attached to the detector, it may be held in front of the station antenna to indicate that power is actually radiated. If you choose the Down East Microwave (**www.downeastmicrowave.com**) All Band Power Meter (ABPM), be sure to bring a spare battery — last September, I forgot and was unable to determine that my 24 GHz transverter was not working until I had missed several contacts.

The receiver needs a signal to listen to. A beacon station is ideal, but there aren't enough microwave beacons. If none is within range, then a local weak signal source is needed. "Microwavelengths" for August 2006 described some of these, including some locked to GPS for accurate frequency reference, but a much simpler signal source will usually suffice.[2]

Figure 4 is the schematic diagram of a very simple one — a 64 MHz computer oscillator overdrives an MMIC amplifier, producing a distorted waveform that is rich in harmonics. The harmonics should be audible at 2304, 3456, 5760 and 10,368 MHz, but there are no harmonics at the common IF frequencies of 144 or 432 MHz, reducing the chances of detecting a birdie. A very small antenna is usually adequate — just a short length of wire, trimmed to produce the desired signal level.

The unit in Figure 5 is built on a scrap of perfboard, with short lengths of solderwick braid added for better grounding. Final assembly is in the ever-popular Altoids tin — one of our members has an Altoids habit and provides us with empty tins. With a short length of wire for an antenna, it is audible at short range; a small horn would increase the range a bit. The signal is not on an exact frequency, but close enough to find.

System Performance is what Counts

The real test is getting out and making contacts. Knowing that the system works as well as it should, and making sure it still works when you get to the hilltop, will give you confidence to try some real DX contacts and to persevere until you are successful.

[1]P. Wade, "Microwavelengths," *QST*, Jan 2010, pp 94-95.
[2]P. Wade, "Microwavelengths," *QST*, Aug 2006, pp 76-77.

CONVENTION AND HAMFEST CALENDAR

Abbreviations
Spr = **Sponsor**
TI = **Talk-in frequency**
Adm = **Admission**

SOUTHEASTERN DIVISION CONVENTION

August 21-22, Huntsville, Alabama
D F H Q R S V

The Southeastern Division Convention, sponsored by the Huntsville Hamfest Assn, will be held at the Von Braun Center (South Hall), 700 Monroe St. Doors are open Saturday 9 AM-4:30 PM, Sunday 9 AM-3 PM. Features include all indoor, air-conditioned event with giant new dealer/manufacturer show (Charlie Emerson, N4OKL, 256-882-9137; huge flea market (Dave Givens, K5RSI, 256-883-2760; **dagivens@yahoo.com**); exhibitors; vendors; wide selection of forums (Johnny Winter, KR4F, 256-534-6785; or Chuck Lewis, N4NM, 256-539-8950); special guest from ARRL HQ Mike Corey, W5MPC, Emergency Preparedness and Response Manager; VE sessions (10 AM sharp, both days; $15 test fee); Hospitality Suites (Friday and Saturday eves at the Holiday Inn, located across the street from the VBC); DXCC card checking; convenient parking ($5); limited RV parking. Talk-in on 146.94, 147.3. Admission is $7 (under 12 free). Tables are $30 (8-ft table and 1 chair). Contact Charlie Emerson, N4OKL, 8003 Craigmont Rd, Huntsville, AL 35802; 256-882-9137; **n4okl@arrl.net**; **www.hamfest.org**.

Arkansas (Mena) — Sep 10-11 D F H R T V
Friday 7 AM-5 PM; Saturday 7 AM-3 PM. *Spr:* Queen Wilhelmina Hamfest Assn. Queen Wilhelmina State Park, 3877 Hwy 88 W. RV sites. *TI:* 146.79 (100 Hz). *Adm:* Free. Tables: $5 for space outside tent; $10 for space under tent (bring your own tables). Roy Chaloner, WO5A, 42 Round Tree Rd, Murfreesboro, AR 71958; 870-285-1376; **wo5a@hughes.net**; **www.qwha.org**.

SANTA BARBARA SECTION CONVENTION

August 14, Santa Barbara, California
D F H Q R S T V

The Santa Barbara Section Convention, sponsored by the Santa Barbara ARC, will be held at the Earl Warren Showgrounds, 3400 Calle Real. Doors are open 6 AM-9 PM. Features include dealers, flea market, tailgating, QSL card checking, static display of emergency vehicles, forums, VE sessions, refreshments, handicapped accessible. Talk-in on 146.79 (131.8 Hz). Admission is free. Tables are $100. Contact Michael Ditmore, W7HUT, 211 Rametto Rd, Santa Barbara, CA 93108; 805-886-8887; **michael@rangefire.com**; **www.sbarc.org**.

Colorado (Golden) — Aug 22 D F H R S V
8:30 AM-1 PM. *Spr:* Denver Radio Club. Jefferson County Fairgrounds, 15200 W 6th Ave. *TI:* 145.49, 448.625 (100 Hz). *Adm:* $5. Tables: $15. Bryan Steinberg, KBØA, 1011 S Foothill Dr, Lakewood, CO 80228; 303-987-9596; **drcfest@w0tx.org**; **www.w0tx.org**.

Coming ARRL Conventions

July 16-17
Arizona State, Williams*

July 16-18
Montana State, Essex*

July 23-24
Oklahoma Section, Oklahoma City*

July 23-25
Central States VHF, St Louis, MO*

August 6-7
Texas State, Austin*

September 11
Virginia Section, Virginia Beach

September 17-19
Southwestern Division, San Diego, CA

September 18
EMCOMM East, Rochester, NY
MicroHAMS Digital, Redmond, WA

September 24-25
SEDCO W4DXCC, Pigeon Forge, TN

September 25
Washington State, Spokane Valley

October 2-3
Iowa State, West Liberty

October 9-10
Florida State, Melbourne

October 10
Connecticut State, Wallingford

*See July *QST* for details.

Connecticut (Gales Ferry/Ledyard) — Aug 14
D H R V
9 AM-1 PM. *Spr:* Radio Amateur Society of Norwich. Gales Ferry Firehouse, 1772 Rte 12. *TI:* 146.73, 449.725 (both 156.7 Hz). *Adm:* $4. Tables: 6-ft $15 (first table; additional tables at lower cost). Chip Griffin, N1MIE, 1672 Glasgo Rd, Griswold, CT 06351; 860-376-0888 (home) or 860-287-3373 (cell); **n1mie@arrl.net**; **www.RASON.org**.

Florida (Fort Pierce) — Aug 14 D H Q R S V
8 AM-2 PM. *Spr:* Fort Pierce ARC. Indian River State College, 3209 Virginia Ave. *TI:* 147.345, 444.8 (both 107.2 Hz). *Adm:* $5. Tables: $15 (with electricity), $10 (without electricity). Pete Amar, KD4SPW, 1046 Trinidad Ave, Ft Pierce, FL 34982; 772-465-5204; fax 772-564-0587; **kd4spw@aol.com**; **www.qsl.net/w4akh**.

Florida (Tampa) — Aug 21 F H R T V
8 AM-1 PM. *Spr:* Tampa ARC. Tampa ARC Clubhouse, 7801 N 22nd St. TARCFest XXIV. *TI:* 147.105 (146.2 Hz). *Adm:* $2. Tables: $3. William Bode, N4WEB, 14302 Capitol Dr, Tampa, FL 33613; 813-382-9262; **n4web@hamclub.org**; **www.hamclub.org**.

Illinois (Carlinville) — Aug 7 D H R S T V
7 AM-1 PM. *Sprs:* Montgomery and Macoupin County ARCs. Macoupin County Fairgrounds, IL State Route 4. *TI:* 146.82, 444.25 (103.5 Hz). *Adm:* $5. Tables: $10. John Stretch, W9KHQ, 630 S Oak St, Hillsboro, IL 62049; 217-827-0660; **w9khq@yahoo.com**; **www.k9mce.org**.

W9DXCC CONVENTION

September 10-11
Elk Grove Village, Illinois
D H Q R S

The W9DXCC Convention (58th W9DXCC DX Convention and Banquet), sponsored by the Northern Illinois DX Assn, will be held at the Holiday Inn, 1000 Busse Rd (Rte 83). Doors are open Friday eve for Welcome Reception at 7:30 PM, Saturday registration at 8 AM, convention begins at 9 AM. Features include forums and presentations with world-renowned speakers; WAS and VUCC card checking; CW Copying Contest; Hospitality Suites (Friday and Saturday eves at 10 PM), banquet (Saturday, 6:30 PM). Admission is $55 in advance, $60 at the door. Contact Bruce Osterberg, N9BX, 10310 Fox Bluff Ln, Spring Grove, IL 60081; 815-678-0215 (phone and fax); **n9bx@mchsi.com**; **www.w9dxcc.com**.

Illinois (Peotone) — Aug 8 D F H R V
6 AM-3 PM. *Spr:* Hamfesters RC. Will County Fairgrounds, Wilmington/Peotone Rd. 76th Anniversary Hamfest. *TI:* 146.52. *Adm:* advance $6 (with double stub), door $8 (with single stub). Tables: $15. Kerry Nelson, AA9SB, 3404 Hazel Ln, Hazel Crest, IL 60429; 708-335-4574; **kw_nelson@earthlink.net**; **www.hamfesters.org**.

Indiana (Lafayette) — Aug 15 D F H R V
8 AM-2 PM. *Spr:* Tippecanoe ARA. Tippecanoe Fairgrounds, Home Ec Bldg, 1401 Teal Rd. 40th Annual Hamfest. *TI:* 147.135 (88.5 Hz). *Adm:* $5. John Parker, AB9LE, 30 Guinevere Ct, Lafayette, IN 47905; 765-446-7747; fax 509-694-0973; **ab9le@arrl.net**; **w9reg.org/hamfest/index.htm**.

Indiana (LaPorte) — Aug 21 D F R T
Set up 6 AM; public 8 AM-3 PM. *Spr:* Porter County ARC. All States Radio Club Complex, Rte 35 and Schultz Rd. *TI:* 146.775 (131.8 Hz). *Adm:* $3. Tables: $5. Matt Lasayko, KC9KUD, 6178 Lute Rd, Portage, IN 46368; 219-916-4907; **mlasayko@verizon.net**; **www.pcarc.net**.

Indiana (Osgood) — Aug 21 F H R T
8 AM-2 PM. *Spr:* Ripley County ARC. Ripley County 4-H Fairgrounds, 524 Beech St. 3rd Annual Tailgaters Hamfest. *TI:* 441.775, 147.52. *Adm:* $4. Tables: $3. Delbert Felix, WY9L, 114 Harlan St, Osgood, IN 47037; 812-689-3161; **wy9l.thebigdog@gmail.com**; **www.rcarc.ripleycounty.net**.

Indiana (Spencer) — Aug 28 D H R S T V
7 AM to 2 PM. *Sprs:* Owen County ARA and Bloomington ARC. Owen County Fairgrounds, 300 S East St. *TI:* 146.985 (136.5 Hz). *Adm:* $5. Tables: First table free. Bob Poortinga, K9SQL, 5930 N Maple Grove Rd, Bloomington, IN 47404; 812-876-6174; fax 812-323-4060; **k9sql@arrl.net**; **www.owencountyara.org/images/OwenMonroe2009.pdf**.

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

Iowa (Red Oak) — Aug 21 D F H R
8 AM-1 PM. *Sprs:* Montgomery County History Center and Robert Snyder, KCØMUX. Montgomery County History Center, 2700 N 4th St. Museum Tours. *Tl:* 146.655. *Adm:* $3. Tables: $5. Robert Snyder, KCØMUX, Box 95, Elliott, IA 51532; 712-767-2368; **oldyeller@netins.net**.

KANSAS STATE CONVENTION

August 15, Salina
D F H Q R S V

The Kansas State Convention, sponsored by the Central Kansas ARC, will be held at the Salina Bicentennial Center, 800 The Midway. Doors are open 8 AM-4 PM. Features include large indoor air-conditioned flea market; major vendors; forums; meetings; VE sessions (8:30-10 AM); DXCC, WAS, and VUCC card checking; handicapped accessible; refreshments. Talk-in on 147.03, 443.9. Admission is $5. Tables are $15 (commercial or flea market; includes electricity if requested, and 1 admission ticket per table). Contact Ron Tremblay, WAØPSF, 112 N Douglas Dr, Salina, KS 67401; 785-827-8149; **rtremblay@cox.net**; **www.centralksarc.com**.

Kentucky (Lawrenceburg) — Aug 15
D F H R S T V

8 AM-3 PM. *Spr:* Bluegrass ARS. American Legion Post #34, 745 W Broadway. Special Event/MARS Station. *Tl:* 145.39, 146.76. *Adm:* advance $5, door $6. Tables: advance $15, door $25. Jeanie Dalton, KB8QLC, Box 24188, Lexington, KY 40524; 859-619-8164; **jeanie@insightbb.com**; **www.BluegrassARS.org**.

Louisiana (Leesville) — Aug 14
D F H R S T V

7:30 AM-2 PM. *Spr:* West Central Louisiana ARC. First United Methodist Church, 202 N 5th St. 35th Annual Hamfest. *Tl:* 145.31 (203.5 Hz), 146.52. *Adm:* $5. Tables: $5. Lonnie Jacobs, W5LPJ, 12326 Lake Charles Hwy, Leesville, LA 71446; 337-239-4888; fax 337-462-0305; **w5lpj@arrl.net**; **www.wclarc.com**.

Maine (St Albans) — Aug 14 D H R S T V

8 AM-noon. *Spr:* Piscataquis ARC. Snow Devils Snowmobile Club, 9 Bryant Rd. 26th Annual Hamfest. *Tl:* 146.52. *Adm:* $5. George Dean, WA1JMM, 39 Railroad Ave, Brownville, ME 04414; 207-441-6112; **wa1jmm@roadrunner.com**; **www.k1pq.org/**.

Maryland (Westminster) — Aug 15 F H R T

8 AM-noon. *Spr:* Carroll County ARC. Carroll County Agricultural Center, 700 Agriculture Center Dr. 11th Annual Tailgate Fest (spaces are free with admission donation). *Tl:* 145.41 (114.8 Hz). *Adm:* $5. Steve Beckman, N3SB, 2145 Bethel Rd, Finksburg, MD 21048; 410-583-4321; fax 410-583-4149; **n3sb@qis.net**; **www.qis.net/~k3pzn**.

Massachusetts (Adams) — Aug 22 F R T V

8 AM-2 PM. *Spr:* Northern Berkshire ARC. Adams Agricultural Fairgrounds, Rte 8. *Tl:* 146.91 (162.2 Hz). *Adm:* $5. Tables: $10. Tim Ertl, KE3HT, 128 Hale St, Dalton, MA 01226; 413-822-7075; **flea@ke3ht.org**; **www.nobarc.org/hamfest.htm**.

NEW ENGLAND DIVISION CONVENTION

August 27-29
Boxborough, Massachusetts
D F H Q R S T V

The New England Division Convention, sponsored by FEMARA, will be held at the Holiday Inn Boxborough Woods, 242 Adams Pl. Doors are open Friday afternoon, all day Saturday, and Sunday until 2 PM. Features include flea market; exhibitors; dealers; vendors; forums and seminars; demos and workshops; QSL card checking; VE sessions; Special Event Station W1A; Contesting Banquet (Friday eve, $35); Saturday eve banquet with special guest speaker ARRL Chief Executive Officer Dave Sumner, K1ZZ ($40); Wouff Hong ceremony; RV parking; handicapped accessible. Talk-in on 147.27 (146.2 Hz), 224.88 (103.5 Hz), 449.925 (88.5 Hz), 53.81 (71.9 Hz). Admission is $15 (covers all 3 days); under 16 free. Tables are $10. Contact Mike Raisbeck, K1TWF, 85 High St, Chelmsford, MA 01824; 978-250-1235; **k1twf@arrl.org**; **www.boxboro.org**.

Massachusetts (Cambridge) — Aug 15. Nick Altenbernd, KA1MQX, 617-253-3776 (9 AM-5 PM); **w1gsl@mit.edu**; **www.swapfest.us**.

Michigan (Lapeer) — Aug 15 D F H R V

8 AM-noon. *Spr:* Lapeer County ARA. Lapeer County Center Building, 425 County Center Dr. *Tl:* 146.62 (100 Hz). *Adm:* $5. Tables: $10. Bill Miller, KD8VP, 3605 Pratt Rd, Metamora, MI 48455; 810-797-5329; **kd8vp@arrl.net**; **www.w8lap.com**.

Michigan (Owosso) — Aug 21
D F H R S T V

8 AM-noon. *Spr:* Shiawassee ARA. Baker College Welcome Center, 1309 South M-52. *Tl:* 147.02 (100 Hz). *Adm:* $1. Tables: $3 ($1 for outside car space). Don Warner, WB8GUS, 10008 Lehring Rd, Byron, MI 48418; 810-266-4897 or 810-599-0729 (cell); **wb8gus@arrl.net**; **www.w8qqq.org**.

Michigan (Port Huron) — Aug 8 R T

9 AM-noon. *Spr:* Eastern Michigan ARC. Vantage Point Maritime Center Parking Lot, 5 Water St. 2nd Annual Seaway Trunk Swap. *Tl:* 147.3. *Adm:* Free. Bob Herbert, K8WMW, 819 Tunnel St, Port Huron, MI 48060; 810-982-1561; **k8wmw@arrl.net**.

Missouri (Joplin) — Aug 27-28
D F H Q R S V

Friday 4-9 PM; Saturday 8 AM-2 PM. *Spr:* Joplin ARC. Holiday Inn Convention Center, 3615 Range Line Rd. Friday cookout. *Tl:* 147.21. *Adm:* advance $5, door $6. Tables: $12. Jim Johannes, NØZSQ, c/o JARC, Box 2983, Joplin, MO 64803-2983; 417-437-9547; fax 417-781-2234; **jimjohannes@sbcglobal.net**; **www.joplin-arc.org**.

Missouri (O'Fallon) — Aug 15 D F H R V

Set up 6 AM; public 8 AM-1 PM. *Spr:* St Charles ARC. Elks Lodge, 1163 Tom Ginnever Ave. *Tl:* 146.67, 145.33. *Adm:* $3. Tables: $15. Matt Anderson, NØMSA, c/o Hamfest 2010, 35 Countrywood Dr, St Peters, MO 63376; 636-724-9777; **n0msa@yahoo.com**; **www.wb0hsi.org**.

New Mexico (Alamogordo) — Sep 4
D F H R S V

7 AM-2 PM. *Spr:* Alamogordo ARC. Otero County Fairgrounds, 401 Fairgrounds Rd. 26th Annual Hamfest. *Tl:* 146.8 (100 Hz). *Adm:* Free. Tables: $5. Dave Pote, AE5OV, 3600 Greasewood Ave, Alamogordo, NM 88310; 575-442-1315; fax 866-304-6824; **ae5ov@arrl.net**; **www.qsl.net/k5lrw/hamfest.htm**.

NEW MEXICO STATE CONVENTION

August 13-14, Albuquerque
D H R S T V

The New Mexico State Convention ("Duke City Hamfest"), sponsored by New Mexico Hamvention, Inc, will be held at the Del Norte Baptist Church, 5800 Montgomery Blvd NE. Doors are open Friday noon-9 PM, Saturday 7 AM-3 PM. Features include the buying, selling, and trading of new and used Ham Radio equipment; commercial vendors; free tailgating (Saturday only); many excellent technical and non-technical forums and demonstrations; Special Event Station N5M; VE sessions (Saturday, all license classes, walk-ins welcomed; Darryl Clutter, NX5W, 505-286-1672); Saturday eve banquet with special guest speaker Bob Martin, KC5LHL ($25 for single; $40 for two); handicapped accessible; free dry RV camping available; refreshments. Talk-in on 145.33 (-100 Hz), 444.0 (+100 Hz). Admission is free. Tables are $25 (without power), $35 (with power); register in advance. Contact Mike Langner, K5MGR, 929 Alameda Rd NW, Albuquerque, NM 87114; 505-898-3212 or 505-238-8810 (cell); fax 505-890-3404; **k5mgr@arrl.net**; **www.dukecityhamfest.org**.

New York (Deerfield) — Aug 21 D F H R T V

8 AM. *Spr:* Central New York ARA. Deerfield Volunteer Fire Department, 5476 Trenton Rd. Ham-Jam. *Tl:* 145.21. *Adm:* $5. Brian Lekki, KC2UQR, 458 Butler Rd, Poland, NY 13431; 315-725-7910; fax 315-737-8729; **kc2uqr@gmail.com**; **www.cnyara.com**.

New York (Howard) — Aug 14 D F H R T V

7 AM-noon. *Spr:* Keuka Lake ARA. Howard Community Building, 7481 Hopkins Rd. *Tl:* 145.19. *Adm:* $5. Tables: Free. Roy Koehler, KB2WXV, 37 Carrington St, Avoca, NY 14809; 607-566-3688; **hamfest@xdrcertified.com**; **klara.us**.

New York (Lancaster) — Aug 29 F R T

7 AM-3 PM. *Spr:* Lancaster ARC. Bowen Rd Grove at Como Lake Park, Bowen Rd. *Tl:* 147.255 (107.2 Hz). *Adm:* $5. Tables: Included. Luke Calianno, N2GDU, 1105 Ransom Rd, Lancaster, NY 14086; 716-481-5747; **luke48@gmail.com**; **gbhamfest.hamgate.net**.

New York (Ridgeway/Medina) — Aug 21
D F H R S T V

Set up 6 AM; public 8 AM. *Spr:* Orleans County ARC. Ridgeway Fire Hall, 11392 Ridge Rd. *Tl:* 145.27 (141.3 Hz). *Adm:* $5. Tables: $5. Terry Cook, KC2JKU, 14069 W County House Rd, Albion, NY 14411; 585-589-6362; fax 585-861-4885; **kc2jku@ocarc.us**; **www.ocarc.us**.

New York (Rochester) — Aug 17-21. AWA World Convention; Roy Wildermuth, W2IT, 585-899-6703; **awaconference.com**.

New York (Rochester) — Aug 21 F H R S V

8 AM-5 PM. *Spr:* Antique Wireless Assn. RIT Inn and Conference Center, 5257 W Henrietta Rd. *Tl:* 146.88. *Adm:* Free. Tables: $5. Roy Wildermuth, W2IT, 45 Old Forge Ln, Pittsford, NY 14534; 585-899-6703; **w3rlw@rochester.rr.com**; **awaconference.com**.

New York (Westmoreland) — Aug 14
D F H R T

8 AM. *Spr:* Rome RC. Westmoreland VFD Fireman Field, Station Rd. 57th Annual Hamfest. *Tl:* 146.88 (151.4 Hz). *Adm:* $5. Tables: $5. David Muscarella, K2YE, 6075 Hawkins Corners Rd, Lee Center, NY 13363; 315-337-0790; **k2ye@arrl.net**; **romeradioclub.com**.

North Carolina (Dallas) — Sep 4-5
D F H R S V

Saturday 8 AM-5 PM, Sunday 8 AM-2 PM (inside building); outdoor flea market opens at 7 AM both days. *Spr:* Shelby ARC. Biggerstaff Park, 1303 Dallas-Cherryville Hwy. 54th Shelby Hamfest. *Tl:* 146.88, 147.12. *Adm:* advance $6, door $8. Tables: $70. Robby Hamrick, WA4RH, Box 1408, Ellenboro, NC 28040; 828-453-9121; **wa4rh@bellsouth.net**; **www.shelbyhamfest.org**.

Ohio (Cambridge) — Aug 22 D F H R T V

8 AM-noon. *Spr:* Cambridge ARA. Pritchard Laughlin Civic Center, 7033 Glenn Hwy. Ham-

fest and Computer Show. *Tl:* 146.85 (91.5 Hz). *Adm:* $5. Tables: $10. Mary Rhodes-Ellis, KD8EIR, 5855 Sherrard Rd, Cambridge, OH 43725; 740-439-6610; **radicalrhodes@yahoo.com**; **www.w8vp.org**.

Ohio (Columbus) — Aug 7 F H R S T V
8 AM-2 PM. Spr: Voice of Aladdin ARC. Aladdin Shrine Center, 3850 Stelzer Rd. TI: 147.24. *Adm:* $5. Tables: Free. Barry Mertz, KC8SXG, 3602 Dinsmore Castle Dr, Columbus, OH 43221; **kc8sxg@arrl.net**; **www.aladdinshrine.org**.

Ohio (Cortland) — Aug 15 D F H R T V
8 AM-2 PM. *Spr:* Warren ARA. Trumbull County Fairgrounds, 899 Everett Hull Rd. *Tl:* 146.97. *Adm:* $6. Tables: $5. Jackie Williams, KD8DNE, Box 809, Warren, OH 44483; 440-636-2806; **kd8dne@yahoo.com**; **www.w8vtd.org**.

Oregon (North Bend) — Jul 17 D F H R S V
10 AM-2 PM. *Spr:* Coos County RC. North Bend Middle School, 16th and E Sts. *Tl:* 146.61, 147.28 (146.2 Hz). *Adm:* $3. Tables: $15. Elise Ciraolo, N7CIR, 63353 Juniper Dr, Coos Bay, OR 97420; 541-267-4243; **e.ciraolo@verizon.net**; **www.coosradioclub.net**.

Pennsylvania (Matamoras) — Aug 8 D F R T
7 AM-noon. *Spr:* Tri-State ARA. Matamoras Airport Park, 9th St Extension. *Tl:* 145.35 (100 Hz). *Adm:* $5. Tables: $15. Tom Olver, W2TAO, Box 711, Sparrowbush, NY 12780; 570-630-0050; **tristateara@gmail.com**; **k3tsa.com**.

WESTERN PENNSYLVANIA SECTION CONVENTION

August 22, New Kensington
D F Q R S T

The Western Pennsylvania Section Convention, sponsored by the Skyview Radio Society, will be held at the Skyview Radio Society Clubhouse Grounds, 2335 Turkey Ridge Rd. Doors are open 8 AM-1 PM. Features include 50th Annual Swap 'n Shop; tailgating; VUCC/WAS card checking; special guest from ARRL HQ Norm Fusaro, W3IZ, MVP Assistant Manager; breakfast and lunch served; "Skyview Jam" (musicians bring your instruments); bring your high performance or antique cars for the Skyview Car Show; food bank donation center. Talk-in on 146.64 (131.8 Hz). Admission is $3. Tables are $5. Contact Bob Boehmer, KG3F, 1240 Hulton Rd, Oakmont, PA 15139; 412-860-0046; **kg3f@arrl.net**; **www.skyviewradio.net**.

Pennsylvania (Sinking Spring) — Aug 14
D F R T V
7 AM-1 PM. *Spr:* Reading RC. Heritage Park, off Rtes 422 and 724. Equipment Auction (11:30 AM). *Tl:* 146.91. *Adm:* $1 (nonham spouses and under 18 free). Tables: $2 per car space (tailgate only). Harry Hoffman, W3VBY, 104 Evans Ave, Sinking Spring, PA 19608; 610-678-8976; **harryhoffmanjr@juno.com**; **readingradioclub.org**.

South Carolina (Moncks Corner) — Aug 14
T
9 AM-3PM. *Spr:* Trident ARC. Moncks Corner Fraternal Order of Police, Lodge 19, 1310 S Live Oak Dr. 4th Annual Tailgate Party, equipment test station. *Tl:* 147.15. *Adm:* $1. Tables: $3. Dennis Zabawa, KG4RUL, 307 Pine Cone Ct, Ladson, SC 29456; 843-572-4053 (after 10 AM); **kg4rul@arrl.net**; **www.tridenthams.org/Tailgate_Party.htm**.

Tennessee (Athens) — Jul 17 D F H R T
7 AM-noon. *Spr:* McMinn County ARC. Athens Regional Park. Hwy 30. 6th Annual Hamfest. *Tl:* 147.06, 145.15 (both 141.3 Hz). *Adm:* Free. Tables: $5. Scott Duckworth, NA4IT, 522 County Rd 783, Etowah, TN 37331; 423-263-1989; **kg4fzr@yahoo.com**; **www.mcminnarc.com/fest/fest.html**.

Texas (Gainesville) — Aug 21 D F H R T V
7 AM-1 PM. *Spr:* Cooke County ARC. Gainesville Civic Center, 311 S Weaver St. 18th Annual Hamfest, programs, eyeball QSOs, RV parking with full hookups adjacent to Civic Center ($15; 940-668-4530). *Tl:* 147.34, 442.775 (both 100 Hz). *Adm:* advance $6 (by Aug 15), $8 (after Aug 15). Tables: advance $8 (by Aug 15), $10 (after Aug 15); electrical hookup $5 extra. James K. Floyd, N5ZPU, 1704 E California St, Gainesville, TX 76240; 940-668-7511; **jfloyd54@swbell.net**; **www.gainesvillehamfest.org**.

Vermont (Swanton) — Aug 14
D F H R S T V
8 AM-3 PM. *Spr:* St Albans ARC. Raven Industrial, Rte 78 E. Home Brew displays, Craft Fair vendors. *Tl:* 145.23 (123 Hz). *Adm:* $5. Tables: $5. Arnold Benjamin, N1ARN, 1420 Rice Hill Rd, Franklin, VT 05457; 802-309-0666; **n1arn@yahoo.com**; **www.starc.org**.

Washington (Spanaway) — Aug 14
D F H R S V
9 AM-2 PM. *Spr:* Radio Club of Tacoma. Bethel Junior High School, 22001 38th Ave E. Country Store, test, consignments. *Tl:* 147.28 (103.5 Hz), 147.5. *Adm:* $5. Tables: $20. Larry Watson, KD4VOM, 2708 295th St S, Roy, WA 98580; 253-843-2190; **royretreat@mailcan.com**; **www.w7dk.org**.

West Virginia (Huntington) — Aug 14
D F H Q R V
8:30 AM-1 PM. *Spr:* Tri-State ARA. Veterans Memorial Fieldhouse, 2590 5th Ave. Hamfest and Computer Show. *Tl:* 146.76 (131.8 Hz). *Adm:* $6. Tables: $10. Karl Labor Sr, KD8BZX, 4693B Darnell Rd, Huntington, WV 25705; 304-736-1013; fax 304-736-0807; **DEI18@comcast.net**; **www.qsl.net/tara**.

WEST VIRGINIA STATE CONVENTION

August 21, Weston
D F H Q R S T V

The West Virginia State Convention (52nd Annual Event), sponsored by the West Virginia State Amateur Radio Council, will be held at the WVU Convention Center – Jackson's Mill 4-H Conference Center, 160 WVU Jackson Mill. Doors are open 8 AM-midnight. Features include President's Reception (Friday, Aug 20, 6 PM; Jackson Lodge Basement); flea market; vendors; auction; forums; keynote guest speakers; educational programs and demonstrations; ARES, MARS, QCWA, NTS Net Meetings; VE sessions; awards; Wouff Hong Ceremony. Talk-in on 145.39, 147.88. Admission is $8. Contact Bob West, WA8YCD, 883 Goshen Rd, Morgantown, WV 26508; 304-625-6280 or 304-672-6381; fax 304-776-1068; **wa8ycd@comcast.net**; **www.qsl.net/wvsarc**.

Wisconsin (Baraboo) — Aug 28 D F R V
8 AM-1 PM. *Spr:* Yellow Thunder ARC. Elks Club Lodge, 623 Broadway St. 14th Annual Circus City Swapfest. *Tl:* 147.315 (123 Hz). *Adm:* $5. Tables: $5. Steve Schulze, N9UDO, 1120 City View Rd, Baraboo, WI 53913; 608-356-2313; **n9udo@yellowthunder.org**; **www.yellowthunder.org**.

Wisconsin (Sturtevant) — Aug 14 D F R
7 AM-1 PM. *Spr:* Racine Megacycle Club. Fireman's Park, 9600 Charles St. 3rd Annual Freefest. *Tl:* 147.27 (127.3 Hz). *Adm:* Free. Bob Frederiksen, KB9ZAF, 4455 Spring St, Racine, WI 53405; 414-815-6649; **kb9zaf@arrl.net**; **www.w9udu.org**.

To All Event Sponsors

Before making a final decision on a date for your event, you are encouraged to check the Hamfest and Convention Database (**www.arrl.org/hamfests-and-conventions-calendar**) for events that may already be scheduled in your area on that date. You are also encouraged to register your event with HQ as far in advance as your planning permits. See **www.arrl.org/hamfest-convention-application** for an online registration form. Dates may be recorded up to two years in advance.

Events that are sanctioned by the ARRL receive special benefits, including an announcement in these listings and online, donated ARRL gift certificates and handouts.

For hamfests: Once the form has been submitted, your ARRL director will decide whether to approve the date and provide ARRL sanction. *For conventions:* Approval must come from your director and the ARRL executive committee.

The deadline for receipt of items for this column is the **1st of the second month preceding publication date**. For example, your information must arrive at HQ by **August 1** to be listed in the **October** issue. Information in this column is accurate as of our deadline; contact the sponsor or check the sponsor's Web site for possible late changes, for driving directions and for other event details. Please note that postal regulations prohibit mention in *QST* of prizes or any kind of games of chance such as raffles or bingo.

Promoting your event is guaranteed to increase attendance. As an approved event sponsor, you are entitled to special discounted rates on *QST* display advertising and *ARRLWeb* banner advertising. Call the ARRL Advertising Desk at 860-594-0207, or e-mail **ads@arrl.org**. QST

Strays

JOHN (JC) CRAWFORD, W4QK

The VHF bands are dead, and here's proof: **JC Crawford, W4QK, of Evans, Georgia took this picture of a turkey vulture perched comfortably on his 24 element VHF/UHF log periodic in early May.**

75, 50 AND 25 YEARS AGO

August 1935

- The cover photo shows some nice homebrew equipment.
- The editorial discusses changes in the radio regulations and the need for filtered d.c. power on transmitter tubes in the 10-meter band — a band with very good possibilities.
- George Grammer, W1DF, tells us how to get "Greater Economy in Class-B Modulator Design for Speech."
- Charles Fisher, W3FX, presents Part 1 of "An All-Purpose S.S. Superhet with Turret-Type Automatic Coil Changing."
- "Five-Meter Signals Do the Impossible" reports that W1CBJ and W8CYE made contact over a 900-mile path!
- Frank Gow, W1AF, tells us how to get on "Four Bands with Two Tubes," using a type 59 oscillator and an RK-20 output tube for 100 watts on c.w. and 20 watts on 'phone.
- W. C. Lent describes "Adjusting the 'Phone Transmitter for Best Modulation Performance."
- "The 803 — High-Power Pentode" describes this new tube for both r.f. and a.f. use. The 803 features 125 watts plate dissipation and can provide 200 watts output.
- In "Simple Methods of Checking Modulation to Comply with the New Regulations," James Lamb tells us how to abide by the new F.C.C. Rule 381.

August 1960

- The cover photo shows W1CUT standing beside his new little car with all his mobile equipment laid out beside it — obviously wondering how he will fit it all in.
- The editorial discusses the problem, "Which Call to Sign?," a question that has become common now that multiple family members share the same ham station.
- C. J. Prechtel, W8DRR, describes his "Experimental Transceivers for 5650 Mc."
- Jo Emmett Jennings, W6EI, tells about "A Portable Kilowatt Power Supply" that weighs only 12 pounds and delivers 3000 volts D.C.
- Ken Glanzer, K7GCO, presents "The Inverted V-Shaped Dipole," which also features multiple wire elements to increase the antenna's bandwidth.
- Ernest Adolph, K1DRX, describes "The Electromonimuter," a gadget that combines an electronic keyer, a vacuum-tube keyer, a sidetone oscillator and receiver muter."
- "The SJ-97A Transmitter," by Bob Perthel, W9MWD, is a homebrew unit that runs 150 watts on A.M. and 180 watts on C.W. on all bands, 80 through 10 meters.
- Lew McCoy, W1ICP, presents an "All-Band C.W. Transmitter for the Novice" that uses a 6AG7 oscillator driving a 1625 amplifier.
- Ed Tilton, W1HDQ, describes "A Featherweight Array for 50-Mc. Portable Work."
- W. R. Stangel, W6FLT, presents his new final, which uses a pair of "813s in Grounded Grid" to run a kilowatt.
- An item in "Strays" reports that "VP3FM's name is R. F. McWatt."

August 1985

- The cover photo shows a packet station, with the caption "Packet Fever: Catch It!"
- The editorial, "How Are We Doing?", looks at the progress in increasing League membership as well as the number of U.S. hams.

- Martin Schick, KA4IWG, tells us how to get color SSTV images, in "Color SSTV and the Atari Computer."
- Harold Price, NK6K, takes "A Closer Look at Packet Radio," the cover story.
- "The VIP: A VIC Image Processor," by Grant Zehr, WA9TFB, tells us how to receive enhanced satellite weather images.
- In "The ATVer's Amazing Little Gray Box," Ced Tanner, VE3BBI, tells us how we can display both the transmitted and the received TV signals on the same screen.
- Doug DeMaw, W1FB, tells us how to build "A Semi-Kit Receiver for 75/80 Meters," using a broadcast-band receiver.
- John Lindholm, W1XX, asks, "Is 160 *Your* Top Band?" John discusses how users need to cooperate in the use of the band, which is becoming more heavily used because of poor propagation on the higher bands.
- In "The World above 50 MHz," conductor Bill Tynan, W3XO, suggests, "Want More States on Two Meters? Use Meteor Scatter!"

Al Brogdon, W1AB ♦ Contributing Editor

Field Organization Reports

MAY 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**.

570 W7TVA
560 KØIBS
525 WB7WOW
420 W4CAC
397 WB8RCR
361 WB9FHP
339 KA2ZNZ
325 KB2FED N2LTC
320 KT2D
285 K2DYB
280 K2HJ K8RDN
255 KB2ETO
251 N4HUB
250 KØLQB AK2Z
248 K2HAT
245 WB9JSR
240 K7BFL KB2RTZ
224 K9EOH
218 KC4VA
217 W4LHQ
208 KC2SFU
200 WA2BSS
197 W4AVD
190 W4AGA
188 K7BC

184 K2ABX
183 KK5NU
175 W5KAV
170 WB9YBI
165 N5NVP
160 W5DY KK3F
158 WD8USA
152 KK1X
150 N7EIE KE7HYW WD9FLJ N8IO N7CM WB6OTS
148 KF7GC
147 KB1NMO
140 NA9L
141 KK7DEB
135 K9LGU WØLAW WE2G W3YVQ KC2UVQ
130 K6JT NX9K N2JBA WB2FTX K7EAJ W4OTN K4IWW W4FAL K3CSX W1SGC NX8A
127 W7EKB
125 NN7H N9VC N3RB K4DND KD1LE

123 K4BEH
120 AG9C KB2BAA WM2C WB2KNS N2GS W8UL WB8HHZ K4GK KA4FZI W4DNA KB3LNM W1GMF KW1U N1LKJ N1IQI WI2G
112 KB1KRS
110 W7QM W7GB KC5OZT K5KV KK5GY K1HEJ N9AUG K3RC N7XG N7YSS N4ABM KE4CB W2EAG WB4GHU K1YCQ WB4GHU KB8GT WB8WKQ
108 KB5SDU KD7OED
107 N2YJZ
106 WC5M
105 N8OD K2TV
104 N2VC W2SFD
103 N8NMA
102 W9WXN
100 K4SCL WB6UZX N3SW W3TWV WØCLS NØMEA WAØVKC

W7GHT KI6RUW N1JX WB8SIQ WG8Z W8DJG K4BG KI4YV W4TTO AA3SB WB4FDT W2DSX W8CPG N9MN NR2F N9MN NR2F K2AN
99 AD4BL K2GW
98 KC5MMH
97 W7ELI
96 WA4UJC N7IE NA7G
95 KCØM W2CC K7OAH
94 KK7TN W7JSW
93 W6SX
91 KB2CCD
90 K6RAU WA2CUW W9MBT K5MC N8DD WD8Q W4WNE WB4BIK K4MSG K3IN K1JPG KA1EHR NU8K W3GQJ W8IM NU8K W3GQJ
89 N2DW
87 WØSJS KI4DHS
86 KA8ZGY

WB8OIF N2VQA
85 KB9KEG K8DD
83 W1PLW
82 KC8WH
80 K7MQF W5GKH KCØZDA WA8EZN KC8UR N5EEO KA3NZR KJ4HGH KD8LZB KD8CYK K8KV
78 KS3Z WDØGUF KC4PZA
77 KJ7NO
76 KB1NAL
75 AD5CQ W3CB KA4SZQ
74 KT5SR N3ZOC
73 KE5YTA W5XX
72 K8VFZ
71 WD8DHC KJ4MNW W1PLK
70 KØDEU NØDLK NØDUW NØDUX NUØF KAØFUI NIØI KBØJKO NØMHJ NØNTV KØPTK KØOR KØRXC NØUKO KD7ZUP K5GLS N8SY

The following stations qualified for PSHR in previous months, but were not properly recognized in this column: (April) W4KLB 100, N4MEH 90.

Section Traffic Manager Reports

The following Section Traffic Managers reported: AK, AR, AZ, CO, CT, ENY, EPA, EWA, GA, ID, IL, IN, LA, MDC, MS, MN, NFL, NC, NLI, NNJ, NNY, NTX, OH, OR, OK, ORG, SD, SFL, SJV, SNJ, STX, TN, UT, VA, WCF, WI, WMA, WNY, WV, WY.

Section Emergency Coordinator Reports

The following ARRL Section Emergency Coordinators reported: AZ, CT, EWA, GA, IA, IN, KS, ME, MI, MN, MO, MT, NC, NLI, NTX, OH, 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 1914, KA9EKG 1465, KK3F 1020, W8UL 1001, WB8WKQ 833, KW1U 690, N1LKJ 600, WB9JSR 600, K7IGF 596, N8IXF 569.

Stations earning BPL by Originations plus Deliveries: NM1K 121.

SILENT KEYS

It is with deep regret that we record the passing of these amateurs:

W1DVR **Corey**, Horace E. Jr, Osage Beach, MO
W1EIZ **Boudreau**, Charles R., Harrisville, RI
KA1FOP **Robotham**, William S. Sr, Suffield, CT
WA1FVM **Kaiser**, Wolfgang W. "Bill," Center Tuftonboro, NH
W1IUN **Hayes**, Gordon B., Chester, CT
K1KM **Rosen**, Ralph J., Laconia, NH
W1KPC **Chorobik**, Henry W., Stratford, CT
W1LZS **Rounding**, James R., Belen, NM
W1OSY **Chetham**, John H., Longmont, CO
N1QLN **Sanders**, William A., New Britain, CT
N1VI **Reed**, Emerson C. Jr, North Chelmsford, MA
WA1YNV **Krueger**, Thomas A., New Hampton, NH
K2BH **Pritchard**, Dalton H., Hilton Head Island, SC
WA2EYF **Foley**, Thomas R. Sr, Buffalo, NY
K2HFM **Kerr**, James W., Pittsfield, MA
W2HLR **Rothenhoefer**, Harry L., Cicero, NY
W2JSF **Salisbury**, Robert R., Toms River, NJ
N2JZA **Quartana**, Charles M., Brooklyn, NY
W2MEL **Bry**, Al, Venice, FL
W2MUM **Wolheim**, Elliott, Levittown, NY
KC2NYD **Rydarowski**, Ted S., Richmondville, NY
K2QFX **Chubrick**, Anthony, Middlesex, NJ
N2RIC **Hoppe**, Robert H., Waverly, NY
KB2RJS **Abramowitz**, Burton, Jericho, NY
K2RXQ **Rugg**, William D. "Bill" Jr, Oceanport, NJ
KX2U **Cirrotti**, Louis M., Mays Landing, NJ
K2UWM **Williamson**, Robert A., Seminole, FL
WA2YSW **Widmann**, Frank W., Haddonfield, NJ
W3EEF **Marcus**, Robert B., Sacramento, CA
WB3JDI **Silverio**, Patrick J. "Rick," Meadville, PA
WA3KAZ **Flick**, Paul L., Erie, PA
K3LAW **Payne**, Byron C. Jr, Peculiar, MO
W3NWJ **Elias**, Edward H., Plymouth Meeting, PA
N4BGM **Rutherford**, James T., Stone Mountain, GA
KE4ECM **Hrivnak**, James A., Madison, AL
N4EKO **Gist**, W. Bruce, Killen, AL
KE4FE **Day**, Gary Van Sackett, Rib Lake, WI
W4FKT **Kinney**, Russell, Charlotte, NC
KG4FMN **Wurm**, John J., Deltona, FL
WB4GRB **McClure**, Charles E. "Chuck," Athens, TN
KD4HGQ **McGrath**, James E., LaCrosse, WI
WA4HJE **Raymer**, Leonard C., Henderson, KY
KD4ISP **Johnson**, James M. "Jimmy," Carrollton, GA
♦KV4IY **Robson**, Alfred B. Jr, Osteen, FL
K4JDF **Wimmers**, Bernard C., Ocala, FL
KD4JRJ **Lundy**, Lawrence H., Merritt Island, FL
KI4KNT **White**, Johnny W., Macon, GA
♦W4MCY **Stattelman**, Arthur J., West Bend, IA
W4MQV **Tucker**, Ernest J., Fayetteville, TN
♦K4MR **Bennett**, Dr Bradford S., Durham, NC
N4NMS **Smith**, Fred T., Oakboro, NC
W4PFB **Bradley**, David A. "William," Upper Marlboro, MD
KB4QDB **Mackey**, William A. Sr, Tuscaloosa, AL
KF4SKI **Farris**, David D., Winchester, KY
KD5ACP **Angeloni**, Robert W., Roswell, NM
WA5BEU **Evans**, Dolores A. "Dee," Nederland, TX
N5DYE **Towery**, James M., McKinney, TX
KD5FUY **Myers**, Jimmie L., Star, MS
KA5KIE **Halls**, Agnes M., Socorro, NM
NF5N **Webb**, David A., Denton, TX
K5PSZ **McNulty**, James M., Nashua, NH
KE5PXC **Bartlett**, Ernest C., Wiggins, MS
WB5SEM **Cornett**, Donald B. "Bubba," Hewitt, TX
WD6GCD **Grover**, Patrick L. "Pat," Bangor, ME
N6GXK **Whitfield**, Richard W. MD, Charleston, SC
W6JUG **Thomas**, Everett L. "Speed," Friant, CA
KG6LXV **Lillie**, Cathy M., Riverside, CA
N6PJZ **Sawtelle**, Benjamin N., Novato, CA
K6SQC **Todd**, Arthur L. "Art," Rancho Santa Fe, CA
WB6TGI **McQuilkin**, Robert C. "Bob," Sebastopol, CA
WB6TRF **Kaai**, Samuel W., Vallejo, CA
KC6WYN **Ohanian**, Lucille, Tustin, CA
WB7ABG **Spray**, Donald L., Aurora, NE
W7CGU **Blakeslee**, Guy, Boise, ID
N7DIR **Kidson**, William V., Phoenix, OR
N7IOS **Holmes**, Leslie M., Phoenix, AZ
AE7K **Maddox**, Floyd D. "Butch," Custer, WA
KD7KQE **Allen**, Arthur E., Puyallup, WA
NM7M **Brown**, Robert R., Anacortes, WA
WA7SL **Lewis**, Stanley A., Rainier, OR
KC7TPS **Asay**, Joseph E., Salt Lake City, UT
W8AXI **Weingartner**, Robert G., Gwinn, MI
N8BMX **Thaxton**, Paul M. Jr, Maumee, OH
WD8BPA **Holscher**, Leroy, Flint, MI
KA8CFI **Sassin**, Bertha Y., Ocala, FL
N8DHZ **Walden**, James M., Birmingham, MI
KD8ETS **Hollow**, Clarence G., Ravenna, OH
N8HPD **Mirtes**, Harold W., Norwalk, OH
KB8OMF **Trefz**, Glenn, Williamsburg, OH
K8OV **Schweppe**, Howard B. Jr, Marquette, MI
WD8PFD **Craig**, William A., Southfield, MI
K8QEI **Keiser**, Nancy O., Bloomfield Hills, MI
W8ROM **Matyja**, Roman J., Moundsville, WV
KB8VNI **DeVlieg**, Ray A., Linden, MI
W8WGN **Ewan**, Jack L., Defiance, OH
WB8ZQZ **Cade**, R. Marvin, South Euclid, OH
WD9CRV **Pruett**, Larry E., Okawville, IL
♦K9ERP **Egger**, George W., Danville, IL
KA9FIK **Stater**, Max E., Connersville, IN
WD9FWP **Mehner**, Ernest B. "Ernie," Dorchester, WI
W9JAN **Epstein**, Calvin, Tampa, FL
N9JGD **Glancy**, Patrick J., Madison, WI
W9LCU **Reynolds**, Calvin L., Mishawaka, IN
W9NG **Sanner**, Richard E., Rice Lake, WI
K9RMJ **Brewer**, William W., Spring Lake, MI
K9UDF **Bournique**, Vincent E., Carmel, IN
K9URE **Serandos**, Tom P., Moline, IL
WB9WNA **Massie**, Raymond J., Mukwonago, WI
N9ZFY **Biles**, Everett S., Durand, WI
WDØAES **Connell**, Robert E. "Bob," Chadron, NE
WBØDRI **Carlson**, Donald H., Oelwein, IA
♦WØDYS **Lynk**, Charles K. "Chuck," Marshalltown, IA
WØIZV **Ditmer**, John G., Thornton, CO
KØJZG **Hammer**, Vernon Dean, Newton, IA
WØKEP **Berendt**, John W., Cannon Falls, MN
WØKOL **Davis**, Howard S., Topeka, KS
WCØM **Kurtti**, Roger W. "Bill," Rock Lake, ND
WOØM **Biddinger**, John E., Oelwein, IA
♦NØMSB **Juroszek**, Fr Robert S., Altoona, PA
NØNKZ **Durey**, Paul A., Fayette, IA
WAØOBI **Trigg**, Kenneth V., Lee's Summit, MO
WØSNL **Palmer**, Donald C., Fort Dodge, IA
WBØSRX **Jacobs**, David L., Paola, KS
KØSTF **Brand**, Jack C., Rapid City, SD
WØUEI **Peterson**, Charles W., Minneapolis, MN
WØVAD **Schlickbernd**, William H. Jr, Chadron, NE
KØVU **Steinblock**, Edward A., Saint Cloud, MN
VE1AMA **Amero**, Burt, Auburn, NS, Canada
♦ON5KD **Deforce**, Tillo, Kruishoutem, Belgium

♦ 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

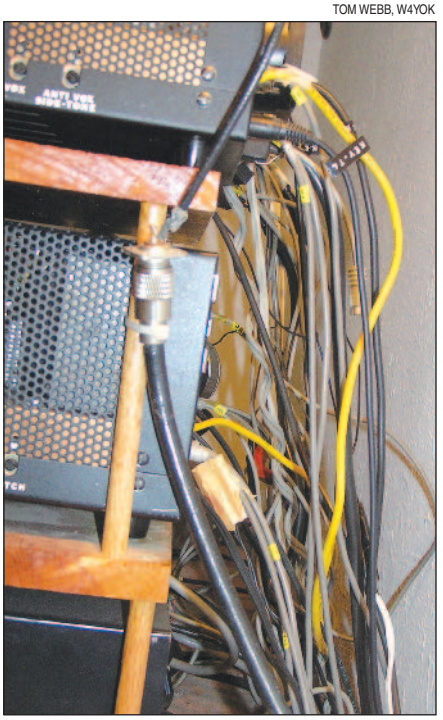
A GENERAL AT 99, STILL QRV AT 101

◊As she approached 100 years of age, Louise B. Evans, KE7LSF, of Portland, Oregon decided to, what else, get back into Amateur Radio. She earned her General class license in 2008 at age 99, and was excited to have the opportunity to rejoin the YL International Single Sideband System and the ARRL. — *tnx Dave Shearer, KE7PPV*

MARVIN RUNYAN

Louise Evans, KE7LSF, holds up her General class license in this 2008 photo. Her ham friends from the Willamette View ARC, situated at the Willamette View retirement community, helped her celebrate her 101st birthday this past March.

TOM WEBB, W4YOK

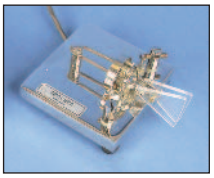


"Why do they call it wireless?"* That was my mother's comment after inspecting my first ham station years ago. — *Tom Webb, W4YOK

HAMSPEAK

The following are brief descriptions of Amateur Radio related terms found in this month's issue of *QST*. More information on most can be found in *The ARRL Handbook*, or other specialized ARRL publications.[1] See also **www.arrl.org/ham-radio-glossary**.

Build a Two Finger Key

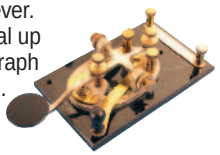


Dual-paddle key — Common name for the mechanical portion of an electronic keyer with dual lever mechanism, one side for dots, one for dashes. In this kind of paddle. they can both be actuated at the same time, if desired.

Electronic keyer — Circuitry that generates sequences of Morse code dots and dashes initiated by switch contact closures.

Semiautomatic key — Telegraph key with horizontal motion of a lever arm. Pushing the arm to the right results in a stream of dots generated by a weight and spring. Dashes are made manually by pushing the arm to the left.

Sideswiper — Mechanically operated telegraph key in which the lever moves side to side. Unlike a semiautomatic key, there is no automation. Early telegraphers found the side to side motion resulted in less tiring and cramping of the sending arm, however.



Straight key — Traditional up and down motion telegraph key with no automation.

The Doctor is IN

1:1 balun — A *bal*anced-to-*un*balanced transformer. Generally used to couple from a balanced antenna such as a dipole to an unbalanced (with respect to ground) transmission line, such as coaxial cable. In a 1:1 balun, no change in impedance should happen across the boundary.

Antenna analyzer — Test instrument designed to measure the impedance and standing wave ratio (SWR) of an antenna or an antenna and feed line combination as a function of frequency. See **www.arrl.org/reviews-listed-by-issue**, look for May 2005.

Antenna tuner — Device that sits between an antenna and a transmission line, or a transmission line and a radio, and transforms the impedance to match the radio or line.

Balanced load — A termination in which each of the two terminals is the same potential above ground.

Caliper — Mechanical measuring instrument in which a sample is placed between a fixed and movable jaw. The movable jaw is closed on the sample to determine the sample's dimension between the jaws.

[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**.

Characteristic impedance (Z_0) — Property of an electrical transmission line, based on its relative dimensions and materials. If the transmission line is terminated in its Z_0, it will appear to have that same impedance at any length. This is not the case for any other terminating impedance.

Driven element — Antenna element in a multielement parasitic array that is connected to the transmission line.

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

Earning 160 Meter WAS in 117 Days

Double bazooka antenna — Kind of half wave dipole antenna in which the elements are partly constructed of transmission line sections that tend to compensate for impedance changes with frequency to result in a wider bandwidth.

WAS (Worked All States) — ARRL award earned by an Amateur Radio operator talking to and exchanging confirmation (QSL) cards with a ham in each of the 50 US states. **www.arrl.org/was**

A Multiband 50 W Linear Amplifier

ARRL Homebrew Challenge — Competitive equipment construction exercise sponsored by the ARRL.

Bias circuitry — Circuitry that provides the dc current applied between the base and emitter of a transistor in order to set the desired collector current for intended circuit operating conditions.

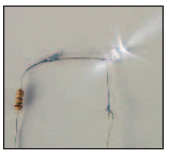
Class A or Class AB mode — The *class* of an amplifier defines the operating conditions in terms of voltages and currents that result in certain operating characteristics. A Class A amplifier draws current throughout the input waveform, providing the most linear, but least efficient, operation. A Class AB amplifier is biased to draw current during only part, but more than half, of the input waveform, providing fairly linear, but more efficient operation than Class A.

Directional coupler — Device, generally composed of coupled transmission line sections, or transformers that sample an RF signal to separately measure the power going toward the antenna and the power reflected from the antenna.

Directional wattmeter — RF power meter with the capability to separately measure the power going toward the antenna and the power reflected from the antenna. In the case of a matched (SWR of 1:1) load, the reflected power equals zero.

Full break-in (QSK) — Radiotelegraph operation in which the sending operator can listen to the channel in between sent dots and dashes. This enables the other operator to "break in" to ask for a repeat or a clarification. It also allows the sending operator to adjust speed or suspend operation in the presence of noise or interference.

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**.



Linear amplifier — An amplifier that provides a constant multiple of the input signal resulting in a larger copy of all original input signals, and no additional signals, at the output. This is the ideal case for many types of amplifiers. All real amplifiers exhibit some distortion products, generally increasing with larger input signals.

MOSFET — A field-effect transistor that forms its electric field through an insulating metal oxide layer.

Push-pull — Amplifier configuration in which two active devices are used. They are arranged so that during one half of the input cycle one device amplifies, while the other amplifies during the other half cycle. The outputs are combined in a common output transformer or coupling arrangement.

RTTY — Radioteletype. Originally a communications system in which keyboard initiated data is sent to a mechanical key printer, like a typewriter. A five unit code is used to represent the 32 possible keys, including one to toggle between letters and figures (including punctuation). Often now synthesized using computer software.

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.

Simplify Transceiver to Amplifier Interfacing with an In-Line Attenuator

Automatic level control (ALC) — Transmitter power control system that adjusts the gain of a stage or stages in order to maintain the output at or below a safe level.

DPDT relay — Abbreviation for *double pole double throw*. Contact configuration of a relay in which two separate circuits are each switched at the same time between two separate outputs.

Duty cycle — Fraction of time a system is in operation, often expressed as a percentage. The average power consumption of a device is thus the power during on time, times the duty cycle.

Full power transmit spike — Short duration pulse of RF from a transmitter resulting from slow activation time of power control circuitry.

Who are You Calling a *Dummy*?

Hamfest — Organized gathering of Amateur Radio operators often sponsored by a radio club or other ham organization.

QRP — Strictly speaking, an operating shorthand for: "I am sending with reduced power." In common use it refers to low power, typically under 5 W output, operation viewed as a special challenge by many amateurs.

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(Near Disneyland)
933 N. Euclid St., 92801
(714) 533-7373
(800) 854-6046
Janet, KL7MF, Mgr.
anaheim@hamradio.com

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1525 W. Magnolia Blvd, 91506
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(877) 892-1748
Eric, K6EJC, Mgr.
Magnolia between
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burbank@hamradio.com

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oakland@hamradio.com

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sandiego@hamradio.com

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1509 N. Dupont Hwy., 19720
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(800) 644-4476
Chuck, N1UC, Mgr.
RT.13 1/4 mi., So. I-295
newcastle@hamradio.com

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11705 S.W. Pacific Hwy.
97223
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(800) 765-4267
Leon, W7AD, Mgr.
Tigard-99W exit
from Hwy. 5 & 217
portland@hamradio.com

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8400 E. Iliff Ave. #9, 80231
(303) 745-7373
(800) 444-9476
John, WØIG, Mgr.
denver@hamradio.com

NEW LOCATION!

PHOENIX, AZ
10613 N. 43rd Ave, 85029
(602) 242-3515
(800) 559-7388
Gary, N7GJ, Mgr.
Corner of 43rd Ave & Peoria
phoenix@hamradio.com

ATLANTA, GA
6071 Buford Hwy., 30340
(770) 263-0700
(800) 444-7927
Mark, KJ4VO, Mgr.
Doraville, 1 mi. no. of I-285
atlanta@hamradio.com

WOODBRIDGE, VA
(Near Washington D.C.)
14803 Build America Dr. 22191
(703) 643-1063
(800) 444-4799
Steve, W4SHG, Mgr.
Exit 161, I-95, So. to US 1
woodbridge@hamradio.com

SALEM, NH
(Near Boston)
224 N. Broadway, 03079
(603) 898-3750
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- GPS/APRS operation optional
- Li-ion Hi-capacity battery
- wide band Rx

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NEW!

FT-450AT HF + 6M TCVR

- 100W HF/6M • Auto Tuner built-in • DSP Built-in
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IC-706MKIIG All Mode Transceiver

• Proven performance • 160-10M*/6M/2M/70CM • All mode w/DSP • HF/6M @ 100W, 2M @ 50W, 440 MHz @ 20W • CTCSS encode/decode w/tone scan • Auto repeater • 107 alphanumeric memories

IC-7000 All Mode Transceiver

SEPARATION KIT RMK-7000 Included with your purchase

• 160-10M/6M/2M/70CM • 2x DSP • Digital IF filters • Digital voice recorder • 2.5" color TFT display

DSP INSTALLED Included with your purchase

$25 INSTANT SPRING SAVINGS!

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• 160-10M* @ 100W • 12V operation • Simple to use • CW Keyer Built-in • One touch band switching • Direct frequency input • VOX Built-in • Band stacking register • IF shift • 101 memories

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• 75 watts • Dynamic Memory Scan (DMS) • CTCSS/DCS encode/decode w/tone scan • Weather alert • Weather channel scan • 200 alphanumeric memories

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• D-STAR & GPS upgradeable 2M/70CM • 50/15/5W RF output levels • RX: 118-173.995, 375-549.995, 810-999.99 MHz** • Analog/digital voice with GPS (optional UT-123) • 500 alphanumeric memories

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• 160-6M @ 200W • Four 32 bit IF-DSPs+ 24 bit AD/DA converters • Two completely independent receivers • +40dBm 3rd order intercept point

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• 100W HF/6m Transceiver, gen cov. receiver • Dual DSP 32 bit • Three roofing filters- 3, 6, 15khz • 5.8 in WQVGA TFT display • Hi-res real time spectrum scope

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IC-2200H 2M Mobile Transceiver

• 65W Output • Optional D-STAR format digital operation & NEMA compatible GPS interface • CTCSS/DTCS encode/decode w/tone scan • 207 alphanumeric memories • Weather alert

D-STAR READY

IC-92AD Analog + Digital Dual Bander

• 2M/70CM @ 5W • Wide-band RX 495 kHz - 999.9 MHz** • 1304 alphanumeric memories • Dualwatch capability • IPX7 Submersible*** • Optional GPS speaker Mic HM-175GPS

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IC-PW1 HF + 6M Amplifier

• 1.8-24MHz + 6M Amp • 1KW amplifier • 100% duty cycle • Compact body • Detachable controller • Automatic antenna tuner

IC-7200 HF Transceiver

• 160-10M • 100W • Simple & tough with IF DSP • AGC Loop Management • Digital IF Filter • Digital Twin PBT • Digital Noise Reduction • Digital Noise Blanker • USB Port for PC Control

IC-880H Analog + Digital Dual Bander D-STAR

• D-STAR DV mode operation • DR (D-STAR repeater) mode • Free software download • GPS A mode for easy D-PRS operation • One touch reply button (DV mode) • Wideband receiver

IC-V80 2M Handheld Transceiver New!

• 2M @ 5.5W • Loud BTL audio output • Military rugged • Classic 2M operation

D-STAR READY

IC-80AD Analog + Digital Dual Bander

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2M + 70CM • 5/2.5/0.5 Watts Output Power • RX: 136-174, 400-479 MHz** • 302 Alphanumeric Memory Channels • 700mW Loud Audio • Ni-MH 7.2V/1400mAh Battery

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- FM, AM, SSB
- 5w 2M/220/440 TX, FM
- 435 Memories
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- 1,000 memories
- VSC • 100 ch/sec. scanning

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Wide Band Receiver

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- 1300 Memories with alphanumeric labels
- VSC scan
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- 0.150-823.995 MHz, 849.0-868.995 MHz, 894.0-1300.000 MHz
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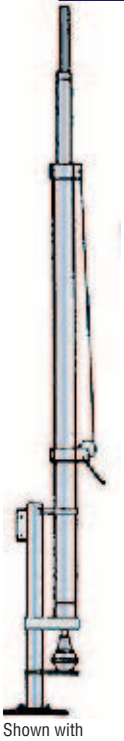

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Perfect for Most Elements
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- Freestanding—just like the other guy's
- Requires UNUN for multi-band use with your wide range tuner

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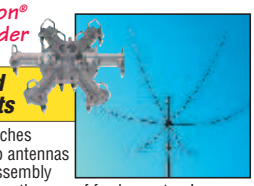

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- Low noise results—approaches performance of closed loop antennas
- Pre-slit fiberglass—easy assembly
- Patent-pending, balanced weather-proof feeder system!
- Small turning radius—has a turning radius of 11 feet
- Light weight—less than 25 pounds fully assembled
- Can be turned with a light duty rotor—save money
- Has full length elements—no lossy coils or traps
- Requires no matching network—direct single 50 Ω coax feed
- Good results at 20 to 30 feet above ground

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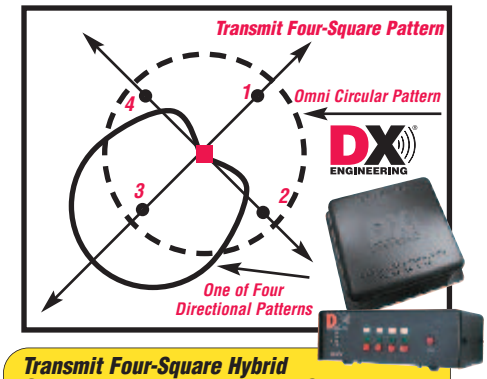
DXE-HEXX-1WRP-2	1-Band Element & Wire Guide Package	**$75.95**
DXE-HEXX-5WRP-2	5-Band Element & Wire Guide Package	**$149.95**
DXE-HEXX-5FFP	5-Band Rigid Feeder Package	**$194.95**
DXE-HEXX-1TAP-2	1-Band Total Antenna Package	**$359.95**
DXE-HEXX-5TAP-2	5-Band Total Antenna Package	**$599.95**

Four-Square Transmit Controller!



Transmit Four-Square Hybrid Controller—4 Directions plus Omni

- Classic Hybrid design—easy to install
- 5 kW CW power rating—high reliability
- Hot switching lock-out—disables amplifier while switching
- Drop-in replacement for Comtek—easy upgrade
- Proven DX Engineering RF relays—high performance
- RF Shielded weatherproof housing—unique protection

DXE-TFS4-160-P	160 Meter Four-Square Controller with Control Console	**$569.00**
DXE-TFS4-80-P	80 Meter Four-Square Controller with Control Console	**$559.00**
DXE-TFS4-40-P	40 Meter Four-Square Controller with Control Console	**$549.00**

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ICO-IC-7600

ICO-AH-4

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HEI-GM-5	GOLDLINE 2-element Mic, HC5	$129.00
HEI-HM-10-DUAL	Desk Mic, HC4 & HC5 Elements	$119.00
HEI-ICM	Desk Mic for ICOM, 8 ft. attached	$99.00
HEI-PR781	Dynamic Cardioid Studio Quality Mic	$139.00

Headsets

HEI-PROSET-4	Boom Mic/Headset, HC4	$125.00
HEI-PROSET-5	Boom Mic/Headset, HC5	$125.00
HEI-PROSETIC	Boom Mic/Headset/Adapter, ICOM Electret	$139.00
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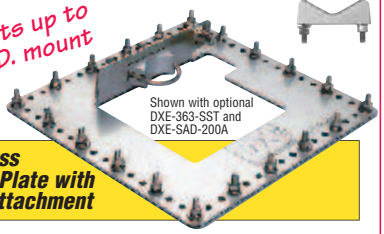

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DXE-SSVC-3P	Stainless Saddle Clamp for attachment to round tube 2" to 3" O.D.	$14.95
DXE-363-SST	Silver/Teflon® bulkhead connector	$6.95
DXE-VFCC-H05-A	Vertical Feedline Current Choke	$134.95
DXE-RADW-500K	Radial Wire Kit, 500 feet of wire, 20 lugs, 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

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- CC-8 Controller
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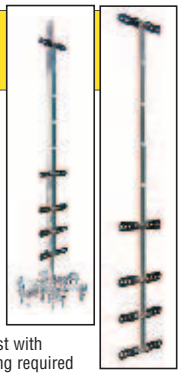
- Coax Prep Tool

DXE-RFS-TS2P	Complete Receive Four-Square Package	$1,650.00

For Hexagonal beams

NEW! DX Engineering 5-Band RIGID Feedpoint System



Our patent-pending rigid feedpoint system is made for use with 5-Band, G3TXQ-design hexagonal beam antennas. Now standard on DX Engineering's 5-Band Mark 2 HEXXAGONAL Beam Antenna, it is a direct replacement for your old-tech coax cable feeder.
- Durable stainless steel/Teflon® construction (patent pending)
- Serpentine center insulators
- Weatherproof, low-loss, high power balanced connections
- Attach to a 1 1/4" fiberglass center post with supplied clamps—no drilling or splicing required
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DXE-HEXX-5FFP	5-Band Rigid Feedpoint System	$194.95

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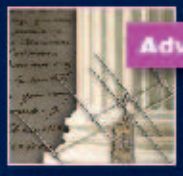

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Source Code: QST 1/2010

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NEW! AT-600Pro

The LDG AT-600Pro will handle up to 600 watts SSB and CW, 300 on RTTY (1.8 – 30 MHz), and 250 watts on 54 MHz. It will match virtually any kind of coax-fed antenna and will typically match a 10:1 SWR down to 1.5:1 in just a few seconds. You can also use the AT-600Pro with longwires, random wires and antennas fed with ladder line just by adding a balun. It has two antenna ports with a front-panel indicator, and separate memory banks for each antenna. Easy to read LED bar-graph meters showing RF power, SWR and tuner status, tactile feedback control buttons and an LED bypass indicator. Operates from 11 – 16 volts DC at 750 mA. Includes Icom interface cable, DC power cable and coax jumper. ***Suggested Price $359.99***

radio not included

Z-817

The ultimate autotuner for QRP radios including the Yaesu FT-817(D). 2000 memories cover 160 through 6 meters. The Z-817 will also function as a general purpose antenna tuner with other QRP radios. Powered by four AA internal Alkaline batteries (not included), no additional cables required. A coax jumper cable is also induced for fast hook up. ***Suggested Price $129.99***

NEW! Z-11ProII

The Z-11Pro, 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. 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***

NEW! AT-100ProII

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-100Pro requires just 1 watt for operation, but will handle up to 125 watts. Includes Icom interface cable, DC power cable and coax jumper. ***Suggested Price $229.99***

radio not included

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***

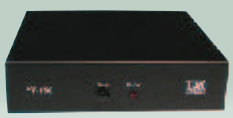
NEW! M-7600 For IC-7600. It will display S-meter on receive, or power out, SWR, ALC level or supply voltages, all selectable from the radio's menu. What's more, the M-7600 and the virtual meter on your radio can work together. ***Suggested Price $79.99***

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. ***Suggested Price $159.99***

IT-100

Matched in size to the IC-7000 and IC-706, the 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***



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

AT-200Pro

The AT-200 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

See AT-1000Pro Review in Nov. '08 CQ

AT-1000Pro

The AT-1000Pro has an Automode that automatically starts a tuning cycle when the SWR exceeds a limit you set. Operates at any power level between 5 and 1,000 watts peak. RF Relay protection software prevents tuning at greater than 125 watts. Tunes from 1.8 to 54.0 MHz (inc. 6 meters), with tuning time usually under 4 seconds, transmitting near a frequency with stored tuning parameters, under 0.2 seconds. 2000 memories. 2 Antenna connections. Includes Icom interface cable, DC power cable and coax jumper.
Suggested Price $599

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Huntsville Hamfest
August 21-22, 2010

South Hall, Von Braun Center, Huntsville, Alabama

Program Highlights

- **Huntsville Hamfest:** Featuring huge new equipment dealer show, many major manufacturers, giant flea market. Huge forum slate including ARRL, public service, DX, technical and contesting topics.
- **DX Card Checking:** Representatives will be available to field check your DX cards for DXCC credit. Visit the NADXC booth for information.
- **Hospitality Suites:** Huntsville Hamfest will host Hospitality Rooms at the Holiday Inn across the street from the VBC on Friday and Saturday nights.
- **2010 YHOTY (Young Ham of the Year):** An award intended to recognize a young ham who has demonstrated his or her dedication to Amateur Radio through his or her activities.
- **Talk-in station:** Our always welcoming and always helpful talk-in crew (they haven't lost a visitor yet) will be operating as K4BFT on the 146.94 repeater for complete talk-in information. Back-up frequency is 147.30. No PL required during the hamfest weekend.

- **HAYLARC YL Breakfast:** The Huntsville Area Young Ladies Amateur Radio Club (HAYLARC) invites all YLs attending the Huntsville Hamfest to join them for a Dutch breakfast Sunday, 7:00 AM at Shoney's.
- **Meet Our Special Guest:** ARRL President, Kay Craigie, N3KN.
- **DX Banquet Saturday Night:** Sponsored by the North Alabama DX Club, featuring Tom Harrell, N4XP, speaking on the K4M DXpedition to Midway Island. The DX Banquet will be held at the Holiday Inn across the street from the Von Braun Center.

Hotels

Holiday Inn Downtown
Huntsville Hamfest Official Hotel
Right across the street from the hamfest site, is the Holiday Inn, Huntsville Downtown. Call them at (256) 533-1400 (Huntsville) or 1-877-320-8455 (Corporate). Mention the Group/Convention code "**SHA**" to get the special Hamfest rate of $82. **www.holidayinn.com/hunsvilleal**

Embassy Suites, Huntsville, AL
You may also want to consider reservations at the Embassy Suites adjacent to the Von Braun Center. Call (256) 539-7373 (Huntsville) or 1-800-362-2779 (Corporate) and mention the Group/Convention code "**HMF**" for the special Hamfest rate of $109 (single or double).
www.embassysuiteshuntsville.com

Nearby Points of Interest

- ✓ U.S. Space & Rocket Center and U.S. Space Camp
- ✓ Bridge Street Centre – Upscale Shopping Mall
- ✓ Huntsville Botanical Garden
- ✓ Huntsville Museum of Art
- ✓ Cathedral Caverns State Park
- ✓ Historic Huntsville Depot Museum and Alabama's Constitution Village

Parking: The parking garage across the street from the VBC will be open with a parking fee of $5. The South Hall where the Hamfest is located has a 500 space ground level garage with a parking fee of $5. Elevators carry you up to the hamfest.

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• Optional HM-189GPS Speaker Mic adds GPS capabilities

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• RX: 0.495-999 MHz (cell blkd)
• Power: 5/2.5/0.5/0.1W
• Optional HM-175GPS Speaker microphone adds GPS capabilities

IC-V82 2M FM HT

• TX: 144-148 • RX: 136-174 • Power: 7W
• Memories: 200 • D-Star with optional UT-118

IC-91A 2M/440 FM Dual Band HT

• TX: 144-148, 420-450 MHz • RX: 0.495-999 MHz (cell blkd) • Power: 5/0.5W • Memories: 1304
• D-Star upgradable with optional UT-121

ID-880H 2M/440 FM Analog & D-Star Digital Dual Bander

• TX: 144-148, 430-450 • RX: 118-173.995, 230-549.995, 810-999.99 MHz (cell blkd) • Power: 50/15/5W
• Memories: 1052 • D-Star Digital Ready
• Improved User Interface

IC-2200H 2M FM Mobile

• TX: 144-148 MHz • RX: 118-174 MHz
• Power: 65/25/10/5W • Memories: 207
• D-Star upgradable with optional UT-118

ID-1 1.2 GHz D-Star & FM Mobile

• TX: 1240-1300 MHz • RX: 1240-1300 MHz
• Power: 10/1W • Memories: 105
• D-Star 128 kbps Data & 4.8 kbps Voice

IC-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

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David Sumner, K1ZZ
Chief Executive Officer

How can you support and protect our Amateur Radio frequencies?

Make a generous contribution to the ARRL Spectrum Defense Fund today—by mail, on the web at **www.arrl.org/arrl-donation-form** or by phone.

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For more information, contact

Mary Hobart, **K1MMH**
Chief Development Officer
ARRL
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Telephone: 860-594-0397
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TM-271A 2M FM Mobile

- TX: 144-148 MHz • RX: 136-174 MHz
- Power: 60/25W • Memories: 200

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- TX: 144-148, 430-450 MHz
- RX: 118-524, 800-1300 MHz (cell blkd)
- Power: 50/10/5W • Dual receive (V+V) (U+U)
- Cross-band repeat • EchoLink® ready

TM-D710A

Dualband FM Mobile w/TNC

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- RX: 118-524, 800-1300 MHz (cell blkd)
- Power: 50/10/5W • Dual receive (V+V) (U+U)
- Built-in TNC for APRS (needs GPS)
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Green Light Labs GPS-710

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AvMap G5 APRS GPS Navigator

- Bright non-glare 5 inch color touchscreen
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- Import extra POI's with no extra costs

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TH-K2AT 2M FM HT

- TX: 144-148 • RX: 136-174
- Power: 5/1.5/0.5W • Memories: 100

TH-F6A Triband FM HT

- TX: 144-148, 222-225, 438-450 MHz
- RX: 0.1-1300 MHz (cell blkd) • Dual band RX
- FM Wide/Narrow, AM, SSB and CW receive modes
- Power: 5/0.5/0.05W • Memories: 435

TS-480HX

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- TX: HF/6M • RX: 0.5-60 MHz
- Power: 10-200W (with two optional 22A PS's)
- Memories: 99
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TS-480SAT

100W version with built-in auto antenna tuner.

TS-2000 100W HF/VHF/UHF Transceiver

- TX: HF/6M/2M/440 MHz • RX: 0.03-60, 142-152, 420-450 MHz • Power: 10-100W (10-50W on 440 MHz)
- Memories: 99 • HF/6M Auto Antenna Tuner
- IF/stage DSP on main band, AF/stage DSP on sub-band

TS-B2000

Same as the TS-2000 with & no front panel controls. Includes PC control software.

TS-2000X

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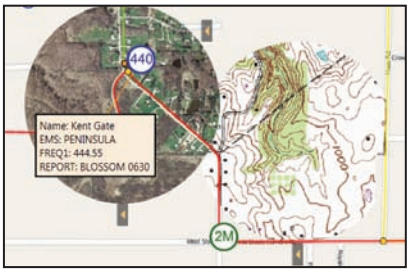
Cuyahoga Falls, OH - Summit County ARES has supported the American Diabetes Association's "Tour de Cure" bike ride for several years. With nearly 500 riders on five courses simultaneously, the event is a logistical challenge for the 45 ARES volunteers who run communications.

"Depiction provided teriffic situational awareness."
Dennis Conklin, AI8P

Responsible for overall situational awareness for the event, this year Assistant Emergency Coordinator Dennis Conklin, AI8P, used *Depiction* mapping software for planning and operations.

Conklin used *Depiction* to quickly combine spreadsheets of stations, rest stops and shelters with street maps, topo maps and aerial imagery. He took his "depiction" into the field where it enabled him to keep track of events as they happened—visually, and without Internet access.



"In past years, I never felt I had the level of situational awareness I desired. This year, with everything mapped in *Depiction*, I was much more aware of exactly what was going on and what the implications were," said Conklin. "*Depiction* provided terrific situational awareness."

Learn more at www.depiction.com/qst

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FT-270R

FT-250R 2M FM HT

- TX: 144-148 • RX: 140-174
- Power: 5/2/0.5W • Memories: 209
- Increased audio output & added "Memory Only" mode

FT-270R 2M FM HT

- 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

FT-60R

VX-8GR

FT-60R 2M/440 FM HT

- TX: 144-148, 430-450 MHz • RX: 108-520, 700-999 (cell blkd) • Power: 5/2/0.5W • Memories: 1000

VX-8GR

2M/440 FM HT w/Built-in GPS

- TX: 144-148, 430-450 MHz
- RX: 108-999 MHz (cell blocked) • Memories: 1200+
- Power: 5/2.5/1/0.05W • Water spray resistant
- GPS unit and antenna is built-in
- Same APRS features as the VX-8DR including the new APRS features such as Smart Beaconing, new DIGI-PATH functions, Station List and APRS Message memories increased & heads up compass display to the LCD screen

FT-1900R 2M FM Mobile

- TX: 144-148 • RX: 136-174
- Power: 55/25/10/5W • Memories: 221
- Added "Memory Only" mode

Comes with a standard DTMF hand mic.

FTM-350R 2M/440 FM Mobile

- TX: 144-148, 430-450 at 50/20/5W and 222-225 at 1W
- RX: 0.5-1.8, 76-250 & 300-1000 MHz (cell blocked)
- Memories: 500 + 500 • Optional Bluetooth® kit allows hands free operation • Optional internal GPS unit FGPS-1 or external FGPS-2 & CT-136 adds GPS and APRS® features

FT-857D FT-897D

FT-857D 100W HF/VHF/UHF Mobile

- TX: HF/VHF/UHF • RX: 0.1-56, 76-108, 118-164, 420-470 MHz • Power: 5-100W (HF/6M), 5-50W (2M), 5-20W (440 MHz) • Memories: 200 • YSK-857 included!

FT-897D 100W HF/VHF/UHF Portable

- Similar to the FT-857D but can also operate using optional FNB-78 13.2V @ 4.5 Ah NiMH battery packs

FT-950 100W HF/6M Transceiver

- TX: HF/6M • RX: 0.03-56 MHz • Power: 10-100W
- Memories: 100 • Auto Antenna Tuner
- 32-bit Floating Point DSP • Built-in high stability TCXO
- Optional DMU-2000 Data Management Unit displays various operational conditions
- Optional MTU tune units for 160M, 80/40M and 30/20M bands allowing you to pull through weak signals

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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

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FTDX-5000MP *With Station Monitor, ±0.05ppm OCXO & 300 Hz Roofing Filter*

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CT17 Level Converter 142.95
FL52A 500Hz CW filter 204.95
MB23 Carrying Handle 16.95
UT102 Voice Synthesizer 67.95

IC2820H

Wideband receiver with simultaneous receive capability, Diversity receive capability, 50W on VHF and UHF, Separate controller from main unit, 522 memory channels, Band scope function, Optional D-Star operation.

CS2820 Programming Software 38.95
MB65 Mounting Base 35.95
OPC478UC USB Cloning Cable 52.95
OPC589 8 pin modular adapter 36.95
OPC1663 Separation Cable 11.2ft 15.95
UT123 Digital/GPS Unit 289.95

IC7000

IF DSP, AGC Loop Management, Digital IF filter, 2 point manual notch filter, Digital noise reduction, Digital noise blanker, 35W output on 70cm band, High stability crystal unit, Direct digital synthesizer circuit, Compact, all in one package, User friendly key allocation, Digital voice recorder, Built-in RTTY demodulator, 2.5 inch color TFT display.

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CT17 Level Converter 142.95
OPC589 Modular 8 pin mic adapter 36.95
RMK7000 Remote Kit 74.95
SM20 Desk Mic 209.95

IC92AD

Rugged submersible protection, Optional GPS speaker microphone, Wideband receiver with dualwatch capability, 5 watt output, Simple bandscope, Built in voice recorder, Large dot matix display, One touch reply button, Keypad navigation, Optional PC remote control capability.

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BP256 7.4V @ 1620mAh Li-Ion 86.95
BP257 AA Battery Case 35.95
HM175GPS Wtrprf spkr mc w/GPS 229.95
HM75A Speaker Mic w/Remote 63.95
HS85 Headset w/VOX, PTT 93.95
LC168 Carrying Case 27.95
RS92 Remote control software 82.95

ICT70A

Rugged 2m/70cm HT, 700mW loud audio, Long Lasting Battery Life, External DC Power Jack, 302 Memory Channels, CTCSS Built-in, Internal VOX function, PC Programmable with Optional CST70.

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CST70 Programming Software 37.95
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KENWOOD

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The TS-2000 offers 100 watts on HF, 6 meters and 2 meters, 50 watts on 70cm, and when you install the optional UT-20 1.2 GHz module at 10 watts, you will have assembled the most complete dual receiver multi-mode transceiver ever produced.

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MB430M2 Mobile Bracket 49.95
MC60A Deluxe Dynamic Desk Mic 149.95
MC90 DSP Compatible Desk Mic 249.95
RC2000 Mobile Controller 349.95
VS3 Voice Synthesizer 38.95

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PB42L 7.4V 1550mAh Li-Ion battery 79.95
PG3J Cigarette Lighter Cable 36.95
PG4P PC Programming Cable 29.95
SC51 Nylon Carrying Case 15.95

TM271A

This compact, MIL-STD-compliant transceiver deliver powerful mobile performance and such advanced features as multiple scan functions and memory names, as well as NOAA Weather Band.

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PG5D Programming Interface Cable 76.95
PG5H PC Interface Cable Kit (Echolink) 57.95
SP50B External Mobile Speaker 54.95

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The control head is detached and comes with remote cable for easy installation. The TM-VD710A is a true dual-band operation radio so VHF+VHF/VHF+UHF/UHF+UHF operation is possible.

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PG5G Programming Interface Cable 36.95
PG5H PC Interface Cable Kit (Echolink) 57.95
VGS1 Voice Guide 65.95

TMV71A

The TM-V71A is a true dual-band operation radio so VHF+VHF/VHF+UHF/UHF+UHF operation is possible. The detachable control head is easily connected with the optional remote cable.

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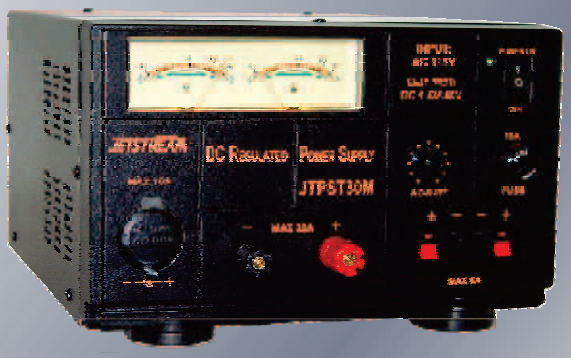

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Jetstream JTPST30M Linear Power Supply. 30 amp surge, 25 amp continuous, variable from 1.5-15 VDC, over voltage protection, over current protection, current and volt meter, lighter jack on front, quick connectors on front. 11" x 9.25" x 6".

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FBA39	Alkaline Battery Tray	26.95
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FNB102LI	7.4V 1800mAh LI-Ion	69.95
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The FT-60R includes wide receiver coverage, outstanding audio quality, the most CTCSS/DCS flexibility in the industry, and a new Emergency Automatic Identification (EAI) feature for search-and-rescue work.

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EDC6	DC Cable	7.95
FBA25A	AA Battery Case	21.95
FNB83	7.2V 1400mAh Ni-MH	39.95
MH34B4B	Speaker Mic	33.95
VAC370B	Rapid Charger	62.95

VX3R

The new ultra-compact VX-3R 2m/70cm FM HT Transceiver is loaded with convenience features. In addition to top quality performance on the 2m and 70cm, you will also be able to enjoy stereo FM and AM broadcast band.

ADMSVX3	Software/Cable	39.95
CSC92	Soft Case	14.95
EDC21	DC Cable w/Noise Filter	36.95
FBA37	AA Battery Case	17.95
FNB82LI	7.2V 1400mAh Ni-MH	34.95
MH34B4B	Speaker Mic	33.95

FT8800R

If you're ready for the best in a Dual-Band FM Mobile Transceiver, the FT-8800R is ready for you! With easy operation, outstanding receiver performance, and cross-band repeat capability, the FT-8800R is the new standard of comparison!!

ADMS2I	Software and cable	39.95
JTPS14M	Jetstream Power Supply	49.95
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YSK8900	Separation Kit	41.95

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MLS100	External Speaker	46.95
MMB60	Quick Release Mobile Bracket	29.95
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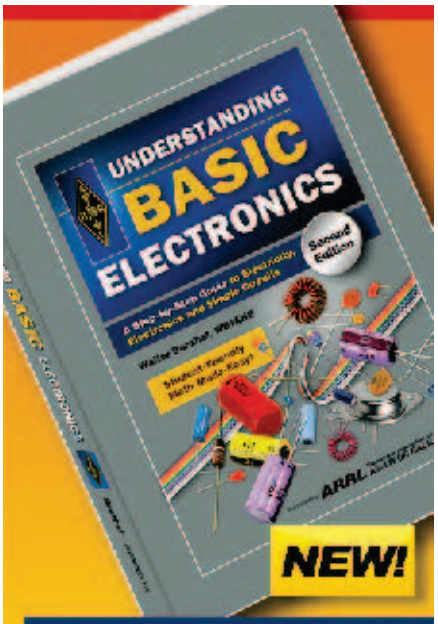

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Shown above withSM5000 Station Monitor (optional on some versions).

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HF,6M, 100W/200W

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

NEW!

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2M/440 50W
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144/440MHz 50/40W

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FT-8900R
10M/6M/2M/440MHz

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FREE YSK-8900 with Purchase

FT-1900R
144-148MHz

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2 meter transceiver

FREE YSK-7800 with Purchase

FT-7900R
Dual bander

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No compromise RX performance

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IC-7600
USB, LSB, CW, RTTY, PSK31, AM, FM

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IC-7800
HF/6m @ 200 Watts, HF/50 MHz All Band

IC-7200
HF/6 100W

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2010 ARRL Photo Contest:

Thanks to All Who Entered!

This year set another record, as we received 88 entries in the ARRL Photo Contest. We appreciate each and every one of you who sent in a photo. Although any of the submitted photos may be used in *QST*, in the *ARRL Amateur Radio Calendar* or in other ARRL publications, we are presenting the top vote-getters here. We hope you enjoy this expanded coverage of the 2010 ARRL Photo Contest.

Hearty congratulations to the **overall winner**, as selected by the *QST* editorial and production staff — Hal Kennedy, N4GG.

Two outstanding photos tied for **Second Place**. The Field Day photo was taken by Mark Hogden, WU7F, while the ethereal shot was taken by Steven Herr, NJ6K.

There was another tie for **Third Place**. Ginger Duffey took the photo of KK6MC outlined against the sunset, and Tom Taormina, K5RC, sent us the photo of the remarkable cloud backdrop to his quarter-wave vertical.

In **Fourth Place** was Chris Brady, N3CB, who shot his photo at his club's Field Day site in Fort Washington, Pennsylvania.

Congratulations to the winners of this year's ARRL Photo Contest. The announcement for the 2011 Contest will appear in a spring 2011 issue of *QST*.

Overall Winner!

HAL KENNEDY, N4GG

Blue Lightning

Hal Kennedy, N4GG, of Woodstock, Georgia, writes: "This is a synchronous rotary gap of 'Blue Lightning,' an authentic 1910 spark gap transmitter. The rig was built in 2008-2010 in memory of my dad, 2NJ."

Second Place Tie!

MARK HOGDEN, WU7F

Is This Fun or What

During a recent Field Day, Mike Hogden, KD7UUB, is making a QRP CW contact in a place the photographer, Mark Hogden, WU7F, describes as "absolutely breathtaking." Who are we to argue? "The site location is in the Uinta Mountain range in northeastern Utah at an elevation of about 10,000 feet," he writes.

Second Place Tie!

STEVEN HERR, NJ6K

Ooooh

Steven Herr, NJ6K, of Lakeside, California, shot this one in spring 2009 on top of Otay Mountain near San Diego.

Continued on page 126

Third Place Tie!

VIRGINIA DUFFEY

Fortuitous Location

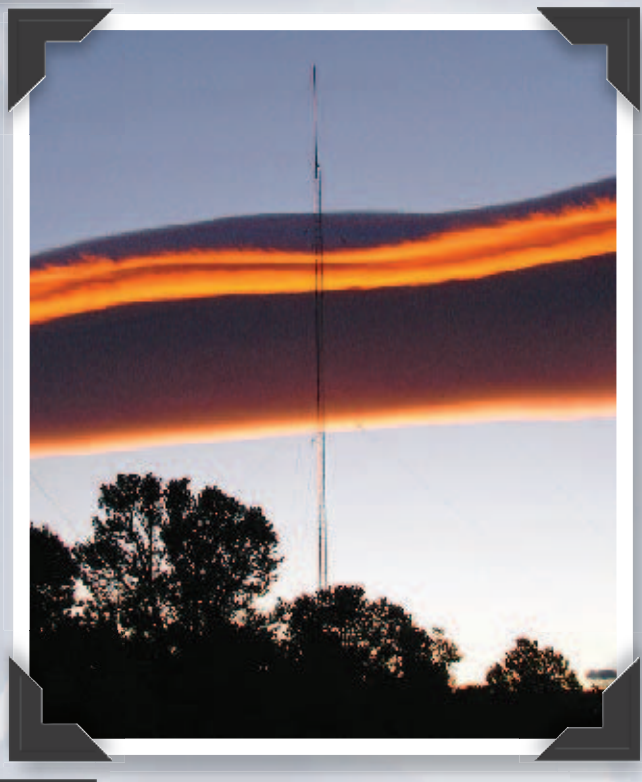
Silhouetted against the sunset, Jim Duffey, KK6MC, of Cedar Crest, New Mexico, makes a sunset repair to his rover antennas after an unfortunate accident with a low-hanging tree during the January ARRL VHF SS. QTH? Alongside the Home Depot parking lot in South Tucson, Arizona.

Third Place Tie!

TOM TAORMINA, K5RC

Rare Wave Cloud

Tom Taormina, K5RC, of Virginia City, Nevada, shot this winning entry. He describes it this way: "We live on the eastern edge of the Sierra Nevadas, an area known for spectacular lenticular cloud formations, but these single-ribbon wave clouds are very rare. These clouds are also called Lee Waves, which are actually caused by thermal 'standing waves' over a mountain crest."



Fourth Place!

CHRIS BRADY, N3CB

Atmosphere

Dick Moll, W3RM, operates 40 meter CW at the Phil-Mont Mobile Radio Club's Field Day site in Fort Washington, Pennsylvania. John DiRenzo, KB3SJV, is logging. Chris Brady, N3CB, of Plymouth Meeting, Pennsylvania, took the photo.

KENWOOD

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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.

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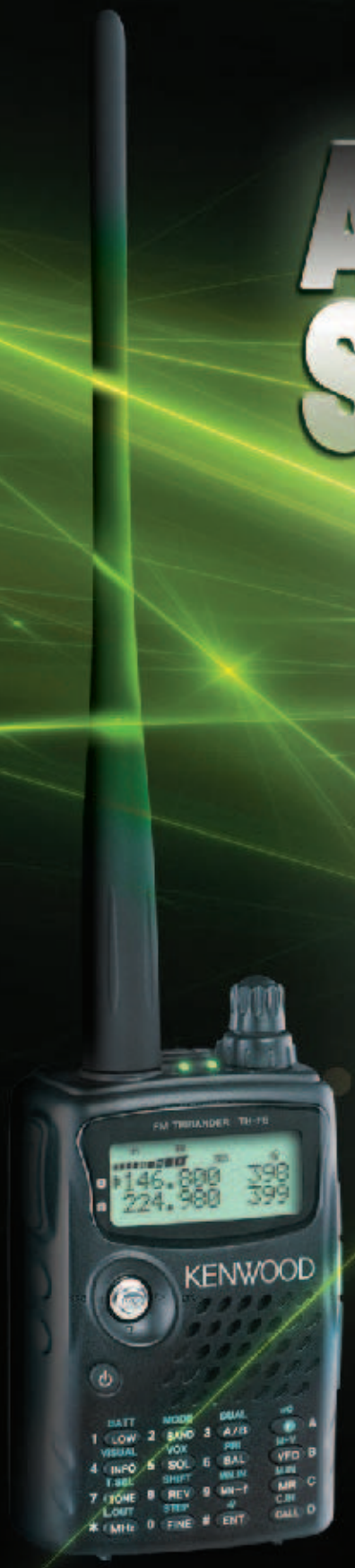
- Bar antenna for receiving AM broadcasts
- Special weather channel RX mode
- 435 memory channels, multiple scan functions
- 7.4V 2000mAh lithium-ion battery (std.) for high output[2] and extended operation
- 16-key pad plus multi-scroll key for easy operation
- Built-in charging circuitry for battery 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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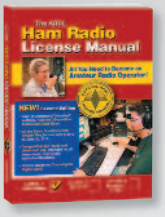

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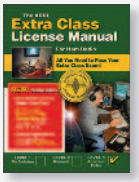

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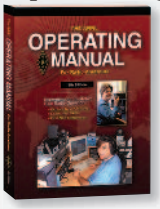

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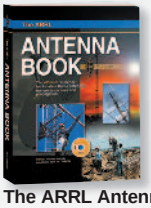

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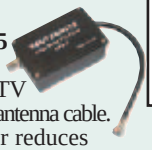

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B-2518-G	5	7	40	60	80	100	125	160	160	160
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Watts In	.25	.5	3	5	8	10	15	25	35	50

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D-3010-N, $389 -- 100 W out/30W in. For 5-45 Watt *mobile/base.* **D-1010-N, $419**, 100W out/10W in. *Dual purpose* -- for handhelds or mobile/ base. **D-26-N, $299**, 60W out/2W in, for *handhelds.*

Low Noise GaAsFET preamps

High gain ultra low noise *GaAsFET* preamps for receiving weak signals. Selectable 15-22 dB gain prevents intermod. < 0.8 dB noise figure, auto RF switching to 160W.

In-shack or Mast-Mount models.

Frequency, MHz	*In Shack, $149.95*	*Mast Mount, $199.95*
28-30	KP-1/10M	KP-2/10M
50-54	KP-1/6M	KP-2/6M
144-148	KP-1/2M	KP-2/2M
220-225	KP-1/220	KP-2/220
430-450	KP-1/440	KP-2/440

Accurate SWR/Wattmeters

Read SWR directly and Forward/ Reflected, Peak/Average power. Remote coupler. 1.8-30, 50-200, 420-450, 1260-1300 MHz band models.

Amateur TV Amps

Industry standard ATV amps: **D-1010-ATVN, $439**, 82 W PEP out/10W in. **D-100-ATVN, $449**, 82W PEP out/2W in. (without sync compression).

1¼ Meter Amps (223-225 MHz)

10 models -- 20-220 Watts out for 2-50W in, $169-$739.

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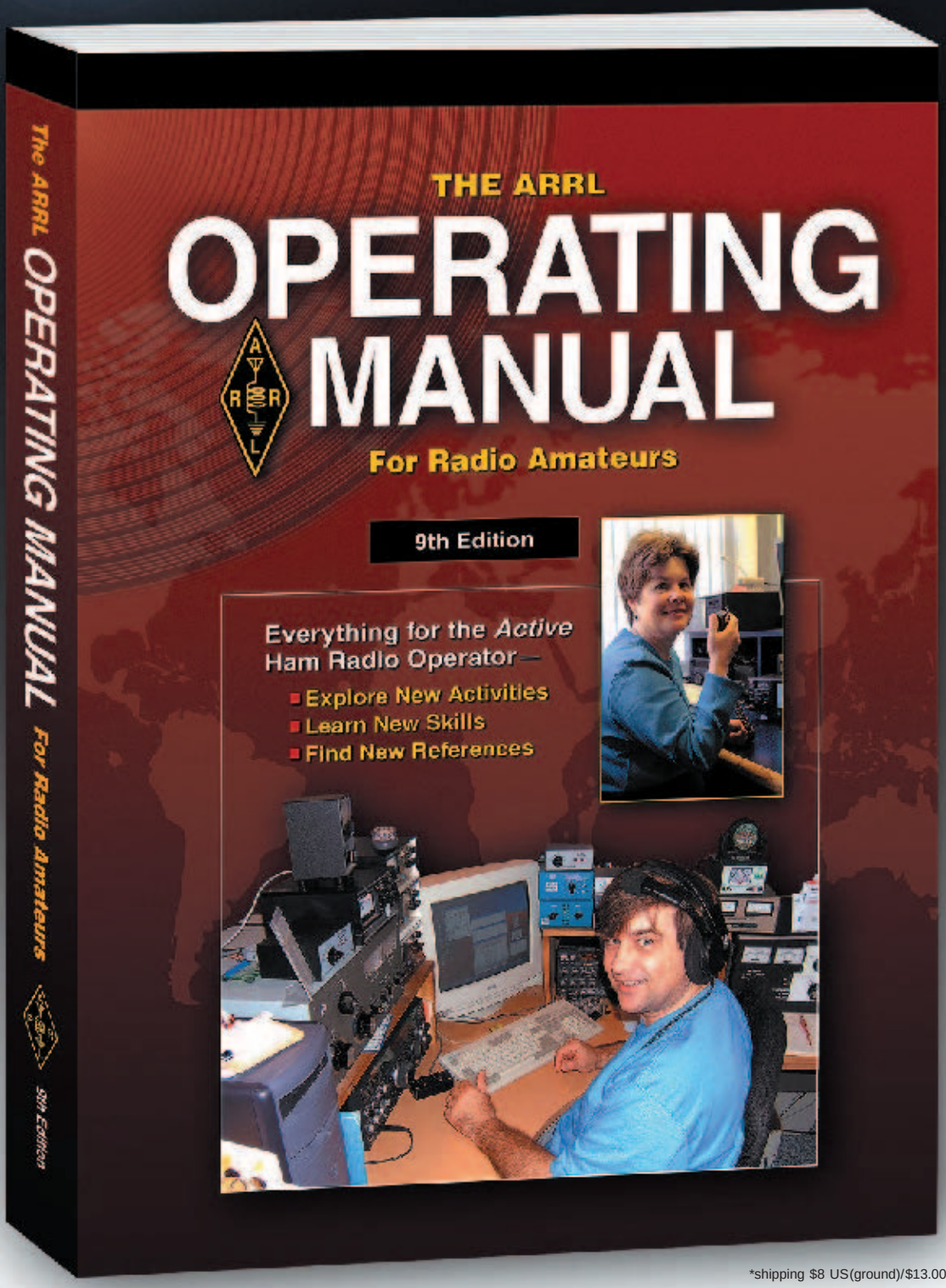

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QST 8/2008

MFJ-259B *1.8-170 MHz* SWR Analyzer

World's most popular SWR analyzer is super easy-to-use

Reads SWR . . . Complex RF Impedance: Resistance(R) and Reactance(X) or Magnitude(Z) and Phase(degrees) . . . Coax cable loss(dB) . . . Coax cable length and Distance to fault . . . Return Loss . . . Reflection Coefficient . . . Inductance . . . Capacitance . . . Battery Voltage. LCD digital readout . . . frequency counter . . . side-by-side meters . . . Battery charger . . . battery saver . . . low battery warning . . . smooth reduction drive tuning . . .

World's most popular SWR analyzer! The famous MFJ-259B gives you a complete picture of your antenna's performance. You can read your antenna's SWR and Complex Impedance from 1.8 to 170 MHz.

You can read Complex Impedance as series resistance and reactance (R+jX) or as magnitude (Z) and phase (degrees).

You can determine velocity factor, coax cable loss in dB, length of coax and distance to a short or open.

You can read SWR, return loss and reflection coefficient at any frequency simultaneously.

You can read inductance in uH and capacitance in pF at RF frequencies.

Large easy-to-read two line LCD screen and side-by-side meters clearly display your information.

It has built-in frequency counter, Ni-MH/Ni-CD charger circuit, battery saver, low battery warning and smooth reduction drive tuning.

Super easy to use! Just set the bandswitch and tune the dial -- just like your transceiver. SWR and Complex Impedance are displayed instantly!

Call your favorite dealer for your best price!

MFJ-259B $289.95

Here's what you can do

Find your antenna's true resonant frequency. Trim dipoles and verticals.

Adjust your Yagi, quad, loop and other antennas, change antenna spacing and height and watch SWR, resistance and reactance change instantly. You'll know exactly what to do by simply watching the display.

Perfectly tune critical HF mobile antennas in seconds for super DX -- without subjecting your transceiver to high SWR.

Measure your antenna's 2:1 SWR bandwidth on one band, or analyze multiband performance from HF to VHF -- 1.8-170 MHz!

Check SWR outside the ham bands without violating FCC rules.

Take the guesswork out of building and adjusting matching networks and baluns.

Accurately measure distance to a short or open in a failed coax. Measure length of a roll of coax, coax loss, velocity factor and impedance.

Measure inductance and capacitance. Troubleshoot and measure resonant frequency and Q of traps, stubs, transmission lines, RF chokes, tuned circuits and baluns.

Adjust your antenna tuner for a perfect 1:1 match without creating QRM.

And this is only the beginning! The MFJ-259B is a complete ham radio test station including -- frequency counter, RF signal generator, *SWR Analyzer*™, RF Resistance and Reactance Analyzer, Coax Analyzer, Capacitance and Inductance Meter and more!

Free Manual: call, write or download

MFJ's comprehensive instruction manual is packed with useful applications -- all explained in simple language you can understand.

Take it anywhere

Fully portable, take it anywhere -- remote sites, up towers, on DX-peditions. It uses 10 AA or Ni-Cad batteries (not included) or 110 VAC with MFJ-1312D, $15.95. Its rugged all metal cabinet is a compact 4x2x6¾ in.

How good is the MFJ-259B?

MFJ *SWR Analyzers*™ work so good, many antenna manufacturers use them in their lab and on the production line -- saving thousands of dollars in instrumentation costs! Used worldwide by professionals everywhere.

More MFJ SWR Analyzers™

MFJ-249B, $269.95. Like MFJ-259B, but reads SWR, true impedance magnitude and frequency only on LCD. No meters.

MFJ-209, $159.95. Like MFJ-249B but SWR meter only. No LCD/frequency counter.

MFJ-219B, $119.95. UHF *SWR Analyzer* covers 420-450 MHz. External frequency counter jack. 7½x2½x2¼ in. *Free* "N" to SO-239 adapter.

SWR Analyzer Accessories

Dip Meter Adapter

MFJ-66, $24.95. Plug a dip meter coupling coil into your MFJ *SWR Analyzer*™ and turn it into a sensitive and accurate bandswitched dip meter. Takes guesswork out of winding coils and determining resonant frequency of tuned circuits and Q of coils. Set of two coils cover 1.8-170 MHz depending on your *SWR Analyzer*.

Genuine MFJ Carrying Case

MFJ-29C, $24.95. Tote your MFJ-259B anywhere with this MFJ custom carrying case. Has back pocket with security cover for carrying dip coils, adaptors and accessories. Made of special foam-filled fabric -- 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 so you can use your MFJ *SWR Analyzer*™ without taking it out of your case.

MFJ-99, $60.85. Accessory Package for MFJ-259/B/249/B/209. Includes MFJ-29C carrying case, MFJ-66 dip meter adapter, MFJ-1312D 110VAC adapter. ***Save $5!***

Tunable Measurement Filter

MFJ-731, $99.95. *Exclusive* MFJ tunable RF filter allows accurate SWR and impedance measurements 1.8-30 MHz in presence of strong RF fields. Virtually no effect on measurements. Works with *all* SWR Analyzers.

MFJ *No Matter What*™ warranty

MFJ will repair or replace (at our option) your MFJ *SWR Analyzer*™ for one full year.

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1.8-170 MHz *plus* 415-470 MHz SWR Analyzer

All-in-one handheld antenna test lab lets you quickly check/tune HF, VHF, ***UHF*** antennas anywhere. Measures: SWR, Return Loss, Reflection Coefficient, R, X, Z, Phase Angle, Coax cable loss, Coax cable length, Distance to short/open in coax, Inductance, Capacitance, Resonant Frequency, Bandwidth, Q, Velocity Factor, Attenuation, more!

MFJ-269 $389.95

• 1 Year *No Matter What*™ warranty • 30 day money back guarantee (less s/h) on orders direct from MFJ

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More hams use MFJ SWR Analyzers™ than any others in the world!

MFJ 160-6 Meter Antenna

Self-supporting 43 foot vertical -- no guy wires required . . . 1500 Watts . . . exceptional performance . . . low-profile . . . includes base mount and legal limit balun . . . assembles in an hour . . .

MFJ-2990
$359.95

New!

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

Exceptional Performance

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

With an automatic antenna tuner there's no fuss -- just talk!

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

An optimized balun design allows *direct coax feed* with negligible coax loss (typically less than ½ dB 60-6 Meters and less than 1 dB 160-80 M with good quality, low-loss coax).

Fully self-supporting, Extremely low wind loading, Very low visibility . . .

With just 2 square feet wind load, the fully self-supporting MFJ-2990 -- *no guy wires needed* -- has the lowest wind-loading and lowest visibility of any vertical antenna! The key is a six foot section of tapering diameter *stainless steel* whip that flexes in strong wind instead of stressing the bottom sections. Its 2-inch O.D. and .120 inch thick walled tubing bottom section makes it incredibly strong -- it'll stay up!

Weighs just 20 pounds -- you can easily put it up by yourself because its corrosion resistant *6063 aircraft aluminum* tubing and stainless steel construction make it light *and* super-strong.

Assembles in an hour

You can easily assemble it in an hour! Ground mounting lets you completely hide its antenna base in shrubbery. Includes ATB-65 high-strength antenna mount. Requires ground system -- at least one radial. More extensive ground system will give much better performance.

Great for Stealth Operation in antenna restricted areas

This very low-profile antenna is perfect for stealth operation in antenna restricted areas. Hide it behind trees, fences, buildings, bushes. Use it as a flagpole. Telescope it down during the day. Put it up at night and take it down in the morning before the neighbors even notice!

Quick and easy installation makes it great for DXpeditions, field day and other portable and temporary operations.

MFJ *Automatic* Tuners

MFJ-998
$699.95

For legal limit 1500 Watt SSB/CW amplifiers. Auto-ranging LCD and Cross-Needle SWR/Wattmeter, antenna switch, amp bypass, matches 12-1600 Ohms, 1.8-30 MHz.

MFJ-993B
$259.95

Dual power range -- 300 Watt range matches 6-1600 Ohms. 150 Watt/6-3200 Ohms. Auto-ranging LCD and Cross-Needle SWR/Wattmeter, antenna switch, 1.8-30 MHz.

MFJ *Manual* Tuners

MFJ-989D
$389.95

1500 Watts SSB/CW, 1.8-30 MHz. Active peak-reading Cross-Needle SWR/Wattmeter, balun, dummy load, antenna switch, aircore roller inductor.

MFJ-949E
$179.95

World's most popular tuner! 300 Watts, 1.8-30 MHz. Peak/Average Cross-Needle SWR/Wattmeter, 8 pos. antenna switch, dummy load, 1kV capacitors.

Window Feedthru

MFJ-4602
$69.95

Bring 3 coaxes, balanced line, random wire, ground thru window. Connectors mounted on *stainless steel* panel. ¾" thick *pressure-treated* weather-proof wood.

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MFJ 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*® coax and *Teflon*® coax connector. Handles full 1.5kW 1.8-30 MHz. Stainless steel hardware with *direct* 14 gauge stranded copper wire connection to antenna. 5x2 inches. Heavy duty weather housing.

RF Isolator

MFJ-915
$29.95

MFJ-915 *RF Isolator* prevents unwanted RF from traveling on the outside of your coax shield into your transceiver. This unwanted stray RF can cause painful RF "bites" when you touch your microphone or volume control, cause your display or settings to go crazy, lock up your transceiver or turn off your power supply. In mobile installations, stray RF could cause your car to do funny things even blow your car computer. Clear up these problems, plug an MFJ-915 between your antenna and transceiver. 5x2 in. Handles full 1500 Watts. Covers 1.8-30 MHz.

MFJ-919, $59.95. 4:1 current balun,1.5 kW.
MFJ-913, $29.95. 4:1 balun, 300 Watts.

Antenna Switches

MFJ-1704
$79.95
4-Positions

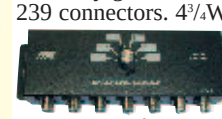
MFJ-1704 heavy duty *antenna switch* lets you select 4 antennas or ground them for static and lightning protection. Unused antennas automatically grounded. Replaceable lightning surge protection. Good to 500 MHz. 60 dB isolation at 30 MHz. 2.5 kW PEP. Less than .2 dB insertion loss, SWR below 1.2:1. SO-239 connectors. Handy mounting holes. 6¼Wx4¼Hx1¼D in.

MFJ-1702C
$39.95
2-Positions

MFJ-1702C Like MFJ-1704, but for 2 antennas. 3Wx2Hx2D"

MFJ-1700C
$99.95

MFJ-1700C *Antenna/ Transceiver Switch* lets you select one of six antennas and one of six transceivers in any combination. Plug in an antenna tuner or SWR wattmeter and it's always in-line for any antenna/transceiver combination. Has lightning surge protection. Handles 2 kW PEP SSB, 1 kW CW, 50-75 Ohm loads. Unused terminals are automatically grounded. 1.8 to 30 MHz. SO-239 connectors. 4¾W6½Hx3D inches.



MFJ-1701
$69.95

MFJ-1701 *Antenna Switch* like MFJ-1700C but lets you select one of six antennas only. 10Wx3Hx1½D inches.

33 ft. Telescoping fiberglass Mast

3.8 feet collapsed, 3.3 lbs.

MFJ-1910
$79.95

Super strong fiberglass mast has huge 1¾ inch bottom section. Flexes to resist breaking. Resists UV. Put up *full size* inverted Vee dipole/vertical antenna in minutes and get *full size performance!*

Make your own antennas

Dipoles, G5RV, Random Wire, Doublets, Beverage Antennas, etc.

MFJ-16C06, $4.56. 6-pack authentic *glazed ceramic* end/center antenna insulators.
MFJ-16B01, $19.95. Custom injection-molded UV-resistant center insulator has built-in coax connector and hanging hole.
MFJ-18G100, $24.95. 100 ft. of flexible, 7-strand, 14-gauge solid copper antenna wire.
MFJ-58100X, $49.95. 100 ft. 50-Ohm RG-8X with PL-259s on each end.
MFJ-18H100, $34.95. 100 feet, 450 Ohm ladder line, 18 gauge copper covered steel.

Lightning Surge Protectors

Ultra-fast gas discharge tube shunts 5000 amps peak. Less than 0.1 dB loss. Up to 1000 MHz. SO-239s. **MFJ-270, $29.95.** 400W PEP. **MFJ-272, $39.95.** 1500W PEP.

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http://www.mfjenterprises.com for instruction manuals, catalog, info

10 Bands -- 1 MFJ Antenna!

Full size performance . . . No ground system or radials. Operate 10 bands: 75/80, 40, 30, 20, 17, 15, 12, 10, 6 and 2 Meters with one antenna . . . Separate full size radiators . . . End loading . . . Elevated top feed . . . Low Radiation Angle . . . Very wide bandwidth . . . Highest performance no ground vertical ever . . .

MFJ-1798
$299.95

Operate 10 bands -- 75/80, 40, 30, 20, 17, 15, 12, 10, 6 and 2 Meters with this MFJ-1798 vertical antenna and get *full size performance* with no ground or radials!

Full size performance is achieved using separate full size radiators for 2-20 Meters and highly efficient end loading for 30, 40, 75/80 Meters.

Get very low radiation angle for exciting DX, automatic bandswitching, omni-directional coverage, low SWR. Handles 1500 Watts PEP SSB.

MFJ's unique *Elevated Top Feed*™ elevates the feedpoint *all the way to the top* of the antenna. It puts the maximum radiation point high up in the clear where it does the most good -- your signal gets out even if you're ground mounted.

It's easy to tune because adjusting one band has minimum effect on the resonant frequencies of other bands.

Self-supporting and just 20 feet tall, the MFJ-1798 mounts easily from ground level to tower top -- small lots, backyards, apartments, condos, roofs, tower mounts.

Separate *full size* quarter wave radiators are used on 20, 17, 15, 12, 10 and 2 Meters. On 6 Meters, the 17 Meter radiator becomes a 3/4 wave radiator.

The active radiator works as a stub to decouple everything beyond it. In *phase* antenna current flows in all parallel radiators. This forms a very large equivalent radiator and gives you incredible bandwidths. Radiator stubs provide automatic bandswitching -- absolutely *no loss* due to loading coils or traps.

On 30, 40, 75/80 Meters, end loading -- the most efficient form of loading -- gives you highly efficient performance, excellent bandwidth, low angle radiation and automatic bandswitching.

MFJ's unique *Frequency Adaptive L-Network*™ provides automatic impedance matching for lowest SWR on these low bands. Tuning to your favorite part of these bands is simple and is done at the *bottom* of the antenna.

You don't need a ground or radials because an effective counterpoise that's 12 feet across gives you *excellent* ground isolation. You can mount it from ground level to roof top and get awesome performance.

The feedline is decoupled and isolated from the antenna with MFJ's exclusive *AirCore*™ high power current balun. It's wound with *Teflon*® coax and can't saturate, no matter how high your power.

Incredibly strong solid fiberglass rod and large diameter 6061 T-6 aircraft strength aluminum tubing is in the main structure.

Efficient high-Q coils are wound on tough *low loss* fiberglass forms using highly weather resistant *Teflon*® covered wire.

MFJ *6-Band* Halfwave Vertical Antenna

6 bands: 40, 20, 15, 10, 6, 2 Meters . . . No radials or ground needed

MFJ-1796
$229.95

MFJ-1796 is only 12 feet high and has a tiny 24 inch footprint! Mount anywhere -- ground level to tower top -- apartments, small lots, trailers. Perfect for field day, DXpeditions, camping.

Efficient end-loading, no lossy traps. Entire length always radiating. Full size halfwave on 2/6 Meters. High power *air-wound* choke balun eliminates feedline radiation. Adjusting one band has minimum effect on other bands.

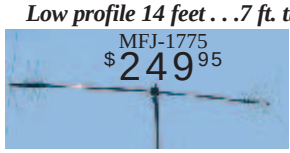
MFJ-1796W, $229.95. WARC band version for 12, 17, 30, 60 Meters only.

MFJ-1792, $189.95. Full size 1/4 wave radiator for 40 Meters. 33 ft., handles 1500 Watts PEP. Requires guying and radials.

MFJ-1793, $209.95. Like MFJ-1792 but has full size 20 Meter 1/4 wave also.

6-Band, 40-2 Meters ***Rotatable*** Mini-Dipole

Low profile 14 feet . . .7 ft. turning radius . . . 40, 20, 15, 10, 6, 2 Meters . . . 1500 Watts . . .



MFJ-1775
$249.95

MFJ-1775 is inconspicuous and low profile -- not much bigger than a TV antenna and is easily turned by a lightweight rotator like Hy-Gain's *AR-35*.

It's no Wimp! Its *directivity* reduces QRM/noise and lets you *focus* your signal in the direction you want -- work some *real* DX.

You can operate 6 bands -- 40, 20, 15, 10, 6 and 2 meters -- and run *full 1500 Watts* SSB/CW on all HF bands!

Features automatic band switching and uses highly efficient end-loading with its *entire length* always radiating. With 6 and 2 Meters thrown-in, you have ham radio's most versatile *rotatable* dipole!

Each HF band uses a separate, efficient end-loading coil wound on fiberglass forms with *Teflon*™ wire, and capacitance hats at each end (no lossy traps). 6 and 2 meters are *full-length* halfwave dipoles.

Built-to-last -- incredibly strong solid rod fiberglass center insulator and 6063 T-6 aircraft strength aluminum tubing radiator. Assembles in an afternoon. Adjusting one band has little effect on other bands.

MFJ-1775W, $249.95. WARC band version for 12, 17, 30, 60 Meters only.

MFJ *80/40/20* Meter ***Rotatable*** Dipole

MFJ-1785
$369.95

Now you can operate the *low bands* on 80, 40, and 20 Meters with a true rotatable dipole that'll blend in with the sky! Take advantage of excellent low band propagation during this low sunspot cycle. Handles 1500 Watts SSB/CW. 80/40 meter end-loading coils are wound on fiberglass forms with *Teflon*™ wire, and resonated with capacitance hats to ensure extremely low-losses. Full-size on 20 Meters gives incredible DX. Balun included! 33 foot low-profile, inconspicuous. Easily rotatable with a medium duty rotator like Hy-gain's AR-40.

MFJ's Super High-Q Loop™ Antennas

MFJ-1786
$419.95

MFJ's *tiny* 36 inch diameter loop antenna lets you operate 10 through 30 MHz *continuously* -- including the WARC bands!

Ideal for limited space -- apartments, small lots, motor homes, attics, or mobile homes. Enjoy DX and local contacts mounted vertically. Get both low angle radiation for excellent DX and high angle radiation for local, close-in contacts. Handles 150 watts.

Super easy-to-use! Only MFJ's super remote control has *Auto Band Selection*™. It auto tunes to desired band, then beeps to let you know. No control cable is needed.

Fast/slow tune buttons and built-in two range Cross-Needle SWR/Wattmeter lets you quickly tune to your exact frequency.

All welded construction, welded butterfly capacitor with no rotating contacts, large 1.050 inch diameter round radiator -- *gives you highest possible efficiency*.

Each plate in MFJ's tuning capacitor is welded for low loss and polished to prevent high voltage arcing, welded to the radiator, has nylon bearing, anti-backlash mechanism, limit switches, continuous no-step DC motor -- gives smooth precision tuning. Heavy duty thick ABS plastic housing has ultraviolet inhibitor protection.

Cover 40-15 Meters. MFJ-1788, $469.95. Like MFJ-1786 but covers 40 - 15 Meters continuous. Includes remote control.

MFJ's G5RV Antenna

MFJ-1778
$44.95

Covers all bands, 160-10 Meters with antenna tuner. 102 ft. long. Can use as inverted vee or sloper. Use on 160 M as Marconi.1500 Watts. Super-strong fiberglass center/feedpoint insulators. *Glazed ceramic* end insulators. All hand-soldered connections. Add coax, some rope and you're *on the air!*

MFJ-1778M, $39.95. G5RV Junior. Half-size, 52 ft. 40-10M with tuner, 1500 Watts.

MFJ . . . the world leader in ham radio accessories!

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Visit: http://www.mfjenterprises.com or call toll-free 800-647-1800

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MFJ Weather-Proof *Window Feedthrough Panels*

Weather-proof window feedthrough panels bring coax, balanced lines, HF/VHF/UHF antennas, random wire antennas, ground, rotator/antenna switch cables and DC/AC power into your hamshack without drilling through walls!

MFJ Weather-Proof *Window Feedthrough Panels* mount in your window sill. Lets you bring all your antenna connections into your hamshack *without* drilling holes through walls.

Simply place in window sill and close window. One cut customizes it for any window up to 48 inches. Use horizontally or vertically. Connectors are mounted on inside/outside stainless steel plates and attached to a 4 foot long, 3½ inch high, ¾ inch thick *pressure-treated* wood panel. Has excellent insulating properties. Weather-sealed with a heavy coat of long-lasting white outdoor enamel paint. Edges sealed by weather-stripping. Seals and insulates against all weather conditions. Includes window locking rod.

Inside/outside stainless steel plates ground all coax shields. Stainless steel ground post brings ground in.

MFJ-4603 Universal Window Feedthru Panel

MFJ-4603 $89.95

Four 50 Ohm *Teflon*(R) SO-239 coax connectors lets you feed HF/VHF/UHF antennas at full legal power limit.

A 50 Ohm *Teflon*(R) coax *N-connector* lets you use any antenna up to 11 GHz, including 450 MHz, UHF, satellite, moon bounce and 2.4/5.8 GHz Wi-Fi antennas.

A 75 Ohm, 1 GHz *F-connector* makes it easy to bring in television, Satellite, HD, cable TV and FM radio signals.

A pair of high-voltage *ceramic feedthru insulators* lets you bring in 450/300 Ohm balanced lines directly to your antenna tuner.

Has random/longwire antenna *ceramic feedthru insulator*.

***5-way** binding posts* lets you supply 50 Volts/15 Amps DC/AC power to your outside antenna tuners/relays/switches.

Stainless ground post brings in ground connection, bonds inside/outside stainless steel panels together and drains away static charges.

MFJ's exclusive *Adaptive Cable Feedthru*™ lets you bring in rotator/antenna switch cable, etc. without removing connectors (up to 1¼X1⅝ in). Adapts to virtually *any* cable size. Seals out rain, snow, adverse weather.

3 Coax, Balanced Line, Random Wire

Best Seller! 3 *Teflon*(R) coax connectors for HF/VHF/UHF antennas. Separate high voltage *ceramic* feed-thru insulators for balanced lines and longwire/random wire, Stainless steel ground post.

MFJ-4602 $69.95

6 Coax

6 high quality *Teflon*(R) coax connectors for HF/VHF/UHF antennas. Stainless steel ground post. Full 1500 Watt legal limit.

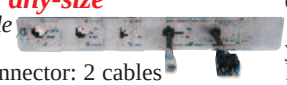
MFJ-4601 $59.95

4 Balanced Line, 2 Coax

4 pairs of high-voltage *ceramic* feed-thru insulators for balanced lines and 2 coax connectors.

New! MFJ-4600 $79.95

5 Cables, any-size



5 *Adaptive Cable Feedthrus*™. Pass any cable with connector: 2 cables with large connectors up to 1¼x1⅝ inches and 3 cables with UHF/N size coax connectors. Seals out weather.

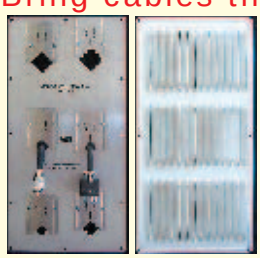
MFJ-4604 $99.95

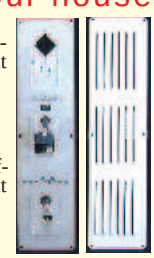
All-Purpose FeedThru/CableThru™

***Stacks** MFJ-4603 **and** MFJ-4604!* Gives you every possible cable connection you'll ever need through your window without drilling holes in wall -- including UHF, N and F coax connectors, balanced lines, random wire, ground, DC/AC power and cables of any size for rotators, antenna switches, etc.

MFJ-4605 $159.95 New!

Bring cables thru eave of your house





MFJ-4616 shown with standard full-size vent (not included) it replaces. For *6 Cables* $26.95

MFJ-4613 shown with standard half-size vent (not included) it replaces. For *3 Cables* $14.95

Replace your standard air vents on the eave/sofitt of your house with these *MFJ AdaptiveCable*™ *Air Vent Plates* and…

Bring in coax, rotator, antenna switch, power cables, etc. *with connectors* up to 1¼x1⅝ inches!

Sliding plates and rubber grommets adjust for virtually any cable size to seal out adverse weather, insects and varmints. Use existing vent hole, mounting screws and screw holes.

AdaptiveCable™ *Wall Plates*

MFJ-4614 *For 4 Cables* $34.95

Bring nearly any cable -- rotator, antenna switch, coax, DC/ AC power, etc. -- through walls *without removing connectors* (up to 1¼x1⅝ inches). Sliding plates and rubber grommets adjust hole size to weather-seal virtually any size cable.

Includes *stainless steel* plates for each side of wall, sliding plates, rubber grommets, weather stripping and screws.

MFJ-4612 *For 2 Cables* $24.95

MFJ-4611 *For 1 Cable* $14.95

Free MFJ Catalog

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http://www.mfjenterprises.com for more info, catalog, manuals, dealers

MFJ *IntelliTuner*™ Automatic Tuners

More hams use MFJ tuners than all other tuners in the world!

World's most advanced Automatic Antenna Tuners feature world renowned MFJ AdaptiveSearch™ and AutomaticRecall™ algorithms -- world's fastest ultra-wide range tuning. Nine World Class models! Choose your features: Digital/Analog/Audio SWR-Wattmeter, Antenna Switch, Balun, Radio Interface, Digital frequency readout, Remoteable, Coax/Balanced Lines/Wire Tuning, Field Upgradeable . . .

MFJ-998 1500 Watt *Legal Limit IntelliTuner*™

Only the MFJ-998 gives you fully automatic antenna tuning for your legal limit full 1500 Watts SSB/CW linear amplifier!

MFJ-998 $699.95

Ultra-fast Automatic Tuning

Instantly match impedances from 12-1600 ohms using MFJ's exclusive *IntelliTune*™, *Adaptive Search*™ and *InstantRecall*™ algorithms with over 20,000 *VirtualAntenna*™ Memories.

Safe auto tuning protects amp

MFJ's exclusive *Amplifier Bypass Control*™ makes tuning safe and "stupid-proof"!

Digital/Analog Meters

A *backlit* LCD meter displays SWR, forward/reflected power, frequency, antenna selected, an auto-ranging bargraph power indication, and much more.

Has quick-glance auto-ranging Cross-Needle SWR/Wattmeter.

MFJ VirtualAntenna™ Memory

MFJ new *VirtualAntenna*™ Memory system gives you 4 antenna memory banks for *each* of 2 switchable antenna coax connectors. Select up to 4 antennas on each antenna connector. Each antenna has 2500 memories, 20,000 total. Has binding post for end-fed long wire antennas.

Download & Upgrade Remotely

Download from internet and upgrade your MFJ-998 firmware as new features are introduced.

Plus Much More!

Built-in radio interface controls most transceivers.

Automatically bypasses with excessive tuning power.

Use balanced line antennas with external **MFJ-912, $59.95**, 1.5 kW 4:1 balun.

Small 13Wx4Hx15D inches easily fits into your ham station. 8 pounds. Requires 12-15VDC at 1.4 amps maximum or 110 VAC with **MFJ-1316, $21.95**.

for 600 Watt amps

AL-811/ALS-600/ALS-500

For 600 Watt amps like Ameritron AL-811/ALS-600/ALS-500M. Matches 12-800 Ohms. 10,000 *Virtual Antenna*™ memories. Cross-Needle SWR/Wattmeter. 10Wx2¾Hx9D inches.

MFJ-994B $359.95

***No Matter What*™ Warranty**

Every MFJ tuner is protected by MFJ's famous one year *No Matter What*™ limited warranty. We will repair or replace your MFJ tuner (at our option) for a full year.

300 Watt...Best Seller

Digital Meter, Ant Switch, Balun

The *world's best selling* automatic antenna tuner is *highly acclaimed the world over* for its ultra high-speed, wide matching range, reliability, ease-of-use! Matches virtually *any* antenna.

MFJ-993B $259.95

300 Watt...Extra Wide Range

SWR/Wattmeter, 10000 VA Memories

Extra *wide matching range at less cost.* Exclusive dual power level: 300 Watts/6-1600 Ohms; 150W/6-3200 Ohms. Cross-Needle SWR/Wattmeter.

MFJ-991B $219.95

200 Watt ...Compact

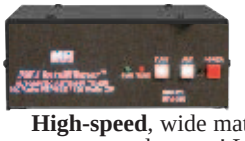
Digital Meter, Ant Switch, Wide Range

World's fastest compact auto tuner uses MFJ *Adaptive Search*™ and *InstantRecall*™ algorithms. 132,072 tuning solutions instantly match virtually any antenna with near perfect SWR.

MFJ-929 $219.95

200 Watt ...Econo

Small, Ant Switch, 20K VA Memories



MFJ-928 $199.95

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.

200 Watt *MightyMite*™

Matches IC-706, FT-857D, TS-50S

MFJ-925 $179.95

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!

G5RV Antenna

MFJ-1778 $44.95

Covers all bands, 160-10 Meters with antenna tuner. 102 ft. long. Can use as inverted vee or sloper. Use on 160 Meters as Marconi.1500 Watts. Super-strong fiberglass center/feedpoint insulators. *Glazed ceramic* end insulators. All hand-soldered connections. Add coax, some rope and you're *on the air!*

MFJ-1778M, $39.95. G5RV Junior. Half-size, 52 ft. 40-10M with tuner, 1500 Watts.

200W...Weather-sealed

for Remote/Outdoor/Marine

MFJ-926B $399.95

Fully *weather-sealed for remote Outdoor/Marine use*! Tough, durable, built-to-last the elements for years.

200 Watt...Remote

Coax/Wire Ant, No pwr cable needed

MFJ-927 $259.95

Weather protected fully automatic *remote* auto tuner for wire ***and*** *coax* antennas -- an MFJ exclusive. Powers through coax -- No separate power cable needed.

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MFJ TUNERS

New, Improved MFJ-989D 1500 Watt *legal limit* Antenna Tuner

World's most popular 1500 Watt Legal Limit Tuner just got better -- much better -- gives you more for your money!

New, improved MFJ-989D *legal limit* antenna tuner gives you better efficiency, lower losses and a new *true* peak reading meter. It easily handles *full* 1500 Watts SSB/CW, 1.8 to 30 MHz, including MARS/WARC bands.

New dual 500 pF *air variable capacitors* give you twice the capacitance for more efficient operation on 160 and 80 Meters.

New, improved *AirCore*™ *Roller Inductor* gives you lower losses, higher Q and handles more power more efficiently.

New TrueActive™ peak reading Cross-Needle *SWR/Wattmeter* lets you read *true* peak power on all modes.

MFJ-989D $389.95

New high voltage *current balun* lets you tune balanced lines at high power with no worries.

New *crank knob* lets you reset your roller inductor quickly, smoothly and accurately.

New larger 2-inch diameter *capacitor knobs* with easy-to-see dials make tuning much easier.

New cabinet maintains components' high-Q. Generous air vents keep components cool. $12^{7}/_{8}$Wx6Hx$11^{5}/_{8}$D inches.

Includes six position ceramic antenna switch, 50 Ohm dummy load, indestructible multi-color Lexan front panel with detailed logging scales and legends.

The MFJ-989D uses the superb time-tested T-Network. It has the widest matching range and is the easiest to use of all matching networks. Now with MFJ's new 500 pF air variable capacitors and new low loss roller inductor, it easily handles higher power much more efficiently.

No Matter What™ **Warranty**

Every MFJ tuner is protected by MFJ's famous one year *No Matter What*™ limited warranty. We will repair or replace your MFJ tuner (at our option) for a full year.

More hams use MFJ tuners than all other tuners in the world!

MFJ-986 Two knob ***Differential-T***™

MFJ-986 $349.95

Two knob tuning (differential capacitor and *AirCore*™ roller inductor) makes tuning foolproof and easier than ever. Gives minimum SWR at only one setting. Handles 3 KW PEP SSB amplifier input power (1.5 KW output). Gear-driven turns counter, lighted peak/average Cross-Needle SWR/Wattmeter, antenna switch, balun. 1.8 to 30 MHz. $10^{3}/_{4}$Wx$4^{1}/_{2}$Hx15 in.

MFJ-962D ***compact*** kW Tuner

MFJ-962D $299.95

A few more dollars steps you up to a KW tuner for an amp later. Handles 1.5 KW PEP SSB amplifier input power (800W output). Ideal for Ameritron's AL-811H! *AirCore*™ roller inductor, gear-driven turns counter, pk/avg lighted Cross-Needle SWR/Wattmeter, antenna switch, balun, Lexan front, 1.8-30MHz. $10^{3}/_{4}$x$4^{1}/_{2}$ x$10^{7}/_{8}$ in.

MFJ-969 300W ***Roller Inductor*** Tuner

MFJ-969 $219.95

Superb *AirCore*™ Roller Inductor tuning. Covers *6 Meters* thru 160 Meters! 300 Watts PEP SSB. *Active* true peak reading lighted Cross-Needle SWR Wattmeter, *QRM-Free PreTune*™, antenna switch, dummy load, 4:1 balun, Lexan front panel. $3^{1}/_{2}$Hx$10^{1}/_{2}$Wx$9^{1}/_{2}$D inches.

MFJ-949E ***deluxe*** 300 Watt Tuner

MFJ-949E $179.95

More *hams use MFJ-949s than any other antenna tuner in the world!* Handles 300 Watts. Full 1.8 to 30 MHz coverage, custom inductor switch, 1000 Volt tuning capacitors, *full size* peak/average lighted Cross-Needle SWR/Wattmeter, 8 position antenna switch, dummy load, *QRM-Free PreTune*™, scratch proof Lexan front panel. $3^{1}/_{2}$Hx$10^{5}/_{8}$Wx7D inches. **MFJ-948, $139.95.** Economy version of MFJ-949E, less dummy load, Lexan front panel.

MFJ-941E ***super value*** Tuner

MFJ-941E $139.95

The *most for your money!* Handles 300 Watts PEP, covers 1.8-30 MHz, *lighted* Cross-Needle SWR/Wattmeter, 8 position antenna switch, 4:1 balun, 1000 volt capacitors, Lexan front panel. Sleek $10^{1}/_{2}$Wx$2^{1}/_{2}$Hx7D in.

MFJ-945E HF/6M ***mobile*** Tuner

MFJ-945E $129.95

Extends your mobile antenna bandwidth so you don't have to stop, go outside and adjust your antenna. Tiny 8x2x6 in. *Lighted* Cross-Needle SWR/Wattmeter. Lamp and bypass switches. Covers 1.8-30 MHz *and* 6 Meters. 300 Watts PEP. **MFJ-20, $6.95,** mobile mount.

MFJ-971 ***portable/QRP*** Tuner

MFJ-971 $119.95

Tunes coax, balanced lines, random wire 1.8-30 MHz. Cross-Needle Meter. SWR, 30/300 or 6 Watt QRP ranges. Matches popular MFJ transceivers. Tiny 6x$6^{1}/_{2}$x$2^{1}/_{2}$ in.

MFJ-901B ***smallest*** Versa Tuner

MFJ-901B $99.95

MFJ's smallest (5x2x6 in.) and most affordable wide range 200 Watt PEP Versa tuner. Covers 1.8 to 30 MHz. Great for matching solid state rigs to linear amps.

MFJ-902 ***Tiny Travel*** Tuner

MFJ-902 $99.95

Tiny $4^{1}/_{2}$x$2^{1}/_{4}$x3 inches, full 150 Watts, 80-10 Meters, has tuner bypass switch, for coax/random wire.

MFJ-904H, $149.95. Same but adds Cross-needle SWR/Wattmeter and 4:1 balun for balanced lines. $7^{1}/_{4}$x$2^{1}/_{4}$x$2^{3}/_{4}$ inches.

MFJ-16010 ***random wire*** Tuner

MFJ-16010 $69.95

Operate all bands anywhere with MFJ's reversible L-network. Turns random wire into powerful transmitting antenna. 1.8-30 MHz. 200 Watts PEP. Tiny 2x3x4 in.

MFJ-906/903 ***6 Meter*** Tuners

MFJ-906 $99.95

MFJ-906 has lighted Cross-Needle SWR/Wattmeter, bypass switch. Handles 100 W FM, 200W SSB. **MFJ-903, $69.95**, Like MFJ-906, less SWR/Wattmeter, bypass switch.

MFJ-921/924 ***VHF/UHF*** Tuners

MFJ-921/924 $89.95

MFJ-921 covers 2 Meters/220 MHz. **MFJ-924** covers 440 MHz. SWR/Wattmeter. 8x$2^{1}/_{2}$x3 in.

MFJ-931 ***artificial*** RF Ground

MFJ-931 $109.95

Eliminates RF hot spots, RF feedback, TVI/RFI, weak signals caused by poor RF grounding. Creates artificial RF ground or electrically places far away RF ground directly at rig. **MFJ-934, $209.95**, Artificial ground/300 Watt Tuner/Cross-Needle SWR/Wattmeter.

Dealer/Catalog/Manuals

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QS6/2010

MFJ *Switching* Power Supplies

Power your HF transceiver, 2 meter/440 MHz mobile/base and accessories with these highly reliable 15, 22, 30, 40 or 75 Amp MFJ Switching Power Supplies!

No RF hash . . . Super lightweight . . . Super small . . . Volt/Amp Meters . . .

MFJ's adjustable voltage switching power supplies do it all! Power your HF or 2M/440 MHz radio and accessories.

MFJ's *MightyLites*™ are so light and small you can carry them with one hand! Take them with you anywhere.

No more picking up and hauling around heavy, bulky supplies that can give you a painful backache, pulled muscle or hernia.

These babies are clean . . . Your buddies won't hear *any* RF hash on your signal! *None* in your receiver either! These super clean *MightyLites*™ meet all FCC Class B regulations.

Less than 35 mV peak-to-peak ripple under 25 or 45 amp full load. Load regulation is better than 1.5% under full load.

You won't burn up our power supplies! MFJ Power supplies are *fully protected* with Over Voltage, Over-temperature and Over Current protection circuits.

MFJ *MightyLites*™ can be used anywhere in the world! They have switchable AC input voltage and work from 85 to 135 VAC or 170 to 260 VAC. Replaceable fuse.

A whisper quiet internal fan efficiently cools your power supply for long life.

22 Amp Continuous

Mighty Lite™

MFJ-4125

$84.95

Ham Radio's smallest and lightest 22 Amp continuous power supply is also its best selling!

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

Mighty Lite™

MFJ-4225MV

$99.95

22 Amps continuous, 25 Amps maximum. Like MFJ-4125 but adds Volt/Amp meters, cigarette lighter plug. Adjustable 9-15 VDC Output. 5¼Wx 4½Hx6D in. Weighs 3.7 lbs. Use 85-135 VAC or 170-260 VAC input. Replaceable fuse.

40 Amp Continuous

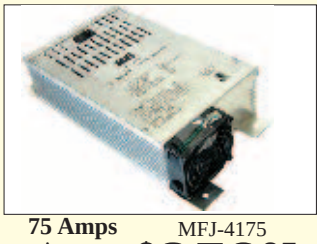
MightyLite™

MFJ-4245MV

$149.95

40 Amps continuous, 45 Amps max. Adjustable 9-15 VDC output. Volt/Amp meters, cigarette lighter plug, front 5-way binding posts, two rear quick connects. 5.5 lbs. 7½Wx 4¾Hx9D inches. Use 85-135 VAC or 170-260 VAC input. Replaceable fuse.

75 Amp Continuous



MFJ-4175

$359.95

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!

High Current Multiple DC Power Outlets

Power multiple Transceivers/accessories from a single DC power supply . . . Keeps you neat, organized and safe . . .Prevents fire hazard . . . Keeps wires from tangling up and shorting . . . Fused and RF bypassed . . . 6 foot, 8 gauge color coded cable . . .

MFJ-1118 **$84.95**

MFJ-1116 **$59.95**

MFJ-1112 **$44.95**

MFJ-1117 **$64.95**

MFJ-1128 **$104.95**

MFJ-1126 **$84.95**

MFJ-1129 **$114.95**

MFJ-1124 **$64.95**

Versatile 5-Way Binding Posts

MFJ-1118, $84.95. Power two HF and/or VHF rigs and six accessories from your main 12 VDC supply. *Built-in 0-25 VDC voltmeter*. Two pairs 35 amp 5-way binding posts, fused and RF bypassed for transceivers. Six pairs RF bypassed binding posts provide 15 Amps for accessories. Master fuse, ON/OFF switch,"ON" LED. 12½x2¾x2½ in.

MFJ-1116, $59.95. 8 pairs binding posts, 15A total.Voltmeter, on/off switch.

MFJ-1112, $44.95. 6 pairs binding posts, 15 Amps total.

MFJ-1117, $64.95. Powers *four* transceivers simultaneously (two at 35 Amps each and two at 35 Amps combined). 8x2x3 inches.

***All PowerPoles*™**

MFJ-1128, $104.95. 3 high-current outlets for transceivers. 9 *switched* outlets for accessories. Mix & match included fuses as needed (one-40A, one-25A, four-10A, four-5A, three-1A fuses installed). 0-25 VDC *Voltmeter*. *Extra* contacts, fuses. 12Wx1¼Hx2¾D".

MFJ-1126, $84.95. 8 outlets, each fused, 40 Amps total. Factory installed fuses: two 1A, three 5A, two 10A, one 25A, one 40A. *0-25 VDC Voltmeter*. Includes *extra PowerPoles*®, *extra* fuses -- *no extra cost*. 9Wx1¼Hx2¾ inches.

PowerPoles*™ *AND 5-Way Binding Posts

MFJ-1129, $114.95. 10 outlets each fused, 40 Amp total. 3 high-current outlets for rigs -- 2 *PowerPoles*® and one 5-way binding post. 7 *switched* outlets for accessories (20A max) -- 5 *PowerPoles*® and 2 binding posts. Fuses include (1- 40A, 2-25A, 3-10A, 3-5A, 2-1A installed). *0-25 VDC Voltmeter*. Includes extra *PowerPoles*® and fuses, 12½Wx1¼Hx2¾D inches.

MFJ-1124, $64.95. 6 outlets each fused, 40 Amps total. 4 *PowerPoles*®, 2 high-current binding posts, Installed fuses: 1-40A, 2-25A, 2-10A, 1-5A, 1-1A. Includes extra *PowerPoles*® & fuses -- *no extra cost.*

15 Amp Continuous

MFJ-4115

$59.95

15 Amps continuous, 17 Amps max at 13.8 VDC. Over-voltage, over-current protection. 5-way binding posts. Load fault indicator and automatic shutdown. 90-130 VAC input. 1½ lbs. Tiny 3¾Wx2¼Hx3¾D inches fits easily in an overnight bag.

30 Amps Continuous

Linear with 19.2 lb.Transformer

No RF Hash!

MFJ-4035MV

$149.95

This heavy-duty linearly regulated MFJ-4035MV has *abolutely no RF Hash*. It delivers 30 Amps continuous, 35 Amps maximum from its massive 19.2 lb. transformer. Front panel adjustable 1-14 VDC output with convenient detent at 13.8 VDC. Volt/Amp Meters. 1% load regulation, 30 mV ripple. Over-voltage/current/temperature protection, 5-way binding posts, 2 pairs of quick-connects and a covered cigarette lighter socket for mobile accessories. Front panel replaceable fuse. 110 VAC input. 9½Wx6Hx9¾D in.

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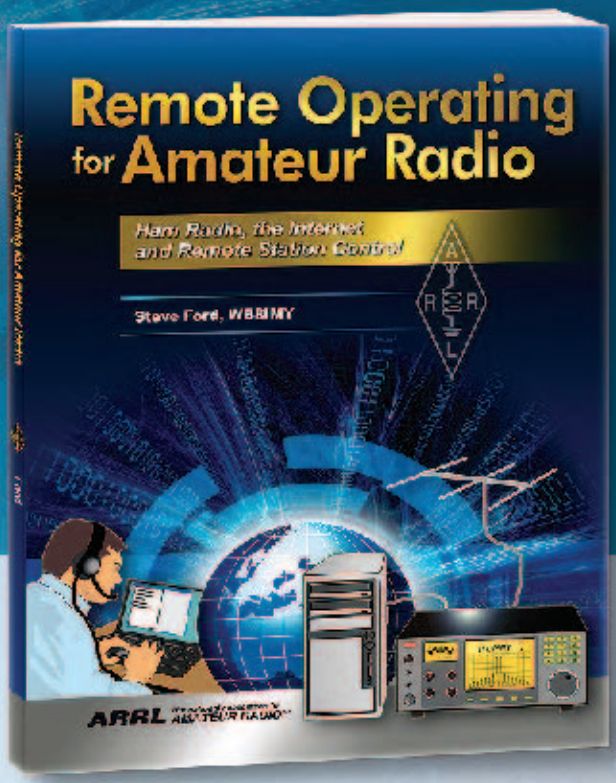

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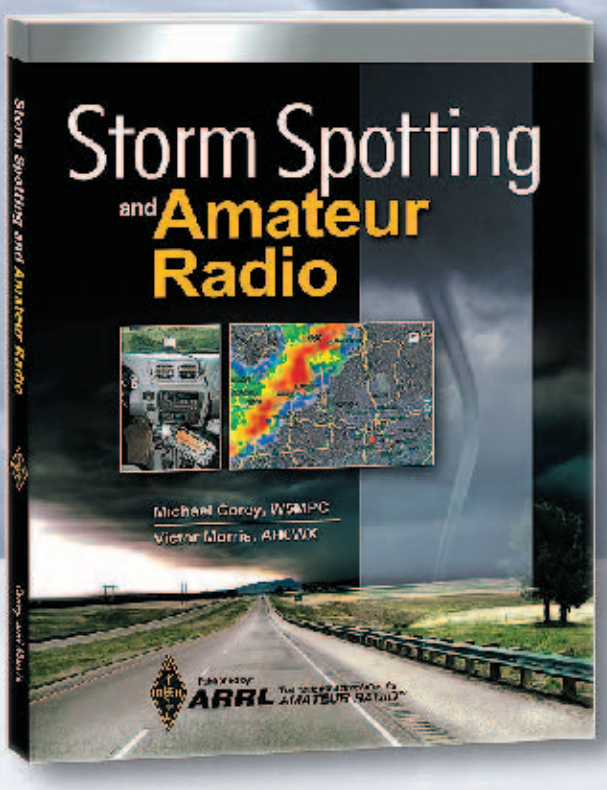

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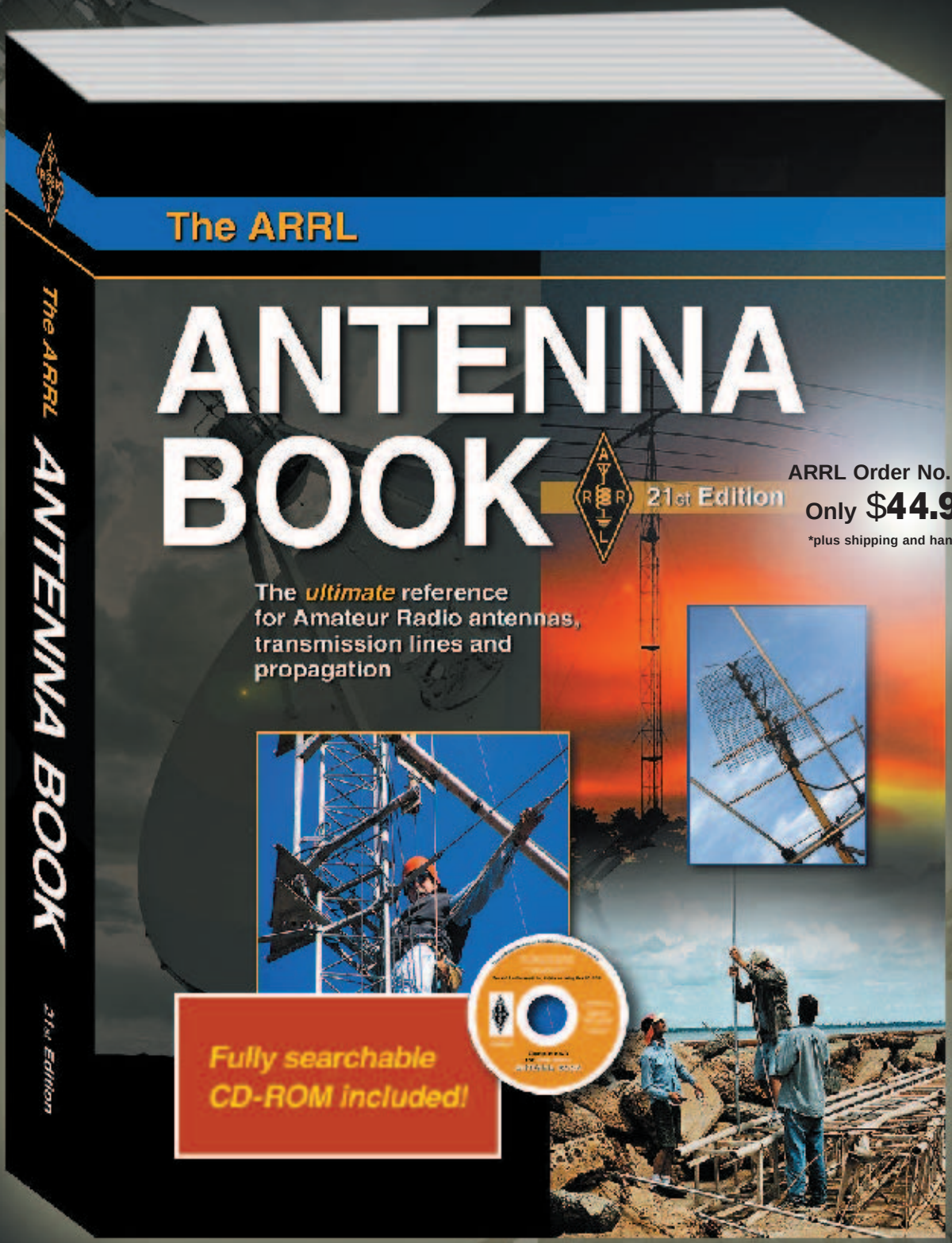

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FT DX 5000 Series

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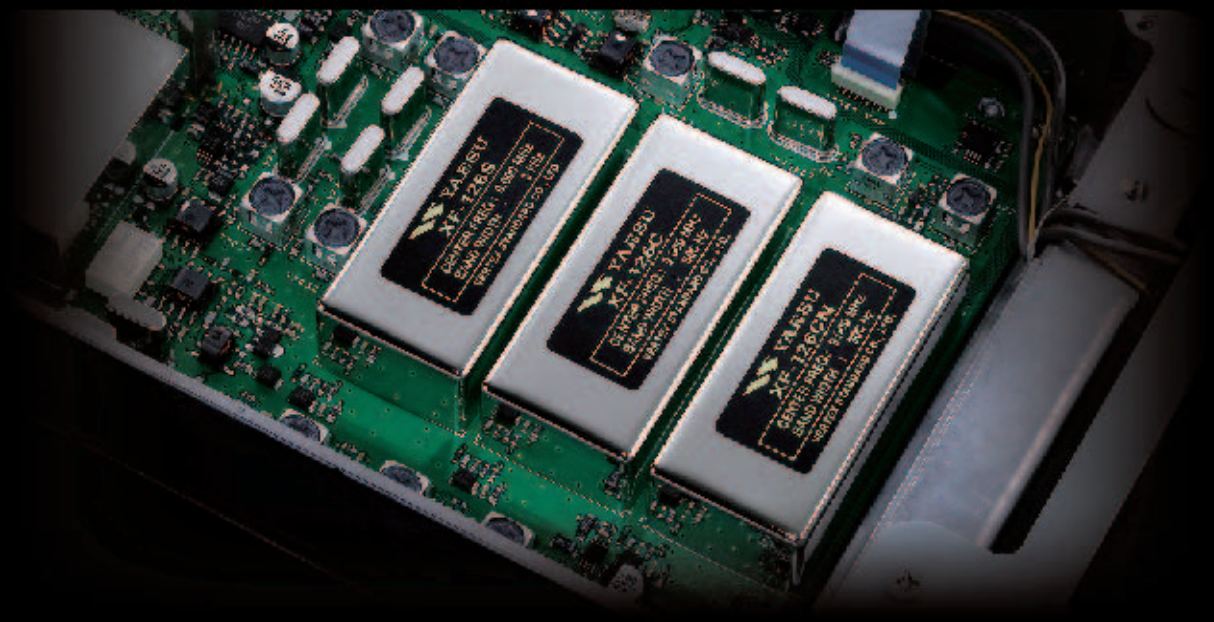
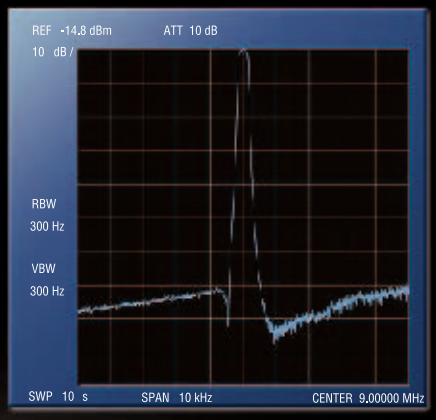


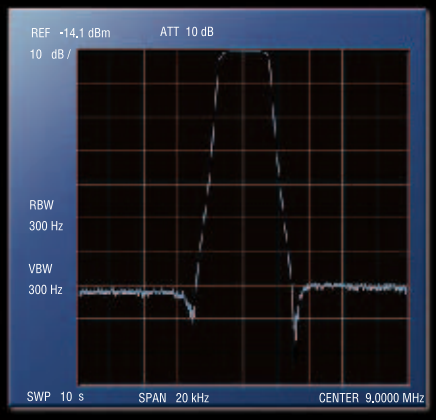
Super sharp "Roofing" filters for VFO-A/Main Receiver to give you the best performance and flexibility

Newly designed sharp "Roofing" filters for VFO-A/Main Receiver, selectable between 300 Hz, (optional/included in MP), 600 Hz, 3 kHz (6-pole crystal filter), 6 kHz, 15 kHz (4-pole MCF).

Roofing Filter Performance



300Hz



3kHz

NEW

Photograpy shows FT DX 5000MP

HF/50 MHz 200 W Transceiver
FT DX 5000MP

Station Monitor SM-5000 included
±0.05ppm OCXO included
300 Hz Roofing Filter included
600 Hz Roofing Filter included
3 kHz Roofing Filter included

HF/50 MHz 200 W Transceiver
FT DX 5000D

Station Monitor SM-5000 included
±0.5ppm TCXO included
600 Hz Roofing Filter included
3 kHz Roofing Filter included

HF/50 MHz 200 W Transceiver
FT DX 5000

Station Monitor SM-5000 optional
±0.5ppm TCXO included
600 Hz Roofing Filter included
3 kHz Roofing Filter included

For the latest Yaesu news, visit us on the internet:
http://www.vertexstandard.com

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

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

Vertex Standard US Headquarters
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KENWOOD

Listen to the Future

All-Terrain Performance

On or off the road, Kenwood's new TM-271A delivers powerful mobile performance with 60W maximum output and other welcome features such as multiple scan functions and memory names. Yet this tough, MIL-STD compliant transceiver goes easy on you, providing high-quality audio, illuminated keys and a large LCD with adjustable green backlighting for simple operation, day or night.

144MHz FM TRANSCEIVER

TM-271A

▮ 200 memory channels (100 when used with memory names) ▮ Frequency stability better than ±2.5ppm (-20~+60°C) ▮ Wide/Narrow deviation with switchable receive filters ▮ DTMF microphone supplied ▮ NOAA Weather Band reception with warning alert tone ▮ CTCSS (42 subtone frequencies), DCS (104 codes) ▮ 1750Hz tone burst ▮ VFO scan, MHz scan, Program scan, Memory scan, Group scan, Call scan, Priority scan, Tone scan, CTCSS scan, DCS scan ▮ Memory channel lockout ▮ Scan resume (time-operated, carrier-operated, seek scan) ▮ Automatic repeater offset ▮ Automatic simplex checker ▮ Power-on message ▮ Key lock & key beep ▮ Automatic power off ▮ Compliant with MIL-STD 810 C/D/E/F standards for resistance to vibration and shock ▮ Memory Control Program (available free for downloading from the Kenwood Website: ***www.kenwoodusa.com***)

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