QST

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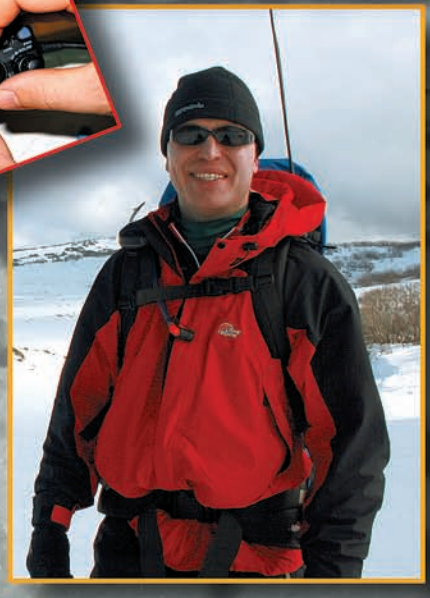
Their Shack was an igloo... COOL RADIO Adventure

QST reviews:

Inside:

54



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Official Journal of ARRL The national association for AMATEUR RADIO

D-STAR for Everyone!

Been looking for an easy way to climb aboard the D-STAR express? Let the new IC-80AD and ID-880H be your tickets to ride! With an improved user interface, smart new look, and free programming software included you can't go wrong!

Get on track and join in on the D-STAR fun today!

D-STAR ready

NEW IC-80AD*

THIRD GENERATION 2M/70CM DUAL BANDER

- 5/2.5/.5/.1 Watt 2m/70cm
- AM, FM, WFM
- RX: 0.495-999.990MHz**
- Improved User Interface
- Li-Ion Power
- **Free Programming Software!***

**www.icomamerica.com/amateur/DSTAR*
for details about free software

NEW IC-880H*

VERSATILE 2M/70CM DUAL BAND MOBILE

- 50 Watt/VHF/UHF
- AM, FM, DV
- RX: 118-999.99MHz**
- 800 Alphanumeric Memory Channels
- **Free Programming Software!***

D-STAR ready

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for details about free software

No matter where you go.

*This device has not been approved by the Federal Communications Commission. This device may not be sold or lease, or be offered for sale or lease, until approval of the FCC has been obtained.**Frequency specs may vary. Refer to owner's manual for exact frequency specs.

ICOM®

Icom has the radio for the experts...

IC-R9500 ICOM'S ULTIMATE WIDE BAND RECEIVER

- 0.005 - 3335.000MHz*
- USB, LSB, CW, FSK, FM, WFM, AM
- 1020 Alphanumeric Memory Channels
- P25 (Option UT-122)
- Five Roofing Filters and so much more!

...or for those just getting started.

IC-R75 WIDE BAND RECEIVER

- 0.03 - 60.0 MHz*
- Triple Conversion
- Twin Passband Tuning
- Digital Signal Processing (DSP)

Now bundled with RadioCom 4.5

Icom's black box radios now come bundled with Bonito's RadioCom 4.5 software.

PCR1500

THE "BLACK BOX"

- 0.01 ~ 3299.99 MHz*
- AM, FM, WFM, CW, SSB
- Record and Save Audio as .WAV File
- USB Cable Connection
- Optional DSP

PCR2500

DUAL BAND "BLACK BOX"

- 0.01 ~ 3299.99 MHz* (Main) 50 to 1300 MHz* (Sub)
- AM, FM, WFM, CW, SSB
- Opt. APCO 25 and D-STAR
- Dual Wideband Receivers
- Dual Watch PC Window
- Optional DSP

IC-R1500

MOBILE OR PC CONTROL

- 0.01 - 3299.99 MHz*
- AM, FM, WFM, USB, LSB, CW
- 1000 Memory Channels
- Fast Scan
- Optional DSP (UT-106)
- PCR Software Included
- Very Compact Design

IC-R2500

2 WIDE BAND RX IN 1

- 0.01 - 3299.99 MHz*
- AM, FM, WFM, SSB, CW (Main)
- AM, FM and WFM (Sub)
- 1000 Memory Channels
- Optional D-STAR (UT-118)
- Optional P25 (UT-122)
- Optional DSP

NEW IC-RX7

STYLISH SCANNER WITH SMART INTERFACE

- 0.150 - 1300.000MHz*
- AM, FM, WFM
- 1650 Alphanumeric Memory Channels
- Digital Signal Processing (DSP)
- IPX4 Water Resistant Rating

IC-R5 SPORT

COMPACT WIDE BAND

- 0.5 - 1300.0 MHz*
- AM, FM, WFM
- 1250 Memory Channels
- CTCSS/DTCS Decode
- Weather Alert

IC-R20

ADVANCED WIDE BAND

- 0.150 - 3304.0 MHz*
- AM, FM, WFM, SSB, CW
- 1000 Memory Channels
- Dual Watch Receiver
- 4 Hour Digital Recorder

Contact your favorite Authorized Icom Dealer today!

ICOM®

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

hy-gain® ROTATORS

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

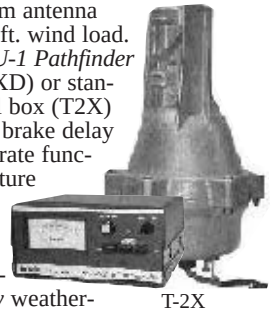
HAM-IV

HAM-IV $649.95

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

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

TAILTWISTER SERIES II



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

T-2X $799.95

T-2XD $1229.95 with DCU-1

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

CD-45II

CD-45II $449.95

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

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

HAM-V

HAM-V $1099.95 with DCU-1

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

ROTATOR OPTIONS

MSHD, $99.95. Heavy duty mast support for T2X, HAM-IV and HAM-V.
MSLD, $39.95. Light duty mast support for CD-45II and AR-40.
TSP-1, $34.95. Lower spacer plate for HAM-IV and HAM-V.

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

For ***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.**

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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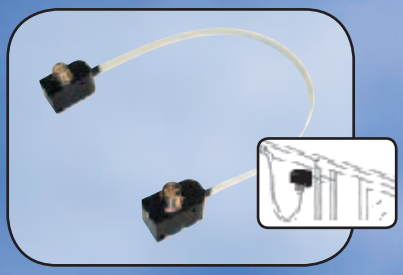
Life is a JOURNEY, Enjoy the ride!



NEW! COMET CTC-50M
Window Gap Adapter!

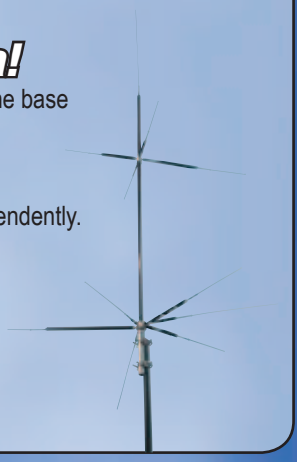
Max Power: HF 100W PEP
VHF: 60W FM
UHF: 40W FM
900MHz - 1.3GHz: 10W
VSWR: <500MHz 1.3:1
>500MHz 1.5:1
Impedance: 50Ohm
Length: 15.75"
Conn: 24k Gold Plated SO-239s

MALDOL HVU-8
Ultra-Compact 8 Band Antenna!

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

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

Each band tunes independently.
Approx 2:1 band-width:
80M 22kHz
40M 52kHz
20M 52kHz
15M 134kHz
10M 260kHz



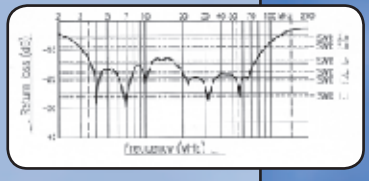
COMET CHA-250B
Broadband HF Vertical!

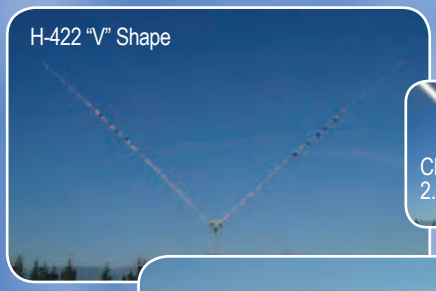
3.5 - 57MHz with SWR of 1.6:1 or less!

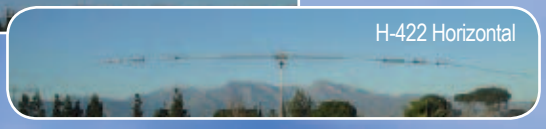
- *NO ANTENNA TUNER NEEDED*
- *NO RADIALS*
- *NO TRAPS*
- *NO COILS*

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

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







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

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

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

COMET and Maldol

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

Or contact NCG Company. 15036 Sierra Bonita Lane, Chino, CA 91710
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This Month in QST

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Technical

News and Features

US & Possessions: Membership in the ARRL, including a one year subscription to *QST*, is available to individuals at $39. Licensed radio amateurs age 21 and under and the eldest licensee in the household may qualify for the rate of $20. Life Membership, including a subscription to *QST* is available at $975.* Membership and *QST* cannot be separated. Libraries and institutions, $39 per year. Single copies $5.

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QST Workbench

Radiosport

Our Cover
Baby, it's cold outside! — Our cover for the month of April, the month that offers the hope of springtime, features some frosty hams operating from Australia. The Warrillow brothers — Stephen, VK3SN, and Gerard, VK3GT, both of Victoria, — trekked over to the Bogong High plains (6200 feet above sea level), part of that country's alpine region, for some snow skiing and Amateur Radio. Read more about their adventure beginning on page 54. Photos by VK3GT.

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Introducing the Yaesu FT-950 transceiver for DX enthusiasts
Superb receiver performance
Direct lineage from the legendary FT DX 9000 and FT-2000

HF/50 MHz 100 W Transceiver

FT-950

- Triple-conversion super-heterodyne receiver architecture, using 69.450 MHz 1st IF
- Eight narrow, band-pass filters in the RF stage eliminate out of band interference and protect the powerful 1st IF
- 1st IF 3 kHz Roofing filter included
- High-speed Direct Digital Synthesizer (DDS) and high-spec Digital PLL for outstanding Local Oscillator performance
- Original YAESU IF DSP advanced design, provides comfortable and effective reception. IF SHIFT / IF WIDTH / CONTOUR / NOTCH / DNR
- DSP enhancement of Transmit SSB/AM signal quality with Parametric Microphone Equalizer and Speech Processor
- Built-in high stability TCXO (±0.5 ppm after 1 minute@77 ° F)
- Built-in automatic antenna tuner ATU, with 100 memories
- Powerful CW operating capabilities for CW enthusiasts
- Five Voice Message memories, with the optional DVS-6 unit
- Large Multi-color VFD (Vacuum Fluorescent Display)
- Optional Data Management Unit (DMU-2000) permits display of various operating conditions, transceiver status and station logging.
- Optional RF μ -Tune Units for 160 m, 80/40 m and 30/20 m Bands

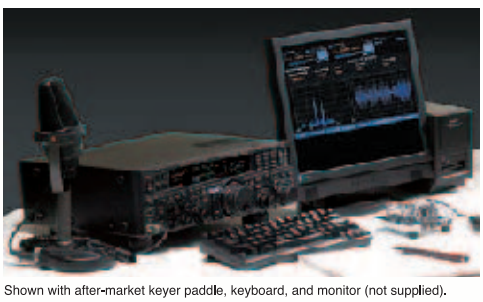
Optional, YAESU Exclusive, Fully-Automatic μ -Tuning Preselector System!

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

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

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

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



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

DMU-2000
Data Management Unit (option)

"The Best of the Best Just Got Better"

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

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 some 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℠

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NEW COMPACT HF TRANSCEIVER WITH IF DSP

A superb, compact HF/50 MHz radio with state-of-the-art IF DSP technology configured to provide YAESU World-Class Performance in an easy to operate package.
New licensees, casual operators, DX chasers, contesters, portable/field enthusiasts, and emergency service providers - *YAESU FT-450…This Radio is for YOU!*

HF/50 MHz 100 W All Mode Transceiver

FT-450 Automatic Antenna Tuner ATU-450 optional

■ **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

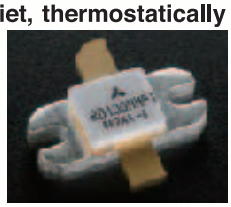
■ Large informative Front Panel Display, convenient Control knobs and Switches

■ The IF DSP guarantees quiet and enjoyable highperformance HF/50 MHz operation

Handy Front Panel Control of Important Features including:

- **CONTOUR Control Operation**
  The Contour filtering system provides a gentle shaping of the filter passband.
- **Manual NOTCH**
  Highly-effective system that can remove an interfering beat tone/signal.
- **Digital Noise Reduction (DNR)**
  Dramatically reduces random noise found on the HF and 50 MHz bands.
- **IF WIDTH**
  The DSP IF WIDTH tuning system provides selectable IF passband width to fight QRM.
  SSB - 1.8/2.4/3.0 kHz , CW - 0.5/1.8/2.4 kHz
- **Digital Microphone Equalizer**
  Custom set your rig to match your voice characteristics for maximum power and punch on the band.
- **Fast IF SHIFT Control**
  Vary the IF SHIFT higher or lower for effective interference reduction / elimination.

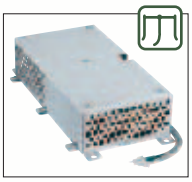
■ The rugged FT-450 aluminum die-cast chassis, with its quiet, thermostatically controlled cooling fan provides a solid foundation for the power amplifier during long hours of field or home contesting use.



MOS FET RD100HHF1

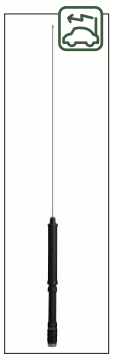
The rugged aluminum die-cast chassis with cooling fan

■ Operate anywhere using optional internal or external antenna tuning systems



Internal Automatic Antenna Tuner ATU-450
Covering 160 m to 6 m Amateur Bands Dipole or Yagi antennas
(The ATU-450 Antenna Tuner is included in the FT-450AT)

External Automatic Antenna Tuner FC-40
Covering 160 m to 6 m Amateur Bands (with 65+ ft end fed wire)



Active Tuning Antenna System ATAS-120A
Covering 40 m to 6 m Amateur Bands
(For mobile)

More features to support your HF operation

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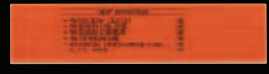

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Keeping the "Amateur" in Amateur Radio

"Being called an amateur can have a negative connotation, but the term's origin is the Latin word for "lover" and it has to do with motivation, not skill level. As they say, professionals built the Titanic; the Ark was built by amateurs."

Radio amateurs do what we do because we love to do it. We are, by international regulation, "interested in radio technique purely with a personal aim and without pecuniary interest." Even if we are employed in a radio-related field, when we are on the air in the ham bands we are not pursuing financial gain for ourselves or our employers.

The "no pecuniary interest" principle has been reflected in the FCC regulations in different ways over the years. In 1928 the Federal Radio Commission — the predecessor of the FCC — adopted revised rules that prohibited amateurs from handling "any form of commercial correspondence." After months of discussion and debate, the ARRL obtained a clarification that relieved amateurs of any obligation to determine whether the messages they were handling were of a commercial nature and established the principle that amateurs could handle messages "…regardless of the source or text, provided that no pecuniary or other consideration is directly or indirectly paid or promised."

More than 40 years later, the FCC at the time of President Nixon suddenly found a reason to reinterpret the rules so as to prohibit amateur communications on behalf of any non-amateur organization. It was immediately apparent that this went too far in discouraging public service communications, so in 1972 the misinterpreted rule was dropped and new rules were adopted prohibiting third party traffic consisting of business communication or involving material compensation of *any* kind to *anyone*.

For the next two decades there were seemingly endless debates about what was and was not permitted. For example, in the days before ubiquitous cell phones, amateur repeater autopatches were the most effective means of summoning aid for disabled motorists — but under a literal application of the rules you couldn't use one to call a tow truck unless there was an immediate threat to life or property. It would be nice to be able to say that common sense prevailed in such situations, but in fact there was a lot of pointless wrangling.

Finally in 1993, at the ARRL's urging the FCC adopted new rules that dropped the "no business communication" language and simply prohibited communication on behalf of an amateur's employer or in which the amateur has a pecuniary interest.

In adopting these rules the FCC made it clear that it didn't want to answer questions about whether specific communications were permitted. In the words of the Report and Order in PR Docket No. 92-136, "…any amateur-to-amateur communication is permitted unless specifically prohibited, or unless transmitted for compensation, or unless done for the pecuniary benefit of the station control operator or his or her employer." It boils down to a simple four-part test:

1. Is it expressly prohibited in the rules (music, obscenity, etc)?
2. Is it transmitted for compensation?
3. Does the control operator have a pecuniary interest, that is, could he or she benefit financially?
4. Does the control operator's employer have a pecuniary interest?

If the answer in each case is "no" then the communication is acceptable to the FCC with one additional caveat: To guard against the systematic use of Amateur Radio for non-amateur purposes, there is a prohibition on "communications, on a regular basis, which could reasonably be furnished alternatively through other radio services."

By now you may be wondering why this is a timely topic in 2009 if the rules have not changed since 1993. The reason is that growing numbers of employers and non-amateur organizations are recognizing the value of Amateur Radio as an emergency communications resource and are encouraging their employees and members to obtain amateur licenses. This is a welcome trend, one that we do not wish to discourage in any way. We can never have enough trained and disciplined amateur operators who have equipped themselves, and are willing, to provide public service communications in time of need. That said, there are limits to what an amateur can do on behalf of his or her employer. There are also limits on the extent to which Amateur Radio can be used for the purposes for which other radio services were created.

If you have just entered Amateur Radio with the desire to be of service, welcome! You have joined a community with a well-earned reputation for being able to communicate when other communications systems have failed. Of course, there is nothing inherently superior about Amateur Radio equipment; it's not hardware, but rather knowhow, that gives us our edge. We look forward to sharing that knowhow so you can help write the next chapter in the proud history of Amateur Radio public service communications. We also look forward to learning from you and with you as together we explore new radio technologies and put new tools to work.

We are radio amateurs. That's what we do — because we love to do it.

David Sumner, K1ZZ
ARRL Chief Executive Officer

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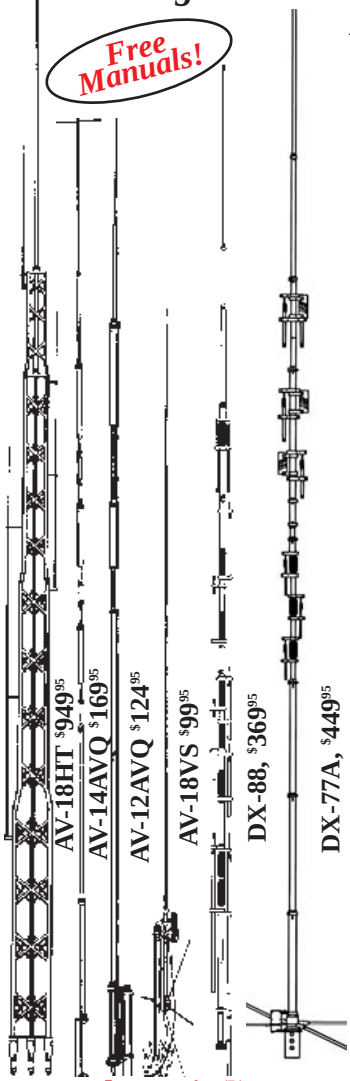
Self-supporting -- no guys required . . . Remarkable DX performance -- low angle radiation, omnidirectional . . . Handles 1500 Watts . . . Low SWR . . . Automatic band switching . . . Aircraft quality aluminum tubing . . . Stainless steel hardware . . . Recessed SO-239 connector . . . Two year limited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



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

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

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

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

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

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

Two year limited warranty.

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

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

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

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

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

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

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

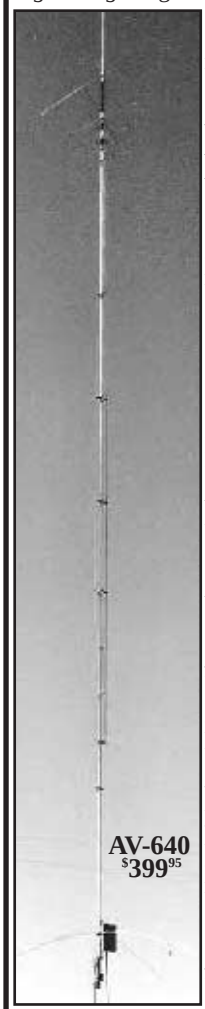
DX-77A, $449.95. (10, 12, 15, 17, 20, 30, 40 Meters). 29 ft., 25 lbs.

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

Model #	Price	Bands	Max Power	Height	Weight	Wind Surv.	Rec. Mast
AV-18HT	$949.95	10,15,20,40,80	1500 W PEP	53 feet	114 pounds	75 MPH	------
AV-14AVQ	**$169.95**	**10,15,20,40**	**1500 W PEP**	**18 feet**	**9 pounds**	**80 MPH**	**1.5-1.625"**
AV-12AVQ	$124.95	10/15/20 M	1500 W PEP	13 feet	9 pounds	80 MPH	1.5-1.625"
AV-18VS	**$99.95**	**10 - 80 M**	**1500 W PEP**	**18 feet**	**4 pounds**	**80 MPH**	**1.5-1.625"**
DX-88	$369.95	10 - 80 M	1500 W PEP	25 feet	18 pounds	75 mph no guy	1.5-1.625"
DX-77A	**$449.95**	**10 - 40 M**	**1500 W PEP**	**29 feet**	**25 pounds**	**60 mph no guy**	**1.5-1.625"**

hy-gain(R) PATRIOT

Hy-Gain's new PATRIOT HF verticals are the best built, best performing and best priced multiband verticals available today. For exciting DX make full use of your sunspot cycle with the PATRIOT's *low 17 degree angle* signal.



No ground or radials needed

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Single coax cable feed. Each band is individually tunable. Extra wide VSWR bandwidth. End fed with broadband matching unit.

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Low 2.5 sq. ft. wind surface area. Small area required for mounting. Mounts easily on decks, roofs and patios.

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Handles 1500 Watts key down continuous for two minutes.

Built-to-last

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

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

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

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

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Automatic Matching for FT-897/857 Series Transceivers

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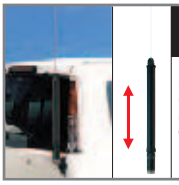

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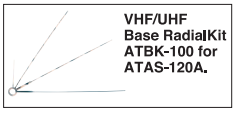

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REAL PERFORMANCE, REALLY PORTABLE

FT-817ND

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This Just In

Joel P. Kleinman, N1BKE
jkleinman@arrl.org

In Brief

- On January 30, at the instruction of the Board of Directors at its January 2009 meeting, the ARRL Executive Committee adopted a policy statement on mobile Amateur Radio operations.
- Volunteer hams are continuing to provide technical support to those who need assistance with the switch-over to digital television, now scheduled for June 12.
- Three IEEE standards for Broadband Over Power Line (BPL) are in development.
- Oklahoma hams alerted the National Weather Service as a rare outbreak of winter tornadoes was about to touch down.
- A cadre of ARES® and MARS volunteers assisted in the aftermath of a devastating late-January ice storm that hit Kentucky and several other states.
- *W1AW Schedule Change:* Effective March 9, the 160 meter CW frequency will move to 1802.5 kHz.
- International Amateur Radio Union Member-Societies voted to elect a new President and Vice President, and to admit two new Amateur Radio societies. Details are in Amateur Radio World, this issue.
- ARRL DXCC Manager Bill Moore, NC1L, has approved the 2008 TT8JT DXpedition to Chad for DXCC credit.
- Noted DXer and ARRL member Jim Smith, VK9NS (ex-P29JS), of Norfolk Island, Australia, passed away February 10.
- On February 6, Los Angeles Superior Court Judge David Yaffe issued a ruling in favor of Alec Zubarau, WB6X, of Palmdale, California, in Zubarau's case against the City relating to his attempt to install an antenna support structure.
- The Second ARRL Homebrew Challenge offers the opportunity to design and build a 50 W amplifier — for $125 total cost.
- The winner of the *QST* Cover Plaque Award for January is William E. Packard, NN9U, for his article "Morse Code: Efficient or Over the Hill?"
- These online course sessions began March 6: Amateur Radio Emergency Communications Level 1; Radio Frequency Interference; Antenna Design and Construction; Technician License Course; Analog Electronics, and Digital Electronics.

Media Hits

Allen Pitts, W1AGP

- Good media hits in the past month have to include WFYI-TV20's "Across Indiana" series which included the Indianapolis Radio Club's hilltop event. The club did all the right things for TV cameras. Well done! An unusual hit was accomplished by the New Mexico Amateur Radio Alliance, which had a 33 foot display in the hallway of the Albuquerque airport. Hams even got a hit in the February 2009 edition of *Field & Stream* magazine for aiding Gallatin County SAR activities. On January 15, MSNBC picked up a Reuters release by Robert McMillan about the magic and enjoyment of capturing radio signals for yourself being far more fulfilling than Internet sites.

MIKE LANGNER, K5MGR

The impressive display at the Albuquerque airport.

- And then there were the ice storms! First to be hit was New Hampshire, and the hams responded. The *Nashua Telegraph* not only reported on their activities, but followed up with a later article about the importance of Amateur Radio and licensing courses held at the Brookline Safety Complex. The HSEM Newsletter (NH Homeland Security and Emergency Management) dittoed the applause and encouraged people to be "better prepared the next time by getting their Amateur Radio licenses."
- But the real crises came in the Kentucky region. The *Lexington Herald-Leader* ran several stories that were also posted on the Kentucky.com Web site. On February 3 they headlined, "Ham radio fills need after the storm." The next day, they reported "...emergency officials scrambled to connect themselves to the outside world by any means available, relying on ham radio operators or relaying messages..." Meanwhile, the *Paducah Sun* headlined "Ham operators provide life line when storm knocks out phones" and WBKO-TV in Bowling Green reported on the Kentucky Colonels ARC and their service to the Red Cross when nothing else was working. Even CNN got into the praise with a story in which reporter Susan Candiotti told how hams were the only means of communication left.

BOB BULLOCK, K5RWB

HAROLD KRAMER, WJ1B

At the Capital City Hamfest in Jackson, Mississippi in late January: **ARRL President Joel Harrison, W5ZN; Mississippi Section Manager Malcolm Keown, W5XX; ARRL Chief Operating Officer Harold Kramer, WJ1B; Arkansas SM J. M. Rowe, N5XFW, and Louisiana SM Gary Stratton, K5GLS. The Jackson ARC hosted the event.**

Area Hams Help at Super Bowl XLIII in Tampa

Local Amateur Radio operators assisted the NFL's Radio Frequency Coordination Group at Super Bowl XLIII at the Tampa Bay Raymond James Stadium. Prior to the game at the Media Center and at the stadium during Media Day on January 27, anyone using RF devices, such as IT devices, WLAN, wireless cameras, wireless microphones and two way radios, excluding cell phones, must have each of them registered, checked and tagged before gaining entry. The NFL is very serious about preventing RFI, so we were assigned to screen all those entering primarily through the Media Entrance. All RF devices are checked for pre-registration, entered into the NFL Event Coordination Program database and each device frequency verified with a spectrum analyzer and/or a frequency counter.

On Sunday, the entire venue was patrolled by our team members, looking for any uncoordinated RF devices. Additionally, we had three RF Direction Finding Teams that worked the stadium to locate and correct any reported interference. It was my pleasure and honor to work with the NFL's Frequency Coordination Group Manager, Jay Gerber, N3AW, and his wife, Barbara, WA3YMF.
— Budd Johnson, N4WBJ

COURTESY BUDD JOHNSON, N4WBJ

From the left, at Super Bowl XLIII: **Back row — Steve Elliott, KS4WA; Budd Johnson, N4WBJ; Roswell Clark Jr, KI4WIF, and Pittsburgh Steelers Frequency Coordinator Otto Schellin, NO3U. Front row — Miami Dolphins Frequency Coordinator Ernesto Diaz, KG4LXH; John Collinson, WB9ATV, and Sara Allen, KI4KMI. Not shown: Jay Gerber, N3AW.**

NJ Scouts Fly High

In January, 56 Boy Scouts from Central New Jersey Council earned their Radio Merit Badges at the David Sarnoff Library in Princeton. This was the fifth year that the Library and Sarnoff Corporation hosted the popular event, run by Amateur Radio operators from the Delaware Valley Radio Association and the David Sarnoff Radio Club. The highlight of the day took place when a local ham radio operator, Dr. Greg Olsen, KC2ONX, described his trip to the International Space Station and how he used Amateur Radio to speak to students from Earth orbit.
— Gary Wilson, K2GW

GARY WILSON, K2GW

Control op Kurt Weirich, K2URT, with Scouts queuing up for their chance to get on the air.

Inside HQ

Triple Play Award

Here inside HQ we have been gratified by the Amateur Radio community's overwhelming response to the new Triple Play Award. The Triple Play is awarded to those amateurs who confirm all 50 states on phone, CW and digital modes in Logbook of The World. Only contacts made starting in 2009 count for this award.

New nets and Web sites have sprung up supporting Triple Play activity. As of this writing, more than 175 amateurs have achieved this award since January 1. We have posted their calls and sequential number on the Logbook of The World Users Home Page.

Join the fun and help others achieve this award. If you live in one of the rarer states, and you have not signed up for Logbook of The World, we urge you to join the 25,000 other amateurs who have done so. The Triple Play Award has even prompted me to dust off my digital interface and get myself up and running again on PSK31.

The bleary-eyed LoTW support group consisting of Dave Patton, NN1N; Norm Fusaro, W3IZ; Bill Moore, NC1L, and Kathy Allison, KA1RWY, have been keeping up with the increased demand for Logbook support. They have updated the material on the LoTW Web site **www.arrl.org/lotw/** including newly revised instructions. Although we offer both e-mail and live support for LoTW, the support staff asks that you please read the instructions before you contact them! Instructions are now available in 10 languages; Polish language instructions have just been added.

We currently award a certificate for achieving the Triple Play Award. Due to member interest and demand, however, we plan to add optional plaques, pins and other Triple Play recognition items in the near future. Keep an eye on the LoTW Web site for up to date information.

QST Updates

Last month, we debuted a new *QST* cover. The new cover is bolder with a cleaner, more modern looking design along with improved color and fonts. Specifically, we have added some additional words to each of the article's descriptions. These captions more accurately describe the articles inside the magazine. In addition, we have added page numbers to the article descriptions to help you find these articles easily and quickly. The new cover was implemented and designed by a team led by cover artist Sue Fagan, KB1OKW, along with Joel Kleinman, N1BKE; Steve Ford, WB8IMY; Deb Jahnke, K1DMJ; Bob Inderbitzen, NQ1R, and Diane Petrilli, KB1RNF.

Starting with this issue, we are combining the Hamfests and Conventions information into one column rather than two separate columns. We will still list events by state, but this change will make it easier for our readers to determine what Amateur Radio event is in their area. There will be no need to flip back and forth between sections to find out where the nearest convention or hamfest will be.

We endeavor to always make *QST,* the ARRL's flagship publication since 1915, informative, up to date and easier to read for our members.

73,

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

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From QST Magazine, March, 2005

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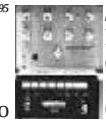

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Have you ever wanted to see a photo of yours in *QST*, the annual ARRL Amateur Radio Calendar or another ARRL publication? Well, here's your chance!

If you're among the winners, not only will photographic skill be propagated far and wide, but we're offering $100 as the First Prize. The winning photo and three runners-up will be published in *QST*. All submitted photos will also be considered for the 2010 ARRL Calendar.

Deadline: Photos must be received at ARRL HQ by May 31, 2009.

Subject: Must be directly related to Amateur Radio, and be in good taste. Photos will be judged on overall quality and composition.

Requirements: Digital images or color prints accepted. If digital, images should be high resolution. A digital image up to 5 MB in size can be e-mailed to **upfront@arrl.org**, subject line "2009 Photo Contest." An image may also be burned to a CD and mailed to ARRL Photo Contest, 225 Main St, Newington, CT 06111. All entries must include caption information describing where the photo was taken, along with a description of the subject of the photo as well as the names and call signs of any persons shown. If you entered last year's contest, please do not resend the same photo for this year's contest. One entry per person.

Miscellaneous: All submitted photos become the exclusive property of the ARRL, and decisions of the judges, composed of *QST* editorial and production staff, are final.

Thank you, and good luck in the 2009 ARRL Photo Contest!

DAVE SARAULT, N3XF

A previous winner: **Dave Sarault, N3XF, entered this scene of St Croix, USVI. Along with K1ZE, he operated CW Sweepstakes from WP2Z in 2006. This year's Photo Contest entries are due at ARRL Headquarters by May 31.**

Helium and Ham Radio

August 11, 1978 was a lovely sunny day in Presque Isle, Maine: A good day for two adventurers to take a fateful step and launch themselves into aeronautical history. Max Anderson and Ben Abruzzo rose from a hay field on their second attempt to be the first balloonists to cross the Atlantic.

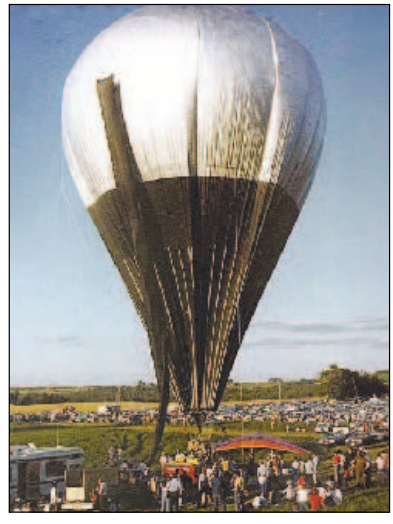
Their craft, the *Double Eagle II*, was their second balloon. The first, the *Double Eagle* launched in September 1977, was forced down in the North Atlantic about 200 miles south of Iceland where Max and Ben spent some desperate hours floating in their balloon's gondola before a US Air Force helicopter was able to rescue them.

The *Double Eagle* had only aeronautical VHF systems, which were reliable near land but were almost useless over the open water. When the *Double Eagle* was forced down in the Atlantic, the adventurers had no means of communicating their whereabouts.

For their second attempt, the *Double Eagle II* was equipped with an extensive collection of communications gear including an Atlas transceiver, which would prove, as ham radio so often does, its inestimable value. As Rich Schwoebel, WY5Z, notes in a fascinating article you can find on the ARRL Web site: "As we amateurs have learned, with Amateur Radio you may not be able to talk to who you want to talk to, but you can usually talk to someone."

Want to know more about ham radio's Atlantic adventure? Head over to **www.arrl.org** and search for *Double Eagle*.

RICH SCHWOEBEL, WY5Z



The launching of the successful *Double Eagle II* flight from Presque Isle, Maine, August 11, 1978. At the lower right is a hang glider that was attached to the base of the gondola but never used.

Hams Assist at Sled Dog Marathon

Northern Minnesota in January is the perfect time and place for a Marathon, as long as it's a sled dog event. The Beargrease Amateur Radio Coalition has been supplying communications for the 376 mile race, and event organizers appreciate their contributions. Jason Rice, president of Beargrease, had this to say: "Ham Radio is absolutely critical to the Beargrease; it is the only communications, and only option. It is the most reliable in the remote locations to ensure the safety and well being of the dogs and mushers."

PAUL WALSH, NAØMI

David Leslie, KC9MKJ, was one of the hams who coordinated communications at this year's Beargrease Sled Dog Marathon in northern Minnesota.

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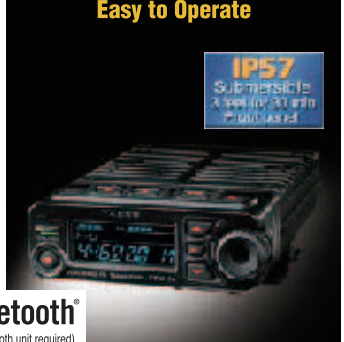

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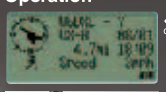

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CORRESPONDENCE

SAFETY FIRST

♦ The ARRL is to be commended for issuing a *Mobile Amateur Radio Policy Statement* [see "Happenings," page 66]. Although belated in view of the current rash of cell phone ordinances being enacted across the country, it nonetheless addresses a potentially dire scenario for those of us who support disaster communications via mobile radio; however, there is an issue that it doesn't cover: Proper installation of amateur equipment. Far too many amateurs do not take the time to properly plan and install their radio gear. In fact, some of them are so hurried, it's an accident waiting to happen. It behooves all of us to make our mobile installations as safe as we can.

The policy correctly states that Amateur Radio is less distracting than cell phone use, but there is still more that can be done to decrease distraction. This leads us back to my point of proper and safe installation practices. Safety and distraction are intertwined and inseparable attributes. If you increase one, you decrease the other. Where you start depends on how well your installation is planned.

ALAN APPLEGATE, KØBG
Roswell, New Mexico

AN INTERNATIONAL PERSPECTIVE

♦ I read an interesting letter by Bruce Walker, KE7SJZ ["Correspondence," Mar 2009, page 24] regarding the phonetic alphabet. The reason why so many amateurs don't use the International Phonetic Alphabet (IPA) is that it has shortcomings when used under very poor signal-to-noise conditions. It was developed way back when, primarily for the International Civil Air Organization, at a time before radio operators disappeared from commercial aircraft on long haul, (sort of pre-1950ish) and voice communications were mainly on VHF. The signal-to-noise ratios were good and the short words were easily pronounced and understood by non-native English speakers. It also didn't take as long to get the message through.

It's been found over a long period of time, especially amongst the VHF DX fraternity in Europe, that when signals are very weak and down in noise (rather than QRM), the IPA words are not good. "Echo" and "Sierra" are easily confused, as are many others; words with a much greater syllabic redundancy are required — much like adding Forward Error Correction to a digital signal. The downside to this is that so many people have trouble recognizing anything other than the IPA, because they are familiar with it. The old Amsterdam — Baltimore — Casablanca alphabet was very good in respect to syllabic redundancy — although "Xanthippe" for X is rather difficult if you don't know any ancient Greek history!

So if KE7JSZ avoids QSOs with people not using the IPA, he may well miss some choice weak signal phone DX.

PETER CHADWICK, G3RZP
Swindon, Wiltshire, England

IT'S A HOME RUN!

♦ I don't know who came up with the idea for the Triple Play Award but I think it's a great idea. I was awarded TPA #47, running only 100 W to a fanfold dipole up 35 feet. I thought winning the Triple Play Award would take months, but it only took three weeks! I could not have done it without the help of the many hams who sent e-mails, made skeds and answered CQs. I renewed old friendships and made many new friends.

ROY GOULD, K1RY, ARRL Life Member
Selbyville, Delaware

SOARING THE HEIGHTS

♦ As any ARRL member, I look forward to receiving *QST* each month, but I could not have been more pleased when I opened my mailbox to see "Annual Antenna Issue" boldly printed on the cover of the March issue. Although we see many fine articles on antennas during the year, I believe giving special significance to antennas — as the March issue does — gives both help to the newcomers, as well as incentive for continual improvement to those of us who have been at it for a while. My hat is off to *QST* once again for this informative issue.

LARRY REID, K1MBF
Baxter, Tennessee

ASK QUESTIONS FIRST

♦ I read with interest the article by Byron Black, W4SSY ["The W4SSY Spudgun," Mar 2009, pages 67-69]. Having encountered spudguns during my law enforcement career, I must say that the quality of construction of W4SSY's antenna launcher far surpasses anything I had seen in the spudgun category in the past.

A word of caution is in order. First, such devices can be lethal. Second, in some places it can be illegal to possess one, or at the very least it can be against the law depending on the age of the user. Before undertaking the construction of such a device, it would be wise to determine its legality in the area of intended use before investing the time and materials which construction requires. A call to your local law enforcement agency should provide the answer.

JERRY BOYD, N7WR, ARRL Life Member
Baker City, Oregon

LOGGING AND BLOGGING

♦ I have an addition to the reasons given by Richard Arnold, AF8X, for keeping a log ["Log It!" Feb 2009, pages 56-57]. A log can be used as an abbreviated personal journal for those of us without the perseverance to actually keep a diary. Since my Novice days in the mid 1950s, I have used my log to make note of unusual weather, new equipment, antenna and other experiments, first contact from a new home, propagation conditions, major news events and other "items of note." The non-ham notes — coupled with ham activity and the dates in the log — have acted as memory triggers for many episodes in my life that would otherwise have been forgotten

DOUGLAS McCRAY, K2QWQ
ARRL Life Member
North Brunswick, New Jersey

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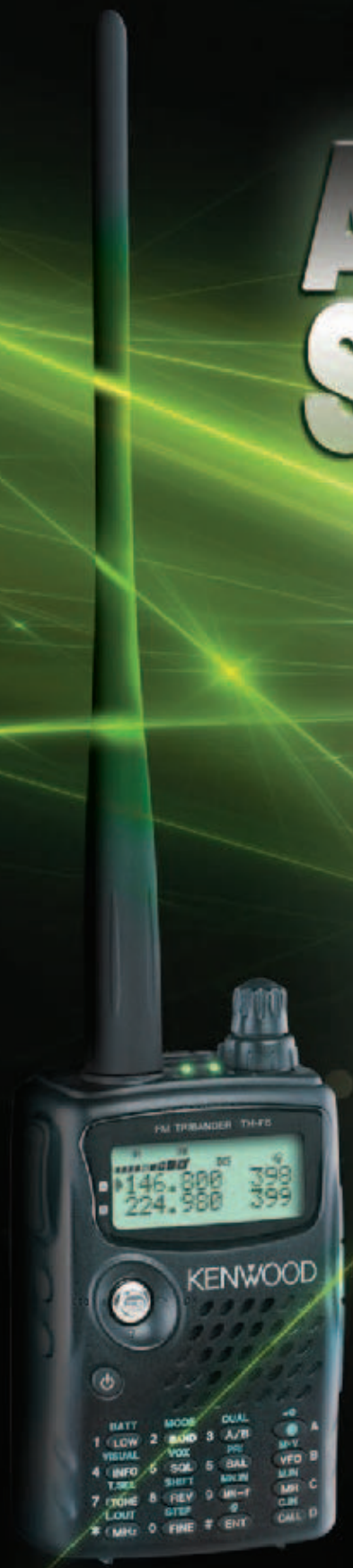
[1]Note that certain frequencies are unavailable. [2]5W output



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Bringing an Early Solid State Transceiver into the 21st Century

Instead of replacing a basically sound transceiver, consider adding the features found in new gear.

Marc van Stralen, DK4DDS

This article describes changes I made to a Drake TR-7 transceiver to bring it up to date. Many could be applied equally well to other transceivers of the era. The Drake TR-7, a solid state HF transceiver manufactured by R. L Drake in Miamisburg, Ohio in the late '70s into the early '80s, has remarkably good performance specifications compared to many more recent transceivers. Its double conversion architecture and analog circuitry lend itself to straightforward operation. The TR-7 is very simple to operate, has no complex menus, and is easy to service and to maintain.

I acquired some TR-7 transceivers, all in working condition, via the Internet in Germany and Holland for prices far lower than current models.

What's Not to Like?

While the basic TR-7 performance is quite good, the 30 year old design does have some disadvantages compared to modern equipment:

- The permeability tuned oscillator (PTO) that controls the operating frequency drifts more than those of modern equipment.
- The original power supply is very heavy and has the same dimensions as the TR-7 itself.
- It has no notch filter.
- The sensitivity on the higher bands is too low for quiet bands.
- The TR-7 offers neither speech processor nor DSP noise reduction.
- The two VCOs of the first oscillator circuit generate excessive phase noise.
- There is neither a front panel TUNE button nor a KEY jack.
- Displays suffer with an analog dial and incandescent bulbs in the S-meter.
- Power output is not flat over the operating range, 1.8-30 MHz.

This article will describe how I addressed each of these deficiencies, while updating the style of the equipment. I now have a radio that can be favorably compared to modern equipment. The modifications are straightforward and incremental, so others may select which are important to them. We will take them one at a time in the sections that follow.

But Wait — There's More

There is far too much information related to this upgrade to fit in a single *QST* article. Some details are provided here, focusing on the added circuitry that might be useful in upgrading other transceivers. A more complete article as well as all PC board artwork, additional schematics and photographs are available on the *QST* binaries Web site.[1]

Notch Filter

The simplest way to create a notch filter for the TR-7 is to use one that operates at audio frequencies. I designed a dedicated printed circuit board (PCB) that can be mounted on the underside of the parent board of the TR-7 with two small stand-off insulators, the type normally used for PC serial and USB ports. The filter is controlled by a relay.

Only a small potentiometer has to be installed at the front of the TR-7 to control the notch filter. When the potentiometer is turned fully counterclockwise, the notch filter will be off. Table 1 lists the defined specifications. The notch filter installed in the TR-7 is shown in Figure 1 with the schematic and parts list in Figure 2.

DSP Noise Reduction

Most current transceivers offer digital signal processing (DSP) noise reduction. As with the notch filter, I chose an audio frequency DSP to provide this function. I used a modified NES-5 DSP board from BHI in the UK (**www.bhinstrumentation.co.uk**). There are other products that could also be employed, however.

The NES-5 DSP noise reduction unit is intended to be connected to the loudspeaker output of a receiver or transceiver. It is built into a small enclosure and includes a built in speaker amplifier IC. I modified the unit by opening the enclosure and removing the PCB. I unsoldered the LM380, the 12 V regulator IC, input resistors R1and R2, and also the output resistors R7 and R8. I replaced the resistors with two 10 turn/50 kΩ potentiometers as shown in Figure 3. Mount the DSP board

[1] **www.arrl.org/files/qst-binaries/**.

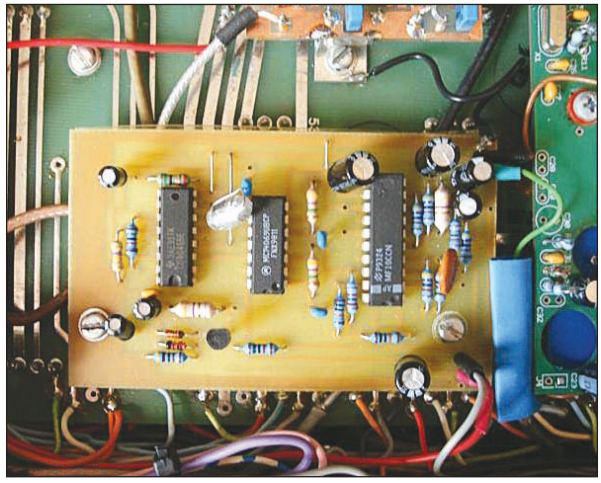

Figure 1 — Notch filter PCB assembled on to the parent board of the TR-7.

Table 1
Specifications of Added Notch Filter

Notch Frequency	*Notch Depth*
300 Hz	30 dB
500 Hz	35 dB
1000 Hz	42 dB
2000 Hz	45 dB

Table 2
Component Changes in TR-7 Exciter Section

Part	*New Value*
C307	47 nF
C310	220 nF
R330	3300 Ω
R333	470 Ω

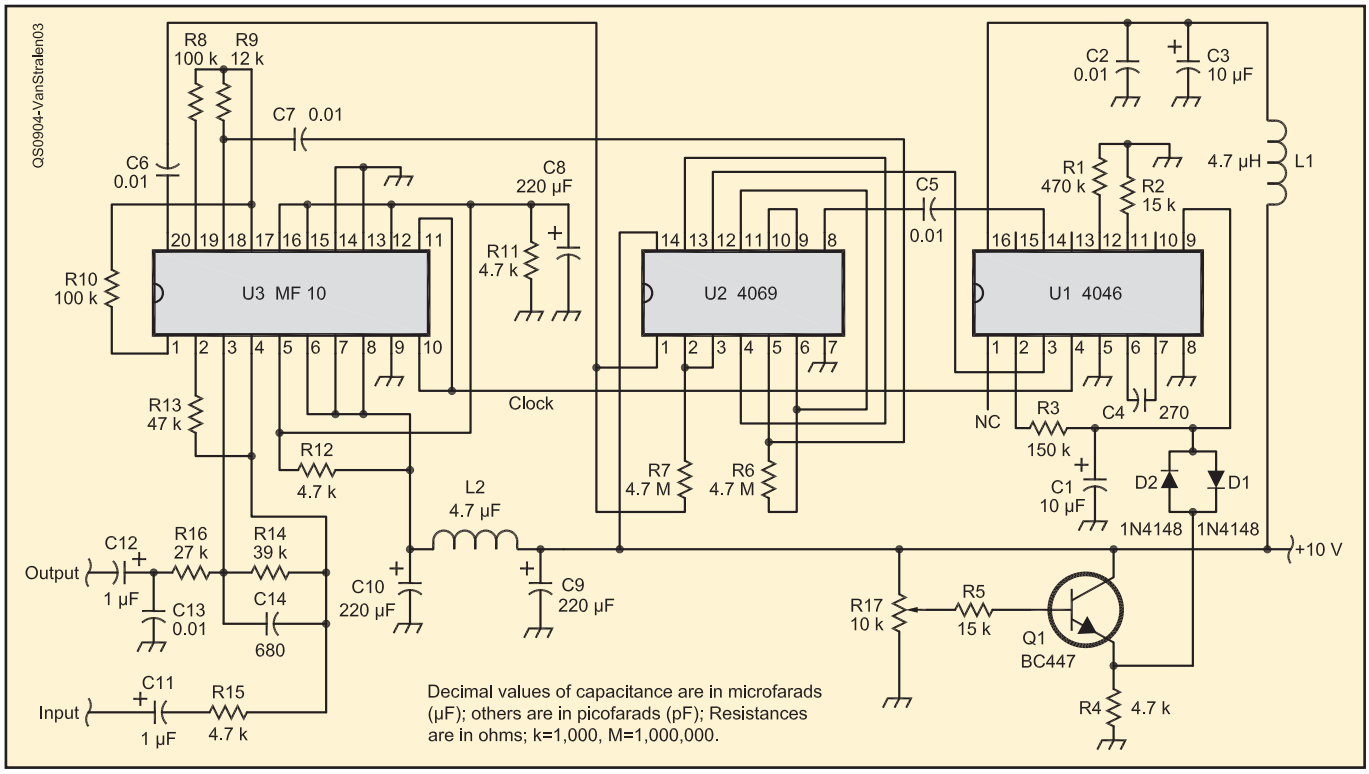

Figure 2 — Notch filter schematic diagram and parts list.

C1 — 10 µF, 16 V electrolytic capacitor.
C2, C5-C7, C13 — 10 nF ceramic capacitor.
C3 — 10 µF, 16 V electrolytic capacitor.
C4 — 270 pF, 2% capacitor.
C8-C10 — 220 µF, 16 V, 3.5 mm electrolytic capacitor.
C11, C12 — 1 µF, 16 V electrolytic capacitor.
C14 — 680 pF ceramic capacitor.
D1-D3 — 1N4148 silicon diode.
L1, L2 — 4.7 µH SMMC RFC.
Q1 — BC 547 transistor.
R1 — 470 kΩ, ⅛ W resistor.
R2 — 15 kΩ, ⅛ W resistor.
R3 — 150 kΩ, ⅛ W resistor.
R4, R11, R12, R16 — 4.7 kΩ, ⅛ W resistor.
R5 — 15 kΩ, ⅛ W resistor.
R6, R7 — 4.7 MΩ, ⅛ W resistor.
R8, R10 — 100 kΩ, ⅛ W resistor.
R9 — 12 kΩ, ⅛ W resistor.
R13 — 47 kΩ, ⅛ W resistor.
R14 — 39 kΩ, ⅛ W resistor.
R15 — 27 kΩ, ⅛ W resistor.
R17 — 10 kΩ linear potentiometer.
U1 — HEF 4046.
U2 — HEF 4069.
U3 — MF 10.

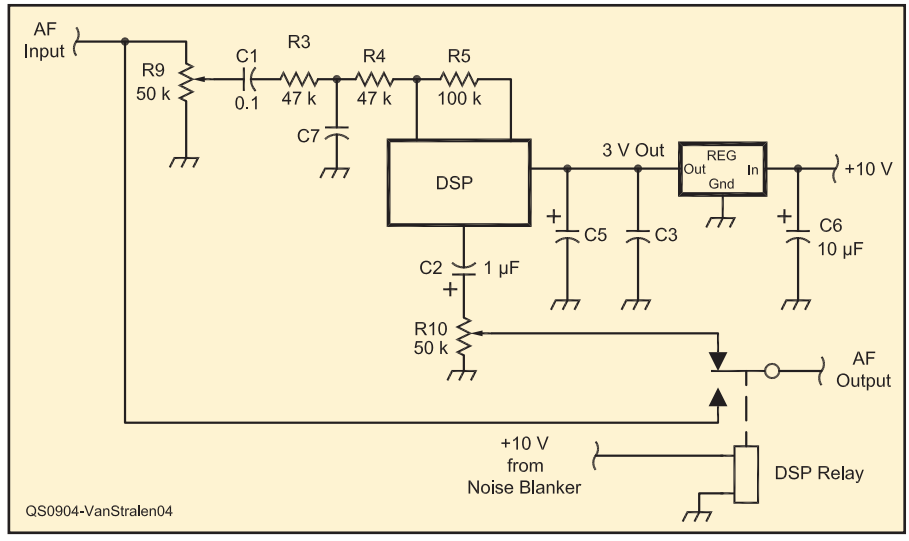

Figure 3 — Schematic of modified DSP including control circuitry.

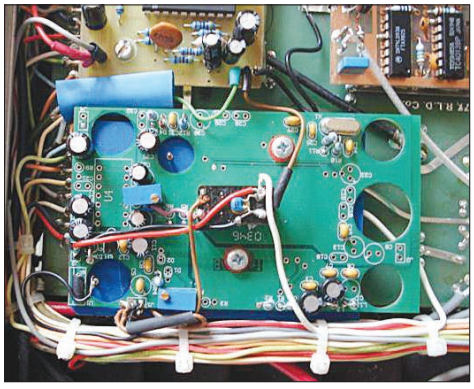

Figure 4 — DSP mounted on the underside of the TR-7 parent board.

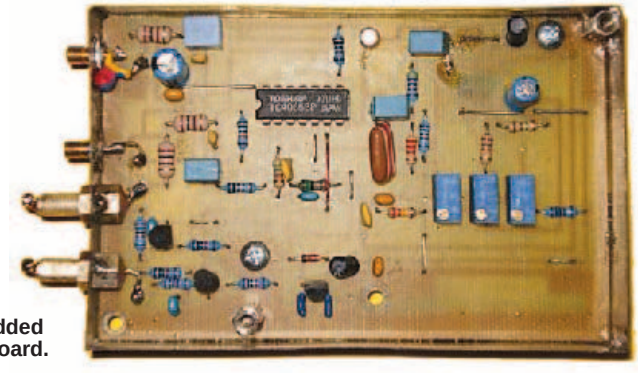

Figure 5 — Added speech processor board.

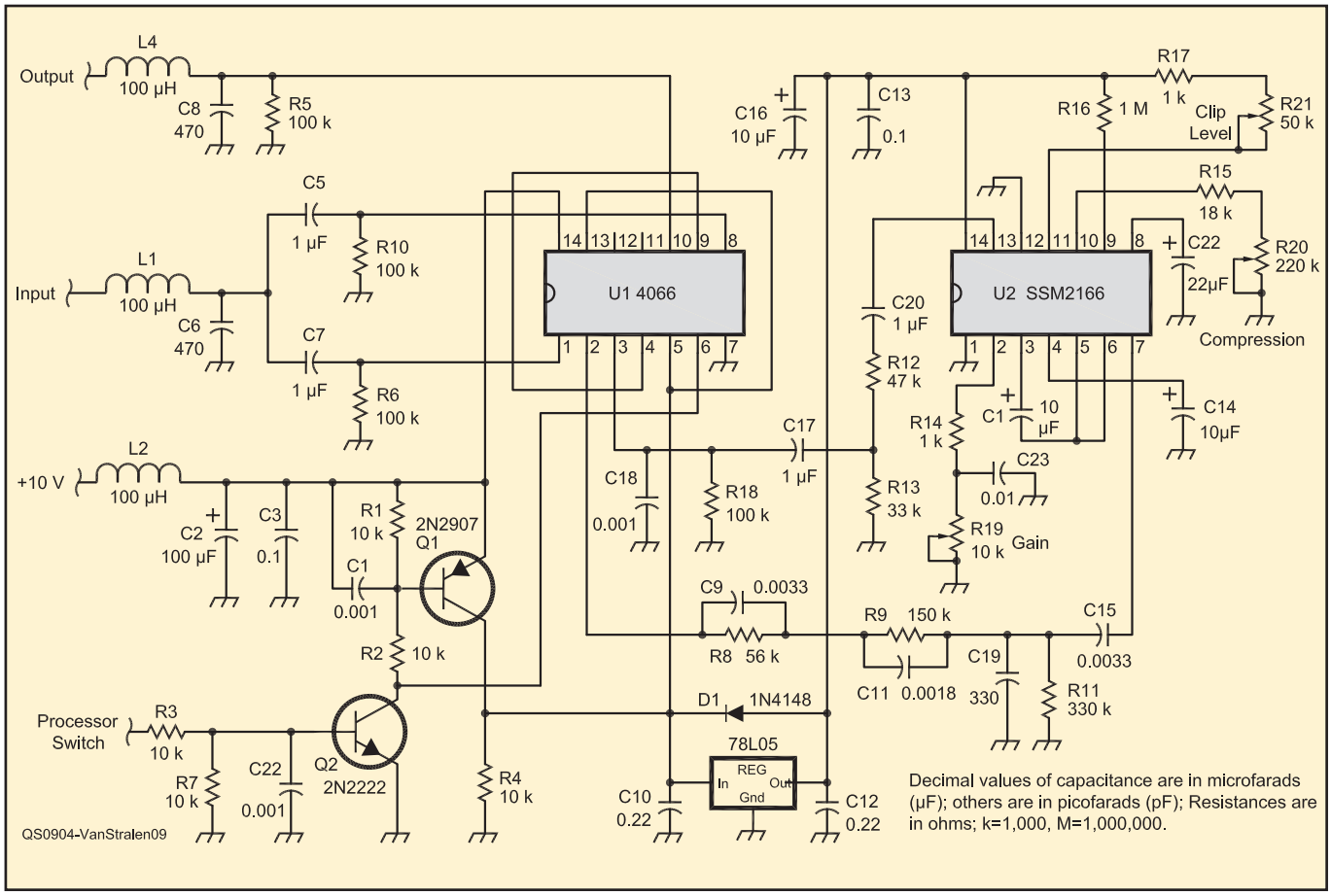

Figure 6 — Schematic diagram and parts list of speech processor board.

C1 — 1 nF ceramic capacitor.
C2 — 100 µF, 16 V electrolytic capacitor.
C3, C13 — 100 nF ceramic capacitor.
C4, C18 — 1 nF ceramic capacitor.
C6 — 470 pF ceramic capacitor.
C5, C7, C17, C20 — 1 µF foil capacitor.
C8 — 470 pF ceramic capacitor.
C9, C15 — 3.3 nF ceramic capacitor.
C10 — 220 nF ceramic capacitor.
C11 — 1.8 nF ceramic capacitor.
C12 — 220 nF ceramic capacitor.
C14, C16, C21 — 10 µF, 16 V electrolytic capacitor.
C19 — 330 pF ceramic capacitor.
C22 — 22 µF, 16 V electrolytic capacitor.
C23 — 10 nF ceramic capacitor.
D1 — 1N4148 silicon diode.
L1-L4 — 100 µH SMMC RFC.
Q1 — 2N2907 PNP transistor.
Q2 — 2N2222 NPN transistor.
Q3 — 78L05 voltage regulator IC.
R1-R4, R7 — 10 kΩ, ⅛ W resistor.
R5, R6, R10, R18 — 100 kΩ, ⅛ W resistor.
R8 — 56 kΩ, ⅛ W resistor.
R9 — 150 kΩ, ⅛ W resistor.
R11 — 330 kΩ, ⅛ W resistor.
R12 — 47 kΩ, ⅛ W resistor.
R13 — 33 kΩ, ⅛ W resistor.
R14, R17 — 1 kΩ, ⅛ W resistor.
R15 — 18 kΩ, ⅛ W resistor.
R16 — 1 MΩ, ⅛ W resistor.
R19 — 10 kΩ trimming potentiometer.
R20 — 220 kΩ trimming potentiometer.
R21 — 50 kΩ trimming potentiometer.
U1 — 4066.
U2 — SSM2166.

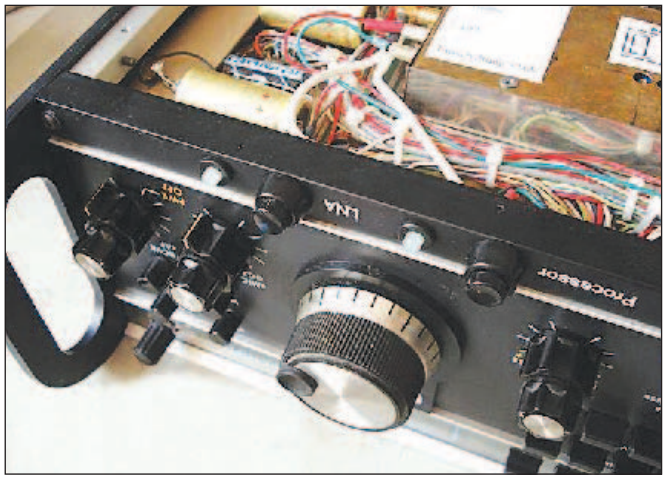

Figure 7 — Installed front panel extension, as seen from the bottom.

Figure 8 — TR-7 with rear extension installed.

Figure 9 — LED built into base of dial light bulb.

and a small 10 V reed relay on an empty piece of PCB board material so that the whole assembly can be mounted on the underside of the parent board as shown in Figure 4.

Speech Processor

The speech processor is a design of Ulrich Graf, DK4SX, who also used it for his modified TR-7. The processor is based on the SSM2166 IC from Analog Devices (**www.analog.com**). I designed a dedicated single sided PCB for the speech processor, to allow it to fit on the underside of the parent board. Some small modifications of the exciter board are needed to switch the processor on or off. The whole unit was built in a complete enclosed metal box, as shown in Figure 5 with the schematic and parts list provided in Figure 6.

Mechanical Changes

The original TR-7 envelope does not provide much space to integrate additional electronics or circuit boards. The only places are on the underside on the parent board and a little space in the high pass filter compartment. There is also very little additional front panel real estate for additional switches or controls. I decided to increase the transceiver and front panel height by about ⅝ inch to accommodate additional jacks and control functions. The changes are shown in Figures 7 and 8.

Bulbs Replaced by LEDs

The bulbs of the S-meter, all indicator lights and the analog dial light are replaced by high intensity LEDs. I used simple defective bulbs, removed the glass and internal wiring and soldered a resistor and LED into the bulb base as shown in Figure 9. By using this method you don't need to replace the sockets in the transceiver.

Conclusions

The additions and changes to the TR-7 that I have described add the modern conveniences we have come to expect to a radio that has been around for more than a quarter century (see Figure 10). The result is a radio that is fun to operate and a good performer in any time period.

Marc van Stralen, DK4DDS, has been licensed since 1970 at age 18 first as PAØMJY, later as PA1HFO. He received his present call letters on his move to Germany in 2004.

Marc has studied electronics and telecommunications and had his own business refurbishing and selling used electronic manufacturing equipment such as soldering machines and placement equipment. Marc retired in 2008.

His interest in electricity and electronics started early and when he was 3 years old he could screw connectors on to electrical wire. At 12 he made his first attempt at building radios, starting with a germanium diode crystal set.

His first Amateur Radio project was the construction of fully transistorized (solid state) 10 W, 2 meter SSB transceiver. After earning his A license, he focused on HF homebrew and kit radios.

You can reach Marc at Schulstrasse 21, D-48455, Bad Bentheim, Germany or at **dk4dds@t-online.de**.

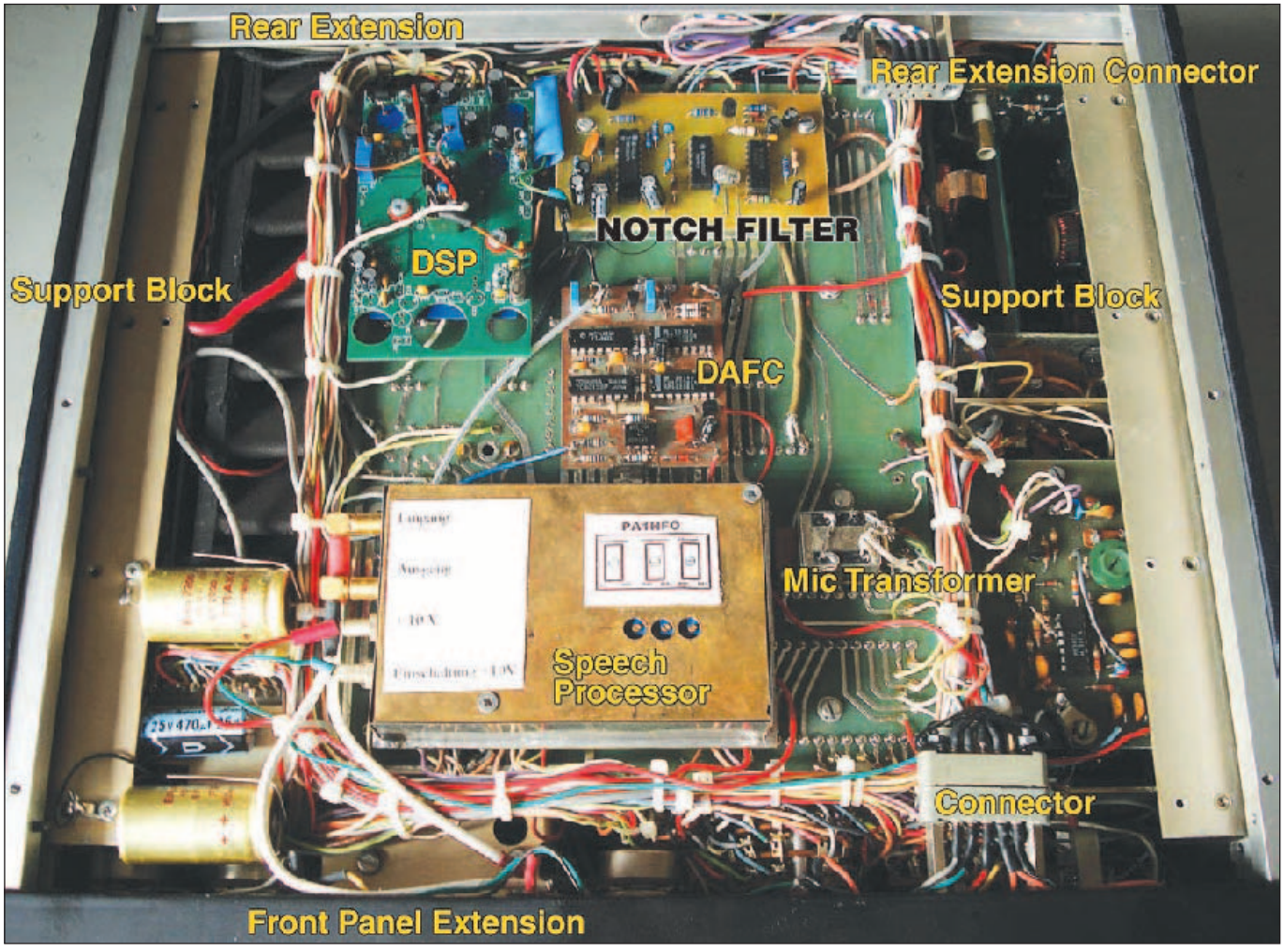

Figure 10 — Bottom view of the TR-7 showing modifications installed.

Hairpin Tuners for Matching Balanced Antenna Systems

Balanced Transmatch designs for 28 to 450 MHz.

John Stanley, K4ERO

Once more, the advantages of ladder line for HF antennas were well presented in July 2008 *QST*.[1] Before WWII surplus brought us cheap coax, balanced feeders were almost always used for VHF as well. In the January 1942 *QST* reproduction that was included with The 2007 ARRL Handbook, we find that both home-brew and commercial VHF gear all used balanced lines.[2] For a given cost, open wire ladder line, window line or even TV twin lead can give you a lower loss installation than trying to buy large diameter coax in an effort to keep the losses to an acceptable level. This is dramatically demonstrated by comparing losses in various line types.[3] So, we wonder, why do so few present-day operators use ladder line or twin lead on the VHF frequencies? Might one reason be the lack of suitable *antenna tuners* (transmatches) for those bands? If balanced tuners were available, would ladder line be as popular at VHF as it has become at HF?

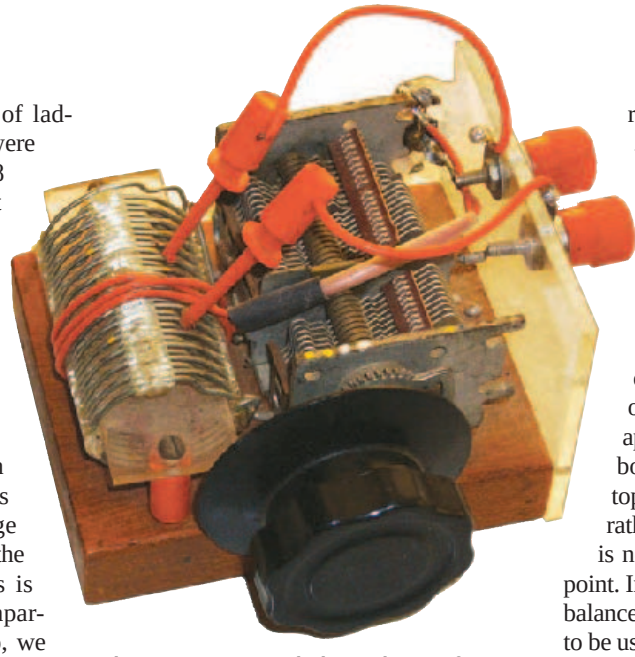

Figure 1 — K4ERO balanced tuner for 60 through 15 meters.

Balanced Tuners for HF Use

The ARRL Handbook, *The ARRL Antenna Book* and other ham publications have always included designs for balanced tuners.[4,5] Adam Nathanson, N4EKV, has one of many good Web sites showing this type of tuner at **www.n4ekv.com/tuners.asp**. I have used tuners like this for years with good results. Figure 1 shows the one I use at up to 100 W on the HF bands.

As noted in Volume 6 of *The ARRL Antenna Compendium*, I lean toward tuners with a fixed link and tapped coil.[6] The match is found by tuning the capacitor and adjusting the output side to connect to a variable number of turns, keeping the taps equidistant from the coil ends. Other versions use the taps for coarse tune and a variable capacitor in series with the link for finer tuning.

Balanced Tuners for the Higher Frequencies

One of the problems with this type of tuner is that as the frequency goes higher, the number of turns on the coil goes down rather quickly. By the time you get to 28 MHz, there may be only four turns on the coil. This means that the adjustment *steps* available are very limited. You can tap to either two or four turns, or if you are willing to unbalance the tap positions, or can access the opposite side of the coil, you could use one or three turns. In either case, the operation is compromised. Another approach is to connect one tap to the bottom of the coil, instead of to the top, effectively using fractions of a turn rather than whole turns, but this often is not feasible from a mechanical standpoint. In addition the symmetry and thus the balance are affected. If this type of tuner is to be used on 10 meters and higher, we need to rethink the design.

Figure 2(A) is a schematic of the conventional tapped link coupled tuner. Figure 2(B) is a representation of what I call a *hairpin* tuner. The electrical properties are essentially identical, but the physical layout of the hairpin type is optimum for the higher frequencies. By making the main inductor in the shape of a hairpin, or shorted transmission line, instead of a single layer solenoid coil, as is used in the conventional design, the tuner becomes much easier to build and adjust. The use of a short short-circuited transmission line section as an inductor is nothing new. It has been used for VHF/UHF circuits for many years.

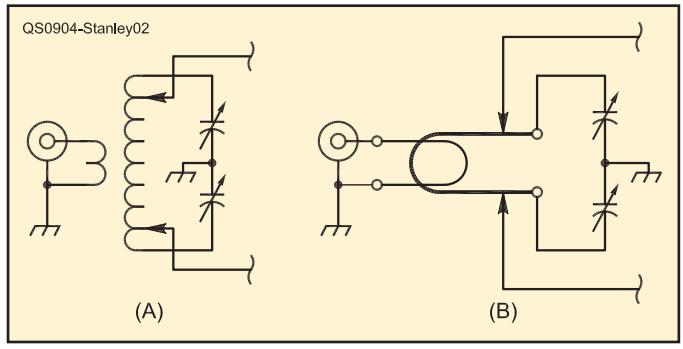

Figure 2 — Balanced tuner configurations. At (A) conventional tapped coil based tuner, at (B) the hairpin equivalent.

Building Hairpin Tuners

For some time I have been using a hairpin inductor in a balanced tuner for 6 and 10 meters, and recently I built one for each of the 144, 220 and 432 MHz bands. The approach is the same on each frequency. A section of transmission line was used instead of the coil typically used on lower frequencies.

[1]Notes appear on page 36.

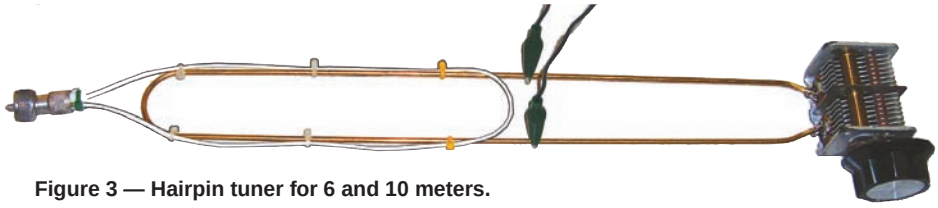

Figure 3 — Hairpin tuner for 6 and 10 meters.

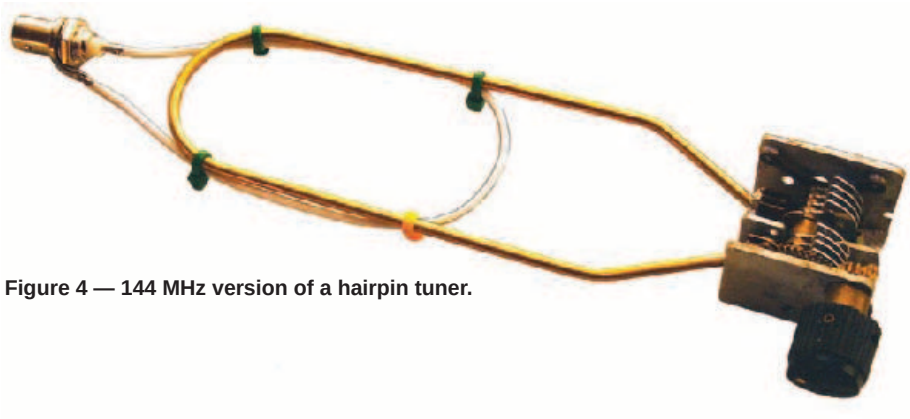

Figure 4 — 144 MHz version of a hairpin tuner.

The capacitor was a split stator or butterfly design. The input link is a single turn inductor that overlaps a portion of the main transmission line inductor and the output taps were taken at whatever point of the hairpin that gives the best match.

The advantage of this layout is that moving the taps to any point on the hairpin is the same as tapping on different numbers of turns on a coil, except that with the hairpin, it is very convenient to make the adjustment in as fine a step as may be desired. In all of my designs, the coupling loop is held to the main hairpin by cable ties. This allows some adjustment of the coupling loop, but holds the loop sufficiently snug so that it is not likely to move around accidentally. Use less loop coupling for higher Q with more selectivity and more loop coupling for lowest loss.

Making them Play

The frequency tuning range percentage will depend on the capacitor used. For widest range, select one with a high minimum to maximum capacitance ratio. All of the capacitors I have tried have provided adequate range to cover the desired amateur band. The range can be extended to cover a second band by putting fixed capacitors in parallel with the variable tuning capacitor. For example, the 6 meter version, shown in Figure 3, works for 10 meters with the addition of a parallel 40 pF fixed ceramic capacitor, while the 220 MHz version, shown in Figure 5, works fine on 2 meters with the addition of a 12 pF ceramic. As it is, the 2 meter version just makes it to 222 MHz, so two bands are possible without switching caps. A single tuner could also work on 10 and 6 meters without switching by careful component selection.

Capacitor Options

The most difficult component to find will likely be the split stator capacitor. There are ways of designing your own capacitor and it is made easier because of the relatively small capacitance required at these frequencies. For all of the designs shown here, I took capacitors from my well stocked junk box. You less well equipped folks will have to search at a hamfest or check out the basement of one of the local old timers. Commercial capacitors are available, but the price may shock you. You could also choose to use a single section capacitor instead of the split stator. In that case, the capacitor shaft and frame will be "hot" and must be floated above ground. You will have to tune it via a long insulated shaft. And, of course, the balance will be somewhat compromised. The method does work and a suitable single section capacitor may be easier to find, however . Alternatively you could use a pair of identical capacitors to ground if you adjusted them each to the same setting or worked out a common shaft arrangement. Fussy, but it could work. Target dimensions and component values for the bands in this range are shown in Table 1.

Inductor Choices

The length of the hairpin will depend on the value of your capacitor. The values below represent tuners I have built and should give you a good starting point. Match the hairpin width to the spacing of the capacitor terminals, or bend the ends of the hairpin in or out at the capacitor end in order to make the connections. Spacing does affect the inductance value so keep it close to what you see in the photos.

My inductors are ⅛ inch diameter brass rod, but they could be soft copper tubing or wire in sizes from 12 gauge up to ¼ inch. Brass welding rods from the hardware store could also be used. A smaller diameter means the hairpin should be shortened a bit as the inductance per inch will be higher. The links should be insulated wire, either enameled or PVC coated or, best of all, Teflon insulated. The 6 meter tuner in Figure 3 uses the shield of Teflon coax as the link. My links do not make electrical contact anywhere with the main hairpin. The coax shield and center of the hairpin could both

Table 1

Hairpin Tuner Component Values, Dimensions and Frequency Range

Band	*Capacitor Value (pF/Section)**	*Inductor Length (Inches)***	*Tuning Range (MHz)****
10 Meters	95-170	15	26-34
6 Meters	15-90	15	36-90
2 Meters	3-20	6	110-225
222 MHz	3-10	4	220-330
432 MHz	3-4	1.5	390-440

*Effective capacity is ½ of the value/section.
**All inductors made of ⅛ inch brass rod.
***Range may by reduced or shifted by reactive loads.

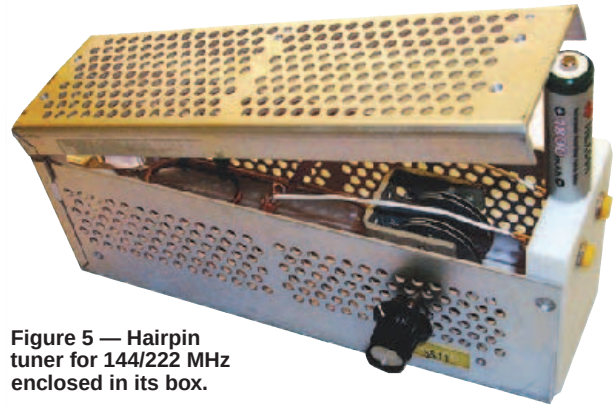

Figure 5 — Hairpin tuner for 144/222 MHz enclosed in its box.

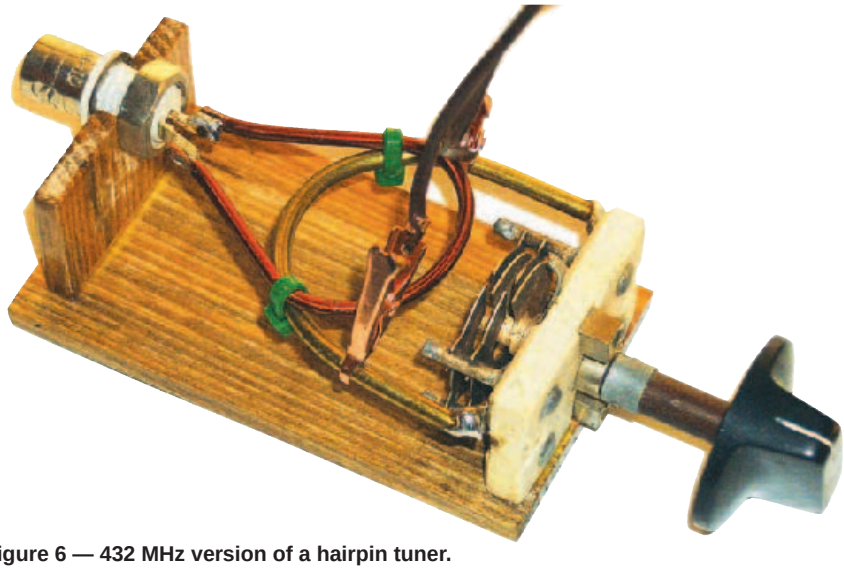

Figure 6 — 432 MHz version of a hairpin tuner.

be grounded to a chassis, if desired.

Tuning Up

Tuning consists of setting the taps to an intermediate position and adjusting the capacitor for minimum SWR. If SWR is not as low as desired, move the taps a bit either towards or away from the capacitor and readjust the capacitor. You should be able to find tap settings that allow the SWR to be reduced to 1:1.

Safety Considerations

Note that neither of the tuners described above are shown installed within a chassis of any kind. This is to show the construction more clearly. Also, I must admit that during tests, I got away with this because I used low power and am very careful not to touch the *hot* parts of the circuit. I also have a non-metallic operating desk. The open construction is useful during experiments.

I definitely do not recommend this approach for general use. You will want to put your tuner in a shielded box of some kind, probably with a hinged lid to allow you to move the taps as shown in Figure 5. You should *never* adjust the tap clips with power applied. The tuning shaft should be brought out through the enclosure where an insulated knob should be installed for tuning even though with a split stator capacitor the shaft should be at ground potential. For high power, the use of a suitable enclosure is essential, especially if the tuner is to be installed close to the operating position. This is to prevent RF burns from contact as well as exposure to excess RF levels.

Remember that your body is more susceptible to pick up from VHF fields than is the case at HF. If you put the tuner well away from the operating position in a place that is protected from access by family members or pets, you may be able to use a somewhat more open construction as is sometimes done with conventional home brew tuners. Radiation from an unenclosed tuner of any type can be enough to cause interference with nearby electronics devices and could cause fires if anything flammable comes in contact with the hot parts of the circuit.

These tuners have been tested with 100 W on 10 and 6 meters, 50 W on 2 meters and 20 W on 70 cm, the maximum output of my rig. For higher power, the designs can be scaled, remembering that the bigger it gets, the lower the frequency for the same geometry. Thus, a design similar to that used here for 432 MHz, but three times larger, would probably work fine with a full kW, but on 144 MHz. Since my 20 W, 432 MHz design uses an inductor that is about as short as is practical (see Figure 6), getting up to 1 kW at 432 MHz, might prove difficult with this design. At the least, a different type of capacitor would be required.

I hope that these simple to build and adjust tuners will start a trend towards greater use of balanced feeders on the higher frequencies just as ladder line has become the favorite for many on the lower bands.

Notes

[1]J. Hallas, W1ZR, "Getting on the Air—Your Second HF Antenna," *QST*, Jul 2008, pp 69-70.

[2]B. Goodman, W1JPE, "Receivers for 112-Mc. Emergency Work," *QST*, Jan 1942, pp 18-25, 74-75.

[3]*The ARRL Handbook for Radio Communications,* 2009 Edition, Figure 21.4. Available from your ARRL dealer or the ARRL Bookstore, ARRL order no. 0261 (Hardcover 0292). Telephone 860-594-0355, or toll-free in the US 888-277-5289; **www.arrl.org/shop**; **pubsales@arrl.org**.

[4]See Note 3, p 21.13.

[5]R. D. Straw, Editor, *The ARRL Antenna Book,* 21st Edition, p 25-3. 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**.

[6]J. Stanley, K4ERO, "The Filtuner," *ARRL Antenna Compendium, Volume 6.* Available from your ARRL dealer or the ARRL Bookstore, ARRL order no. 7431. Telephone 860-594-0355, or toll-free in the US 888-277-5289; **www.arrl.org/shop**; **pubsales@arrl.org**.

John Stanley, K4ERO, holds an Amateur Extra class license and has been licensed for over 50 years. He has worked as a broadcast engineer most of his life, mainly with religious shortwave stations in many parts of the world. He graduated from MIT in 1962 with a BSEE degree. John is an ARRL Technical Adviser. He and his wife, Ruth, WB4LUA, live in Rising Fawn, Georgia. You can reach John at 524 White Pine Ln, Rising Fawn, GA 30738 or at **jnrstanley@alum.MIT.edu**. QST

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A 20 Meter Moxon Antenna

Moxons work great — and they take up less space than full size two element Yagis.

Larry Banks, W1DYJ

I was first licensed as a novice in 1962 as KN1VFX in southern Connecticut, and put a homebrew 807 CW rig on the air. I fed it to an 80 meter vertical outside of my second story bedroom window — with no counterpoise. (The advertisement looked great — how naïve I was!) I was able to make contact with a few local hams, and my best DX was an ARRL Official Observer (OO) report for transmitting a second harmonic on 40 meters, outside of the Novice band. Thus began my interest in antennas.

I quickly gained my Technician class license and built a six element, 6 meter Yagi that I put on a small roof tower, and a homebrew 6 meter AM transmitter based on designs in ARRL publications now long lost. I fell in love with building antennas. My best DX with this antenna and rig was double-hop E-skip to California — I was hooked on antennas.

Fast Forward to Today

I rediscovered Amateur Radio in 1994 and purchased a new home in 1996 on a 210 foot hill ten miles north of Boston — a home I purchased partially because of my love of VHF communications. I consider myself very lucky in that I was able to purchase a home where my ham interests were one of the major requirements. I put a 6 foot tower on my roof with a newly built seven element 6 meter homebrew Yagi, from *The ARRL Antenna Book*, reliving my youth.[1] Shortly thereafter I added an 11 element, 2 meter FM Yagi (a hand-me-down from my dad, WA1INL, now SK) used for repeaters and foxhunting and another 6 foot tower with a homebrew five element, 10 meter Yagi, again from *The ARRL Antenna Book*.[2] A K1FO SSB 2 meter Yagi soon followed, from Directive Systems. (I was in a hurry, and decided to purchase — not homebrew — this one.)

But after completing VHF/UHF Century Club (VUCC) on 6 meters and Worked All States (WAS) on 10 meters, I needed another challenge. I had dipoles for 80, 40, 20, 17 and 15 meters in my backyard, but they were all too low to be really very effective. Early in 2004 I had started working on 20 meter PSK31 WAS and was not happy with the 20 meter dipole. I needed a better antenna.

[1]Notes appear on page 40.

The Moxon Rectangle

I started thinking of putting a simple rotatable dipole at the top of my HF roof tower. I then looked at the 20 meter Yagis in my *ARRL Antenna Book*, but they had a larger turning radius than I could use, due to the spacing of my two roof towers. I also felt I wanted to try something different. Along came the April 2004 *QST* and the article by Allen Baker, KG4JJH, "A 6 Meter Moxon Antenna."[3] Somehow I had never run into the Moxon, but it seemed to have the characteristics I was looking for — smaller than a two element beam with about the same gain.[4] It also offered the front to back ratio of a three element beam. Allen also included some very nice construction methods using insulated tubing support blocks.

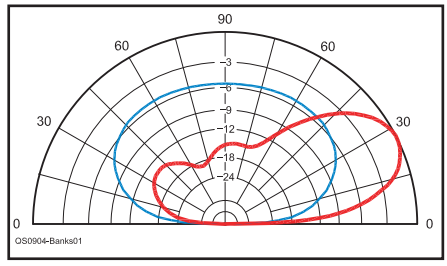

Figure 1 — A comparison of the lower radiation angle and greater gain of the Moxon (red) compared to the dipole (blue).

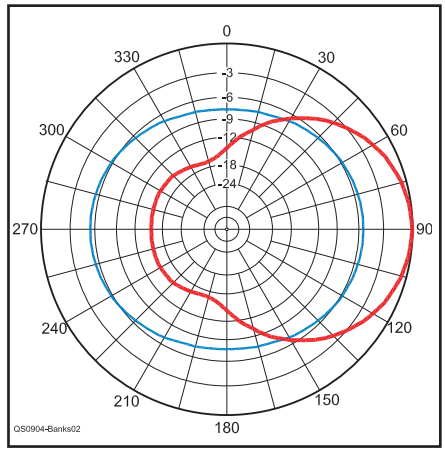

Figure 2 — This shows the superior front-to-back and greater gain of the Moxon (red) compared to the dipole (blue). Both plots are at the Moxon maximum radiation angle of 26° elevation.

Allen's article also referenced the Moxon Web page of L. B. Cebik, W4RNL.[5] I always enjoyed reading LB's antenna columns and articles in *QST*, *QEX*, *10-10 International News* and elsewhere. Somehow I had not run across LB's extensive writings on the Moxon and after spending quite a bit of time perusing the site I was convinced this was the antenna to experiment with.

I had previously used *YA* Yagi analysis software, included in my *ARRL Antenna Book*, to analyze a number of antennas. It was time to upgrade to newer modeling software so this project gave me a reason to purchase *EZNEC* from Roy Lewallen, W7EL, and add that to the fun.[6]

Comparison of Antennas

My dipole was at 18 feet elevation on average, and the Moxon would be at 36 feet at the top of my roof tower's mast. Using *EZNEC* was very informative. I quickly confirmed why my dipole was so poor — it was so low that most of the radiation and reception was directed above 50°. The *good* news, I suppose, was that at the maximum gain (about 5.4 dBi at 60° elevation), the dipole was almost omnidirectional. My dipole could hear high angle noise from all directions!

Figure 1 compares the elevation plots of the two antennas and Figure 2 the azimuth. These plots were very encouraging. The Moxon should do much better, with a lower radiation angle and about 5.3 dB more gain, not to mention a front-to-back ratio of about 15 dB.

Construction

The antenna is built from 6 foot sections of telescoping aluminum tubing. Standard construction techniques were used, with a 3 inch overlap, slotting the end of the larger tube, and using stainless steel pipe clamps to secure the joints.

The mast-to-boom and boom-to-element plates are 3/16 inch aluminum. Stainless steel saddle clamps and insulated tubing support clamps are used with these plates. I used 1¾ inch aluminum (EMT) conduit for the mast and boom. Stainless steel hardware was used throughout. I also decided to use a commercial 1:1 balun at the feed point as it lent itself to a convenient way to connect the coax and transition to a balanced feed.

Table 1

Required Parts and Suggested Suppliers

Part	*Size*	*Quantity*	*Supplier*
Aluminum tubing	¾" × 6'	4	Texas Towers
	⅝" × 6'	4	
	⅝" × 1'	1	
	½" × 4' 9"	2	
	½" × 3' 7"	2	
	½" × 1' 3"	4	
Aluminum plates			Local surplus aluminum dealer or
Mast-to-boom	3/16" × 8" × 8"	1	home supply store
Boom-to-element	3/16" × 4"×12"	2	
Corner plates, 45º	1/16" × 4" × 4"	4	
Tubing support	1/16" × 1⅞" × ⅞"	6	
EMT boom	1¾" × 10"	1	Local hardware store
Fiberglass rod			McMaster-Carr
Driven element	⅝"× 1'	1	
Sides	⅜" × 1' 4"	2	
Corners	⅜" × 6"	8	
Insulated tubing support	¾"	6	DX Engineering
Stainless saddle clamp	1¾"	12	DX Engineering
1:1 balun		1	Unadilla "W2AU" 1/1
Stainless steel pipe clamps	Various	12	Home supply store
Stainless steel hardware	Various	Various	Home supply/McMaster-Carr

The corners need some explanation. Aluminum tubing bent at 90° would normally be used. I had read of several hams having difficulty bending aluminum tubing, however. Based on another one of W4RNL's articles suggesting the use of "L-stock," I decided to use corner plates to sandwich the tubing (see Figure 6).[7] I added fiberglass rods inside the tubing to take care of any deformation of the tubing by the hardware. Although a more complex design, this was easier for me to fabricate with my modest workshop.

See Figures 4 through 10 for construction details and Table 1 for a list of parts and the suppliers I used.

Results

Results for a home-brew antenna come in two forms. The primary measure is how well the antenna performs electrically, but how long the antenna stays up is also important! The mechanical design of a home-brew antenna is just as important as the electrical design, especially in New England.

Mechanical Performance

Let me first address the mechanical design. I erected this antenna in the fall of 2004. As I write this in the winter of 2007-8 I am in my fourth New England winter since erecting it. This has allowed me to see how it handled wind, snow and ice. Each of the first two winters saw a failure — during the first winter a corner plate came off and the antenna quickly became a complex 1½ element beast with very strange RF behavior. It still worked, sort of. When I investigated this failure I realized that the #6 hardware I originally used was not sufficient, especially because I just used lock washers and nuts. Switching to #10 hardware with lock washers and locking (nylon insert) hex nuts fixed this design deficiency (see Figure 6).

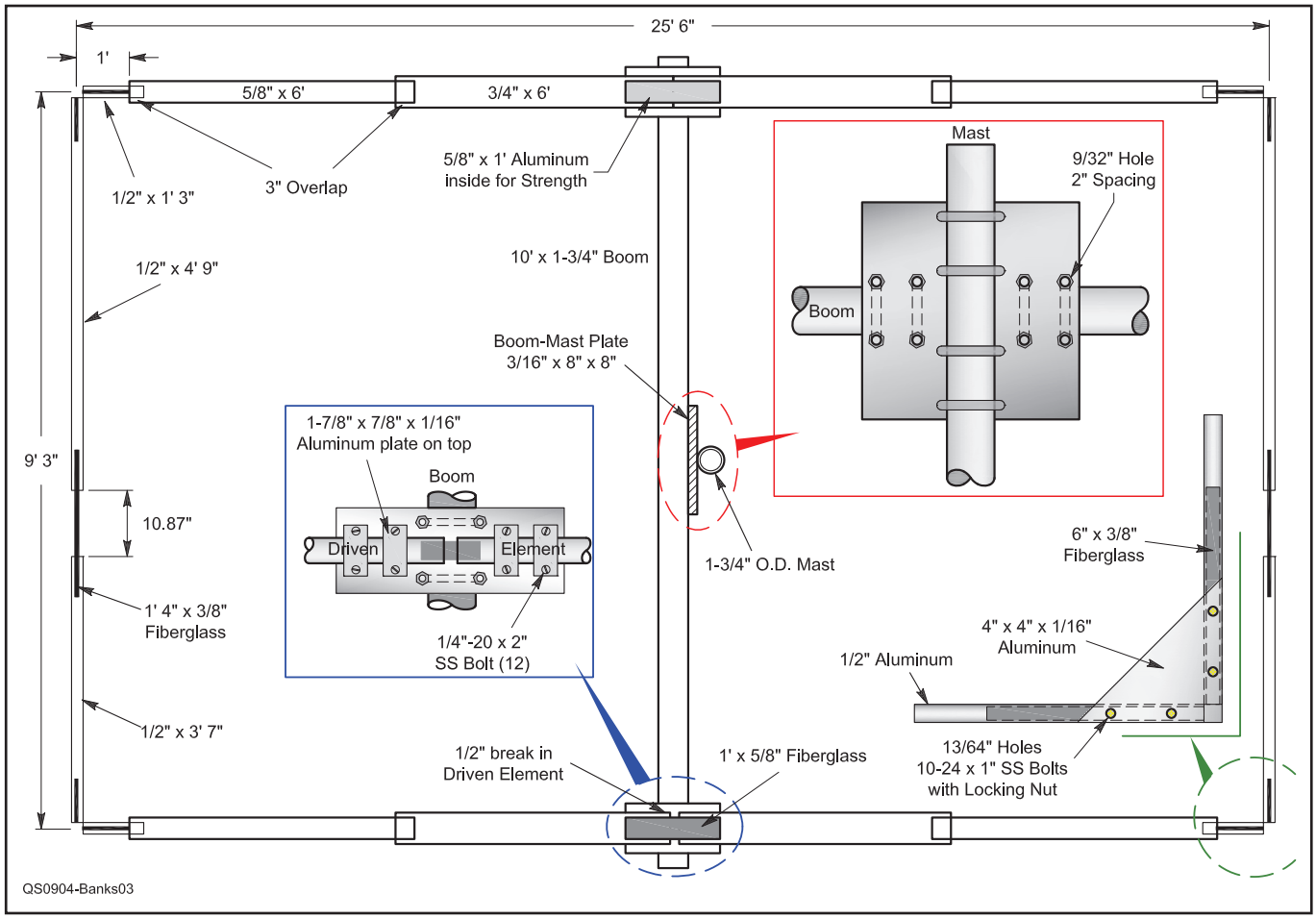

Figure 3 — Details and dimensions of the antenna and various mounting brackets.

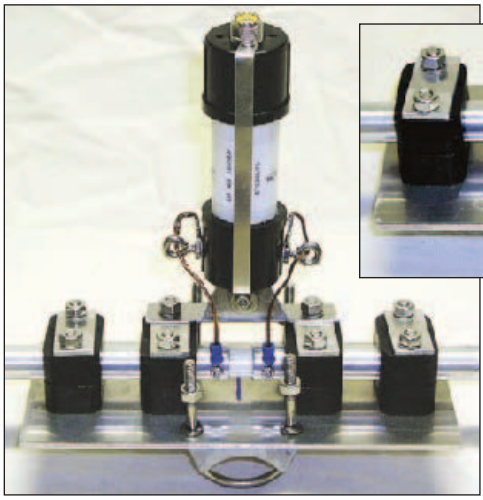

Figure 4 — Driven element boom-to-element detail. Note that the assembly is upside down as shown and the Balun hangs down in use. The fiberglass rod can be seen inside the ½ inch break in the driven element.

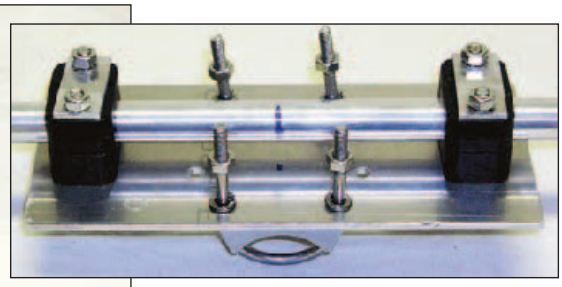

Figure 5 — Reflector boom-to-element detail. The small aluminum plates on top of the insulated pipe clamps were added for strength.

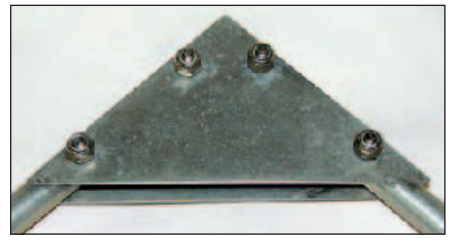

Figure 6 — Detail of the corner construction showing the two triangular plates and locking hex nuts. For an explanation of why the hardware looks new and the aluminum looks old, see the discussion about mechanical performance.

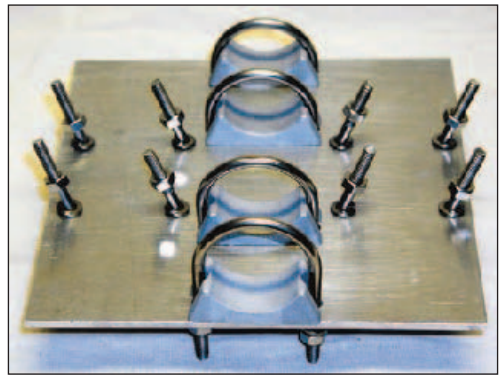

Figure 7 — Detail of the mast-to-boom plate.

During the second winter the SWR became intermittent. Usually fine, it would go to infinity as soon as I started a QSO with a station in an unconfirmed DXCC entity. Again, I discovered this was due to the #6 hardware that I used to connect the balun to the driven element. I should have taken the antenna down from the tower after the first failure and changed *all* of the hardware as above, but that was a lot of work and I didn't — lesson learned!

SWR Performance

Accepting the initial mechanical failures, which only reduced the amount of time I have been able to use the Moxon, the really important information is how does it work with RF. I have tried to be as quantitative as possible with minimal test equipment. My SWR testing has been with my Autek Research RF-1 SWR analyzer. My receiver testing has been with my Kenwood TS-2000 using its S-meter for gathering data. Since modern transceiver manufacturers usually do not adopt the classically accepted S-unit of 6 dB, I have used 5 dB for the TS-2000. (I have seen postings of from 4 to 6 dB for the TS-2000 S-meter calibration, and as typical transceivers do not have linear S-meters, I took this as a reasonable compromise.)

Figure 8 — The antenna under construction in my backyard.

Naturally, the first thing I checked was the SWR. Figure 12 compares the *EZNEC* prediction with my measured SWR. The test data is with the Moxon on my test stand on my back deck using my Autek analyzer and about 20 feet of LMR-240 coax, and when it was installed on my roof. Note that the Autek resolution is 0.1 units, so the measured data is stepped. I cannot explain the upward shift in frequency while on my roof, other than to assume it is the effect of the real life environment and the 10 meter Yagi 6 feet below

Figure 9 — Moxon pointing straight up on my test stand for initial testing. My HF roof tower with the five element 10 meter beam can be seen waiting for the antenna to be mounted.

Figure 10 — Moxon mounted on the HF roof tower above the five element 10 meter beam. The *roof ladder* shown helps save the shingles and enhances safety.

Table 2

Comparison of Signal Strength, Field Day 2005

The dipole runs roughly north and south

Station Location			S-units		Station Location			S-units	
State	*Distance (Miles)**	*Azimuth (°)*	*Moxon*	*Dipole*	*State*	*Distance (Miles)**	*Azimuth (°)*	*Moxon*	*Dipole*
ID	750	270	6	5	MS	1200	225	9	8
IL	950	270	7	5	CA	2500	255	9	7
AL	1050	225	5	—	MS	1200	280	9 +20	9
IA	1100	270	8	6	CA	2500	255	8	7
TX	1700	240	7	6	SD	1500	270	7	5
NC	600	240	9	7	AB	2000	300	8	5
AR	1200	240	9 +15	9	CA	2500	270	7	3
AZ	2200	240	9	7	MI	700	270	7	3
CO	1700	270	9 +20	9	NC	600	240	7	5

*Estimated

Figure 11 — The two roof towers, with my VHF antennas to the right: K1FO 2 meter, 2 meter FM and seven element homebrew 6 meter Yagi.

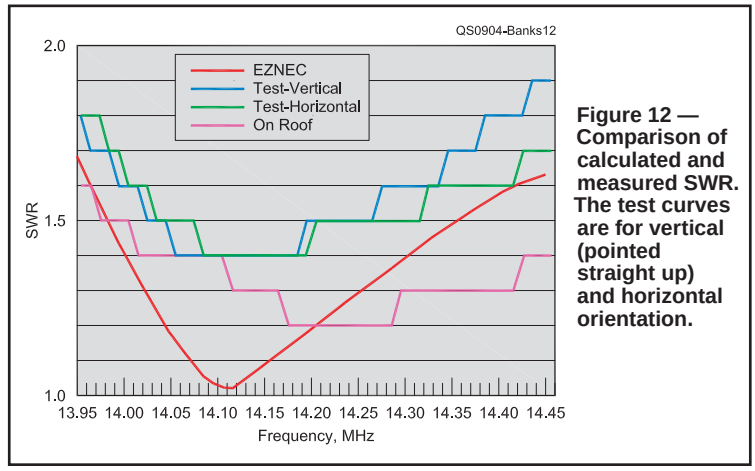

Figure 12 — Comparison of calculated and measured SWR. The test curves are for vertical (pointed straight up) and horizontal orientation.

it. (This would be a good future study for *EZNEC*.) Note that the on-roof measured SWR is measured in the shack and therefore is better than reality due to the attenuation of about 70 feet of LMR240 coax.

On Air Performance

Casual operating showed that the Moxon was one to two S-units better than the dipole in all directions, about what I expected based on the *EZNEC* analysis. Testing with W1PW in Arizona (about 2200 miles from Boston) showed up to 4 S-units improvement over the dipole with different propagation, and reasonable front-to-back ratio.

I needed to be more analytical about the Moxon compared to my dipole if I wanted to really understand how it was working, however. ARRL Field Day 2005 gave me an opportunity. Usually a member of W1HP's Field Day effort, for a number of reasons I decided to work from home. After confirming a contact, I documented the S-meter readings from both the Moxon and my dipole. Table 2 shows the results from this quasi-qualitative experiment.

As can be seen in the table, the difference between the Moxon and the dipole ranged from one S-unit to around 20 dB, if I can believe my TS-2000 S-meter. In all cases the Moxon was better.

I plan on continuing these measurements to obtain a better understanding of the Moxon's beam pattern. I believe the Moxon is a great addition to my RF arsenal.

Acknowledgments

Many people and groups have helped me along with ham radio. I need to mention a few. First is my friend Phil Walker, W1PW. Phil was instrumental in encouraging me to become re-involved in ham radio in the early '90s and without him I would not be on the air. Next, the late L.B. Cebik, W4RNL, for his extensive writing on antennas. Finally and most importantly, my wife, Maren, who puts up with towers on our roof, dipoles in the backyard, sometime TVI, a not always clean workshop and projects for her that are often delayed.

Notes

[1]*The ARRL Antenna Book*, 17th edition, 1994, p 18-18.

[2]See Note 1, p 11-11.

[3]A. Baker, KG4JJH, "A 6-Meter Moxon Antenna," *QST*, Apr 2004, pp 65-67.

[4]See **www.moxonantennaproject.com/backround.htm** for information about the Moxon antenna. It was developed by the late Les Moxon, G6XN, author of *HF Antennas for All Locations*, Available from your ARRL dealer or the ARRL Bookstore, ARRL order no. 4300. Telephone 860-594-0355, or toll-free in the US 888-277-5289; **www.arrl.org/shop; pubsales@arrl.org**.

[5]Moxon Rectangles, **www.cebik.com/moxon/moxpage.html**.

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

[7]"An Aluminum 2-Element Moxon Rectangle," **www.cebik.com/moxon/mox.html**.

An ARRL member, Larry Banks, W1DYJ, was first licensed as a Novice in 1962 as KN1VFX in Stratford, Connecticut and is now an Amateur Extra class licensee. Seldom active during the '70s and '80s due to marriage and kids, he became active again in 1994. Larry holds three degrees in Electrical Engineering from MIT, and worked at Hewlett-Packard/Agilent Technologies for 36 years. He spent 24 years in Medical Instrumentation R&D, first as a design engineer of Electrocardiographs and then as a Project/Section Manager in Cardiac Ultrasound Systems. He moved to HP Corporate Education in 1993 and was the Global Program Manager for Agilent's Enterprise-wide Learning Management System after Agilent split off from HP. "Retiring" in 2005, he now consults with companies who need to implement eLearning and Learning Management Systems. He can be reached at **larryb@alum.mit.edu** *or at* **www.qsl.net/w1dyj** *where you can see other photos of Larry's shack and location north of Boston.* QST

A Removable HF/VHF/UHF Mobile Installation

Build portability into your mobile installation.

Paul Stone, KQ6RJ

My original fuzzy goal for this project was a no-holes-drilled installation of two transceivers in our 2005 Toyota Highlander. It developed into a mobile installation that can be quickly removed as a unit to serve as a field station, as a base station or just for theft prevention.

This portability was achieved because the transceivers feature detachable control panels. I secured the main chassis of a Yaesu FT-900 HF transceiver and a Yaesu FT-7800 VHF/UHF dual-band mobile rig inside one plastic file-storage crate. Mounted inside the open framework of a lightweight crate and conveniently located in the SUV's luggage compartment, the two transceivers — together with their remote control heads — are easy to disconnect, dismount, pick up and relocate.

Transceiver Installation

My FT-900 HF transceiver came with mounting brackets and the optional front panel separation kit. To provide a hard, flat surface for the transceiver's chassis, I cut a ¾ inch melamine board to approximately 12 × 15 inches to fit snugly into the bottom of the 10.75 × 14 × 17 inch (HWD) plastic filing crate. I fastened the supplied transceiver mounting brackets to the melamine board and supported the transceiver inside the brackets. I positioned the transceiver's chassis to maintain a fixed clearance beneath it and to all four sides. Be sure to keep the hot surfaces of the transceiver away from the plastic crate material. You'll also want to situate the transceiver so that controls on the front and connectors on the rear panel are accessible through the crate's framing.

The mounting board needed additional restraint inside a vehicle in motion. I prepared the melamine board by gluing insert nuts into three edges of the particleboard material. Brass screws passed through holes drilled in the crate's plastic framework and threaded into the three insert nuts secure the board vertically and laterally.

In order to be able to easily lift the transceiver out for maintenance, I attached two cabinet handles to the board. Since the HF transceiver occupied the bottom of the plastic crate, I mounted the FT-7800 to another board attached, instead, to the upper edges of the crate. The FT-7800 was similarly supplied with mounting brackets that I fastened to the underside of a 6 × ¾ inch board, cut to a length of about 15.8 inches. With the FT-7800 transceiver chassis suspended underneath this smaller board I fixed the board along its two short edges to the top edges of the crate using four brass screws, as above.

This configuration gave plenty of vertical clearance between the FT-900 and the FT-7800. The narrow upper board left a wide gap for convective ventilation. The plastic filing crate's open framework provides ventilation, access to the transceivers' front and rear panels as well as attachment points for cables and wires. In Figures 1 and 2, you'll see that I've used cable ties to secure the dc cables and their ferrite RF chokes to the outside of the crate. The crate is tethered in the luggage compartment with a hooked rubber tie-down.

Power Cable Installation

One of my selection criteria for the dc power cable was to maintain an adequate supply voltage by minimizing the voltage drop between the battery and the transceivers. With this in mind, I chose the largest conductor size — 8 gauge — that I could manage to route and sheathe along the cable length of about 18 feet. I fused both the negative and the positive 8 gauge wires near the battery terminals with 30 A blade fuses installed inside covered fuse holders. After the installation was completed I measured a voltage drop (at the junction box, described later) of about 0.3 V under the expected maximum load of 100 W SSB transmitter output.

There were no suitable hole plugs to breach in the Highlander's firewall for the dc power cable. Instead, I took a path underneath the vehicle from the battery to the rear luggage compartment. This route, entirely under the driver's side of the vehicle, bypasses the firewall and avoids the wiring harnesses and the vehicle electronic control module

[1]Notes appear on page 43.

(ECM). Fortunately, there is an unused rubber hole plug that communicates between the underside and a cavity inside the Highlander's rear compartment.

After slicing open the hole plug I passed the two 8 gauge wires, sheathed in split flex tubing, into the rear compartment from underneath as shown in Figure 3. I resealed the hole plug opening using silicone adhesive sealant. To anchor the sheathed 8 gauge wires along the SUV's underside and inside the engine compartment I used UV resistant nylon cable ties wherever possible (see Figure 4).

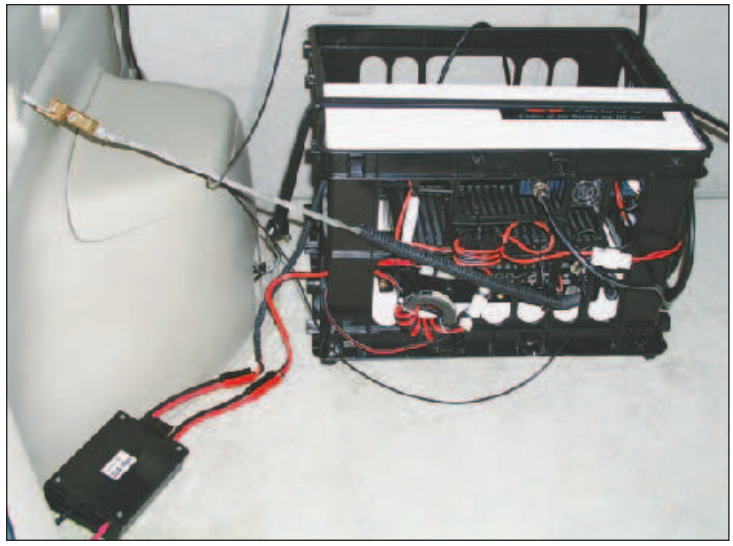

Figure 1 — Rear view of crate positioned in the luggage compartment. A large alligator clip attaches the HF transceiver's grounding strap to a recessed trim bolt (behind a cover plate) for quick disconnection. Cable ties hold the dc cables and their ferrite RFI chokes fast to the plastic crate's framework. The homebrew junction box is on the left.

At certain locations on the vehicle's underside, however, I used nylon mounting bases to provide attachment points for the cable ties. The mounting bases are sold with an adhesive backing that I peeled off while applying heat with a hair dryer. I prepared each base's new bonding surface by lightly sanding and wiping it clean with isopropyl alcohol. I then attached the mounting bases using 3M Black Super Weatherstrip Adhesive, due to its claimed resistance to temperature changes, water, oils and fuels. Elsewhere, I fastened nylon cable clamps to exposed screw shafts with stainless steel nuts and washers.

You may want to protect the sheathing with an additional, short overwrap of split flex tubing in the clamped area. As a thread lock and for corrosion protection, I applied touch-up paint to the threads. In the SUV's luggage compartment I attached the two 8 gauge wires to a terminal block mounted inside a homebrew plastic junction box. I connected two short pairs of 10 gauge wires to four unoccupied terminals, one pair to supply each transceiver.

These 10 gauge wires were terminated with 45 A Anderson Powerpole connectors to provide commonality and to couple to the 30 A Powerpole connectors I installed on the transceivers' factory-supplied 12 gauge dc cables. Equipped with Powerpole connectors, the transceivers' dc power cables are easily connected or disconnected at the readily accessible junction box in the luggage compartment.

Remote Control Heads and Audio

I attached the FT-900's control head to the windshield using a gooseneck-style suction mount with hole patterns that matched the sub-panel's mounting bracket or cradle. There's a similar mounting bracket for the FT-7800's front panel. Beneath the Highlander's center console is a storage compartment open on both sides that provided a unique mounting solution for the VHF/UHF unit. I looped a webbed strap through the front panel's bracket, positioned the control head assembly on top of the center console and passed the strap through the open storage space below. I snapped the buckle closed and pulled the strap tight to firmly secure the front panel, cushioned on non-slip shelf liner. Driver, or passenger, view of the control arrangement is clearly shown in the lead photo.

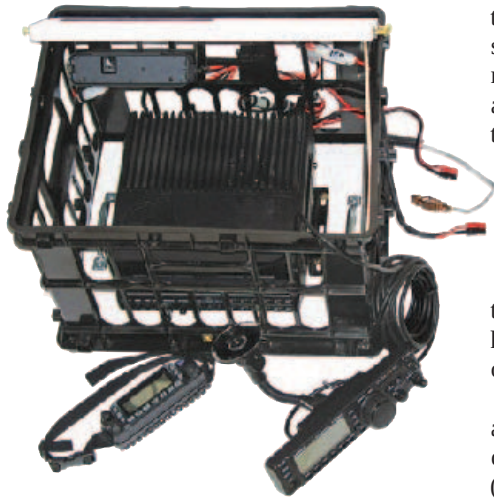

Figure 2 — Front view of crate with FT-7800 VHF/UHF chassis tilted up to show the interior. The mounted FT-900 HF transceiver chassis can be lifted out by grasping the cabinet handles.

With this arrangement I had both HF and VHF/UHF remote control heads located adjacent to the driver's seat. I also wanted to get quality audio through the six speakers of the Highlander's factory-installed stereo system. I've previously used CD to cassette player adapters with individual radios, but now I had the receive audio of two radios to couple to the vehicle's sound system. With a Y connector's plugs inserted into the external speaker jacks located on the two chassis, I connected one shielded audio cable to the Y connector's jack. I ran this audio cable from the SUV's luggage compartment to a cassette adapter inserted into the stereo system's cassette player. With this single adapter arrangement you have the capability to monitor the audio from the two transceivers simultaneously through the vehicle's stereo system. You also won't have to install additional speakers for the radios. I snaked the audio cable and the two remote cables from the luggage compartment through a gap between the fold down rear seats and along the floor to the center console and dashboard. To remove the mobile installation from the SUV, therefore, I don't have to disconnect cables from either the control heads or the transceivers. A block diagram of the system is shown in Figure 5.

You should check out the method for a clever mobile microphone clip holder described by David Quam, WØCIA, in *QST* (May 2005). A ½ × ¼ inch nylon hex bushing will fit snugly into an automobile lighter socket. Thread a ¼ inch nylon hex plug into the bushing, fasten the factory-supplied microphone clip to the hex plug and insert the assembly into a lighter socket. Hang microphone on clip.

Damage Report

Number of holes drilled in vehicle — zero. Amount of adhesive applied to vehicle's interior — none. Secured without fasteners or adhesives, the remote control heads are just as portable as the transceivers' main units mounted inside the plastic crate. The only part of the mobile installation you might consider irreversible is the dc power cable, for which I sacrificed one easily replaced rubber hole plug. I ordered a new hole plug from Toyota to keep with the vehicle.

Performance

Noise. To reduce automotive RFI pickup, I twisted the 8 gauge power cable wires

Figure 3 — The dc power cable entering the luggage compartment. The red arrow points to the sealed rubber hole plug. The yellow arrow points to a cable clamp attached to an exposed screw shaft.

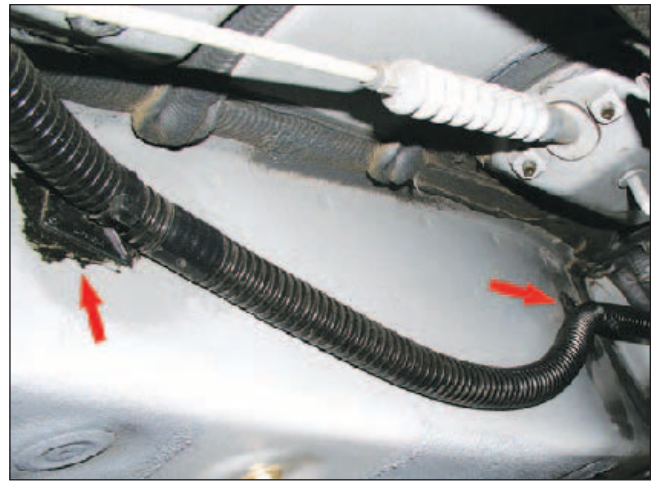

Figure 4 — The dc power cable anchored with cable ties attached to nylon mounting bases (red arrows).

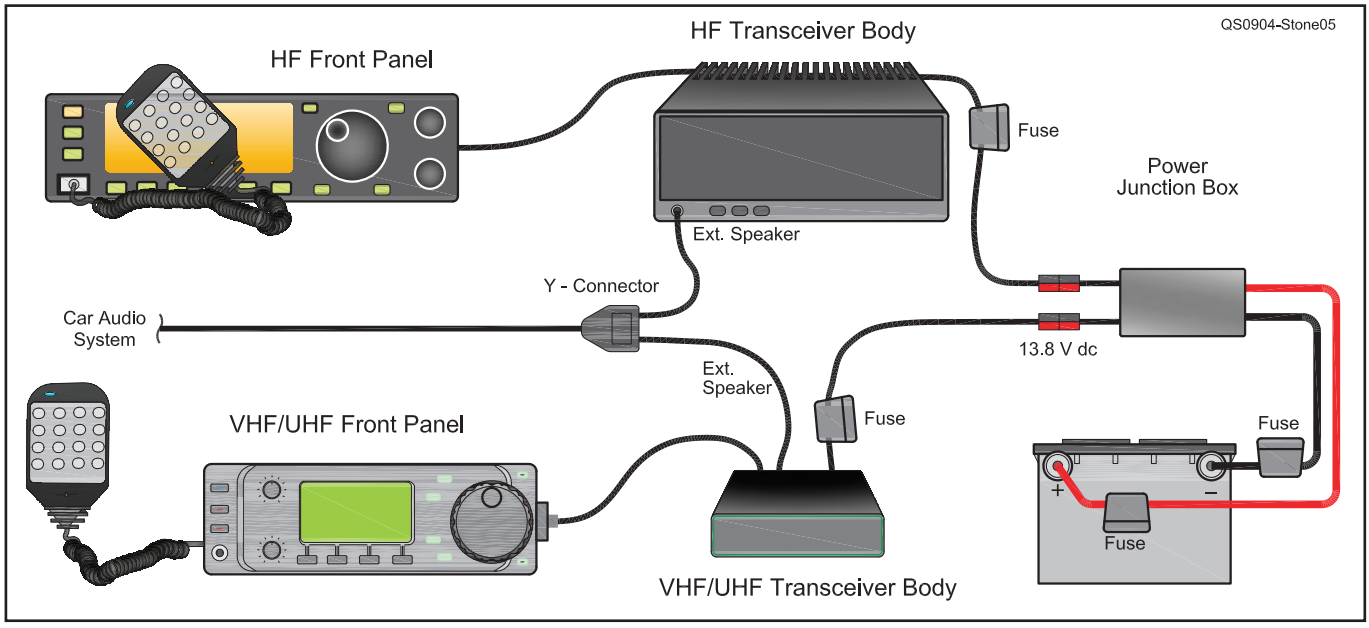

Figure 5 — System block diagram.

together over their entire length and wound both transceivers' dc power leads through ferrite cores. The only automotive noise evident is impulse-type noise on the HF bands, which varies with engine RPM and which is practically eliminated by the FT-900's noise blanker. The noise disappears when the HF antenna is disconnected, confirming that it is radiated and likely originates in the ignition system.

Mobile DX. The HF mobile antenna system consists of a Valor Pro-Am monoband whip installed on the SUV's rear door with a Diamond K400 trunk/hatchback mount. One of my first HF mobile contacts was a Hawaii station on 20 meter SSB. While parked on a bluff overlooking an Orange County beach I responded to his CQ and had a memorable and genuine RS 59 contact discussing the wonders of the Big Island. Later that year, as my wife drove us through central California on Highway 101, I hunted DX contacts on 20 meters during the *CQ* World Wide DX Contest (SSB). Two stations from Japan that came back to my call seemed to have no difficulties with the mobile signal.

Notes

[1]*Amateur Radio on the Move*. Available from your ARRL dealer or the ARRL Bookstore, ARRL order no. 9450. Telephone 860-594-0355, or toll-free in the US 888-277-5289; **www.arrl.org/shop/**; **pubsales@arrl.org**.

[2]D. Green, KB8CS, "Technical Correspondence — Fuses For the Rig In Your Vehicle," *QST*, Jun 2007, pp 73-74.

[3]D. Quam, WØCIA, "Hints & Kinks — A Lighter Plug Mic Holder?" *QST*, May 2005, p 61.

[4]*2-Way Radios in Toyota Vehicles*, Toyota Motor Sales USA, Torrance, California. Also available at **www.arrl.org/tis/info/carproblems.html#toyota**.

All photos by the author.

ARRL member Paul Stone, KQ6RJ, was first licensed in 1995 and upgraded to Amateur Extra class in 2008. He has a BS degree in Chemical Engineering and an MS in Materials Science and Engineering. Paul earned DXCC (Phone) in 2002, and uses ARRL Logbook of the World (LoTW) to confirm his DX contacts. One motivation for this project was his desire to have HF capability during his annual family camping vacations, and he's found the mobile VHF/UHF rig indispensable for communications support of local events. Paul can be contacted via e-mail at **kq6rj@arrl.net**.

PRODUCT REVIEW

DC to AC Power Inverters

Reviewed by Howard Robins, W1HSR
ARRL Contributing Editor

When I became active in the ARRL Amateur Radio Emergency Service (ARES), I realized that I needed to be able to run my station during commercial power outages. A friend, I noticed, lugged an Optima AGM deep-cycle marine battery to field operations.[1] I learned that AGM (absorbed glass matt) batteries are sealed, maintenance free units that do not outgas dangerous levels of hydrogen when charging and can take a beating. Unlike regular automotive batteries, they are designed for many deep charge/discharge cycles — just what's needed for remote station operation. So, I bought one and a battery minder to keep it topped off.

I have since grown my battery farm to four deep-cycle units that will source 220 ampere-hours (Ah) with an 8 A minder that works selectively with different battery chemistries, including AGM. I normally run my entire station on batteries, excluding the computer. In an emergency, I will run on commercial power as long as it is available and switch to battery power when it is not.

My next thought was to add a dc-to-ac power inverter so that I could use my normal desktop computer during power outages. It's a key part of my emergency station, used for digital modes, logging and other record keeping. I have a UPS (uninterruptible power supply) in my system, and with forethought it should keep the computer going long enough to allow me to switch to emergency power.

As it turns out, the marketplace offers a wide variety of power inverters with a wide range of capabilities and prices. First I'll describe my initial experience, and then get into our testing.

[1]For more information on these batteries, see **www.optimabatteries.com/optima_products/bluetop.php**.

Bottom Line

Modified sine wave (MSW) type inverters offer the most power capability for the money, but we found a wide variation in RF interference generated by the three units tested. The more expensive pure sine wave (PSW) units tested were both RF-quiet and generated a nice sine wave.

My First Inverter

The first question: How much power is needed? I power all of the devices needed during an outage, including the computer, LCD monitor, printer, DSL modem and router, via a surge protected power strip. I purchased a Kill-A-Watt electric usage monitor from P3 International and connected it between my power strip and a commercial power outlet.[2] I learned that all of the devices on that power strip consume about 170 W. When the monitor goes to sleep, power consumption drops by 25 W.

I found all sorts of inverters on an Internet search. That was the limit of my research at the time. I got lucky when I order a 1250 W modified sine wave (MSW) type that seemed to be a bargain — much more power than I needed for a price that fit my budget. (See the sidebar, "Inverter Types," for more information.) The inverter worked quite well. I built a transfer switch using a 3PDT relay with a 12 V coil and 16 A contacts, along with a standard duplex outlet. My power strip is now plugged into that duplex outlet, which is wired to the load contacts on the relay. The normally closed contacts on the relay are wired to a plug that goes into my UPS. The normally open relay contacts are wired to a plug that goes into the inverter.

When commercial power fails, my computer system is powered by the battery in the UPS and the UPS sounds an alarm. All I have to do is turn on the inverter and switch the computer system to the ac from the inverter. The computer system keeps running with no interruption. I switch from commercial to inverter power and back routinely and have run on batteries for several hours. This works and works well. If we have a long power outage, I have a 3500 W generator that could be brought online to recharge batteries and power other essentials.

Stupid things happen. One day I decided to straighten out the wiring around my radio desk and accidentally shorted a couple of relay contacts, sending 120 V ac into the inverter output terminals. Inverters do not like ac applied to their output terminals, so I now have a big paperweight.

[2]**www.p3international.com**. Also see S. Ford, WB8IMY, "Kill-A-Watt Electric Usage Monitor," Short Takes, *QST*, Jun 2006, p 61, and D. Falcon, N2JOM, "Kill-A-Watt Electric Usage Monitor Revisited," Technical Correspondence, *QST,* Mar 2007, pp 67-68.

Inverter Types

To research emergency power options for my station, I turned to two publications available from ARRL — *Emergency Power for Radio Communications* and *Independent Energy Guide*.[3,4] Each book devotes a chapter to inverters. *Emergency Power for Radio Communications* provides an interesting historical perspective along with practical insight into applications and use. The *Independent Energy Guide* provides waveforms and a more technical presentation. It includes tutorials on inverter ratings and specifications, features and options, and cost and selection.

Inverters have come a long way from the early mechanical units some of you may remember from the days of tube type mobile radios. Modern technology has made inverters smaller, more efficient, less costly and widely available. Today's solid-state inverters fall into two categories — modified sine wave (MSW) and pure sine wave (PSW). MSW inverters produce stepped square waves that resemble a sine wave. PSW inverters produce outputs that are made up of many finer steps, more closely approximating commercial ac. The difference is readily apparent in Figures 1 through 5, which show waveforms of the inverter outputs while operating under load in the ARRL Lab.

— *Howard Robins, W1HSR*

[3]M. Bryce, WB8VGE, *Emergency Power for Radio Communications*, available from your ARRL dealer or the ARRL Bookstore, ARRL order no. 9531. Telephone 860-594-0355, or toll free in the US 888-277-5289; **www.arrl.org/shop**; **pubsales@arrl.org**.

[4]K. Jeffrey, *Independent Energy Guide*, available from the ARRL Bookstore (order no. 8601, see Note 3).

A Noisy Replacement

I found a great deal on a 2300 W MSW inverter. I figured more is better, so I ordered one and installed it in place of my first inverter. Before I powered up the new inverter, I turned on my HF radio and heard the usual levels of signals and noise. I powered up the inverter with no load and heard signifi-

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cant noise levels across all bands. The band scope on my radio reflected noise peaks all over the spectrum at levels exceeding S9. When I turned on the load, the noise level jumped.

My first inverter generated no detectable noise using the same cables. I tried using ferrite beads to tamp down the interference to no avail. So, I sent it back — losing a 25% restocking charge and shipping costs.

Further investigation got me to a pure sine wave (PSW) type of inverter. Such inverters are quite a bit more expensive than the MSW variety, but they advertise a low distortion sine wave output that more closely resembles ac line power. I wasn't sure if they would generate less radio interference but thought it was worth trying to find out. Because of cost, I got one rated for 300 W, a closer match for my load. The PSW inverter is physically smaller but heavier than the MSW types that I had. The weight of the PSW inverter reflects the massive chokes that must be used in the filtering network. Success — it runs my computer and generates no detectable noise in my receiver.

ARRL Lab Tests

For this review we chose five inverters from the many models available. ARRL Test Engineer Bob Allison, WB1GCM, assembled a pair of 105 Ah AGM batteries, a 55 A charger, and 4 foot long cables made from wire ranging from 00 to 4 AWG (depending on inverter manufacturer recommendations). To test the inverters under varying loads, he made two strings of light bulbs, each having three 300 W bulbs and one each 200 W, 100 W and 50 W. This allowed the setup to be varied from 50 to 2500 W in 50 W steps. See the accompanying tables for the test results. In addition, Bob tested the inverters for RF emissions that might interfere with Amateur Radio operations (see the sidebar, "Power Inverters and Conducted Emissions").

Load testing in the ARRL Lab was followed by practical testing at my station. My station load was a small fraction of the inverter capability, so I focused on usability and listened for noise from the inverters in my receiver. In alphabetical order:

COTEK ST1500-112

The Cotek ST1500-112, from Samlex, is a PSW type inverter rated for 1500 W continuous output and 3000 W surge. This is the only inverter tested that included a built-in automatic transfer switch. At around $650, it's the most expensive unit in this review.

The ST1500 has short circuit, reverse polarity and high temperature protection. A low voltage alarm comes on when the battery sags to 11 V dc, and the unit shuts off at 10.5 V input. At the high end, overvoltage protection kicks in at 15.3 V dc. An ac circuit breaker (16 A) trips if you overload the output. Multicolor LEDs report power status, input voltage and load level.

Connections, controls and indicators are on the front panel, with two cooling fans on the rear. The ST1500 has no ac receptacles and is designed to be hardwired into your system from a terminal strip behind a front panel access cover. For testing we made a short pigtail by cutting the receptacle end off a heavy duty ac extension cord.

In the Lab, the ST1500 easily produced 1500 W maximum although efficiency, rated at 88% typical, dropped off above 1200 W. Output voltage was quite stable, staying near 120 V under varying loads.

This inverter is the only one in this test to include a statement of compliance with FCC Part 15 requirements. ARRL Lab testing confirmed that it's quiet.

This unit produced no detectible noise at my station on any band with my computer and accessories switched in or out. My computer platform seemed happy and there were no issues when I switched between commercial and inverter ac.

Cotek ST1500-112

Serial number: n/a

Manufacturer's Specifications

Power requirement: 10.5-15.3 V dc.
Output voltage: 100/110/120 V ac ±3 %.
Max power output (continuous): 1500 W.
Waveform: Pure sine wave.
Size (HWD): 4.5 × 9.3 × 15.9 inches; weight, 15.4 pounds.
Price: $650 (including transfer switch)

ARRL Lab Measurements

Input current, no load: 1.18 A.
Output frequency: 59.9 Hz.

Load (W)	*Input (V dc)*	*Input (A dc)*	*Output (V ac)*	*Eff. (%)*
49	12.6	5	121.1	77.0
358	12.3	32	120.2	91.1
745	12.0	69	119.4	89.8
1140	11.8	111	118.5	87.0
1515	11.5	158	117.3	83.2

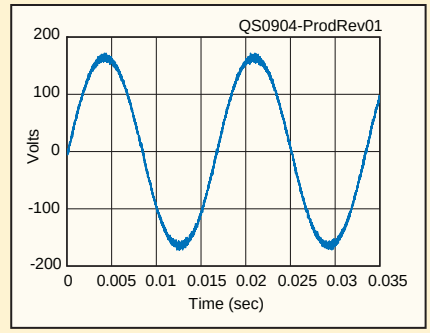


Figure 1 — Output waveform of the Cotek ST1500-112 operating with a 1500 W load. This is a PSW type inverter; note the close approximation of a sine wave.

POWERBRIGHT PW2300-12-1

The PowerBright PW2300-12-1 is an MSW type inverter. It has the highest power rating on any of the units reviewed here — 2300 W continuous output with a surge capability of 4600 W. Selling for around $250, it's a high power rating for the money.

Battery connections are made on the rear panel. The front panel has two standard ac outlets, an on/off switch, and an overload LED indicator. A four digit display shows input dc voltage or output wattage. This meter is not mentioned in the owner's manual. A wireless remote control unit and spare spade fuses are also included in the package. The PW2300 has short circuit and overload protection. A low voltage alarm comes on at 11 V dc, with cutoff at 10 V and 15.5 V. The unit includes a cooling fan.

Our Lab test fixture ran out of steam while testing PW2300. The batteries gave up at 217 A, with the inverter providing just over 2000 W to the load. The PW2300 was starting to fade as well, down to 107 V ac from 120 V under no load, but still within its 117 V ±10% rating. Efficiency was fairly consistent in the mid-80s; we never did see the "up to 90%" stated in the literature. No-load current was only 0.24 A, the lowest in the test.

This model is the same as the one I mentioned earlier, the one I returned because of noise in my receiver. The ARRL Lab

results confirmed my experience concerning interference; this is the noisiest of the units tested.

SAMLEX PST-100S-12A

Another PSW type inverter, the Samlex PST-100S-12A is rated for continuous output power of 1000 W and 2000 W surge.

Battery connections are made on the rear panel. The front panel has two standard ground fault circuit interrupter (GFCI) ac outlets, an on/off switch and LEDs to indicate power on, overload and over temperature. This inverter provides protection for polarity reversal of dc input, overload, and high temperature. The low voltage alarm activates at 10.7 V dc input with shutdown at 10 V. Overvoltage protection shuts the unit down at 16.5 V dc input. The PST-100S has a temperature controlled fan.

In the Lab, the PST-100S had no problem with a 1000 W load. Efficiency was very close to the manufacturer's rating of 85%, and the ac output voltage stayed within a 1.5 V range. At 0.5 A, the no-load current is attractive.

Lab testing indicated that this unit should be RF quiet, with conducted emissions lower than the Cotek ST1500 except on 160 and 80 meters. This unit produced no detectable noise at my station on any band with my computer platform switched in or out. My computer platform seemed to be happy.

TRIPP-LITE POWERVERTER PV-1250FC

Tripp-Lite's PV-1250FC is an MSW type inverter rated for 1250 W continuous and 2500 W surge. It's also got an "overpower" rating of 1875 W for 1 hour.

The PV-1250FC inverter is shaped more like a cube than the other inverters and is housed in a moisture resistant polycarbonate enclosure. All connections are made on the front, and the output uses two standard ac receptacles.

This unit has a circuit breaker for overload protection and a prominent cooling fan. The unit shuts down if the input goes below 10 V dc or above 15 V dc. Two sets of three stacked LEDs, like traffic lights, on the front indicate the approximate battery charge and load level.

Tripp-Lite offers optional remote control capability for turning the unit on and off. It also includes a load sensing feature. The inverter will power up when presented with a load of 150 W or so (this is adjustable and can be overridden).

The PV-1250FC's output voltage remained steady over the test range and easily met its maximum continuous power rating. Efficiency is specified at "up to 94%, depending on load and temperature" but we typically saw mid- to high 80% range.

PowerBright PW2300-12-1

Serial number: 060042186

Manufacturer's Specifications

Power requirement: 10-15.5 V dc.
Output voltage: 117 V ac ±10 %.
Max power output (continuous): 2300 W.
Waveform: Modified sine wave.
Size (HWD): 10.2 × 14.5 × 3.2 inches; weight, 14.5 pounds.
Price: $250

ARRL Lab Measurements

Input current, no load: 0.24 A.
Output frequency: 59.3 Hz.

Load (W)	*Input (V dc)*	*Input (A dc)*	*Output (V ac)*	*Eff. (%)*
49	12.5	6	120.2	65.3
564	11.8	54	126.4	81.0
1138	11.5	114	113.6	86.8
1734	11.1	185	108.6	84.7
2010	11.0	217	107.0	84.2

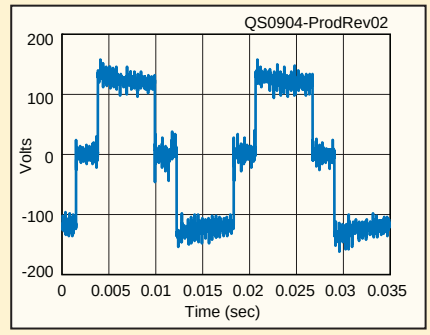


Figure 2 — Output waveform of the PowerBright PW2300-12-1 operating with a 2000 W load. This is an MSW type inverter; note the stepped square waves and noise spikes present.

Samlex PST-100S-12A

Serial number: 07283-8GO3-0046

Manufacturer's Specifications

Power requirement: 10.7-16 V dc.
Output voltage: 120 V ac ±3 %.
Max power output (continuous): 1000 W.
Waveform: Pure sine wave.
Size (HWD): 3.3 × 9.4 × 13.9 inches; weight, 8.8 pounds.
Price: $480

ARRL Lab Measurements

Input current, no load: 0.5 A.
Output frequency: 59.9 Hz.

Load (W)	*Input (V dc)*	*Input (A dc)*	*Output (V ac)*	*Eff. (%)*
50	12.3	5	121.1	81.2
252	12.1	25	120.7	83.2
500	12.0	48	120.2	87.1
755	11.8	75	119.6	85.3
1006	11.6	103	119.4	84.0

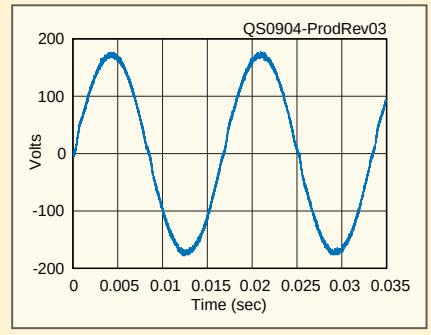


Figure 3 — Output waveform of the Samlex PST-100S-12A, a PSW type inverter, operating with a 1000 W load.

No-load current drain is the highest in this group — 1.7 A.

In the Lab, this inverter by far had the lowest conducted emissions of the MSW inverters tested. On 160 and 80 meters, it was slightly worse than the two PSW units but emissions dropped off sharply at higher frequencies.

The PV-1250FC produced no detectible noise at my station on any band with my computer platform switched in or out. My equipment seemed happy and there were no indications when I switched between commercial and inverter ac.

XANTREX XPOWER 1750 PLUS

The XPower 1750 Plus from Xantrex is an MSW type inverter rated for 1500 W continuous and 3000 W surge. The "1750" in the name is from its rating of 1750 W for 5 minutes.

The *Owner's Guide* for this unit is a little light on discussion of features. There are two LEDs on the front panel — one for POWER on, the other FAULT. In addition there is a power switch, a 3-digit meter that displays battery voltage, and a multicolor LED bar graph for output power. On the left side are three ac outlets — two grounded and one ungrounded. Battery connections and a temperature controlled fan are on the rear panel. There is an RJ-11 type jack under the front panel for a remote power switch that can be located up to 20 feet away.

In addition to thermal and overload/short circuit shutdown protection, a low voltage alarm activates at 10.7 V dc input with shutdown at 10 V and 15 V dc. The FAULT LED turns red if the unit shuts down for any of these conditions.

In the Lab, the XPower 1750 Plus handled a 1500 W load with no problems. The manufacturer rates "optimum efficiency" at 90%. We observed low- to mid-80% range under load. Output voltage strayed a bit but was always within specification. At 57.6 Hz, the output frequency was farther than the other units from the 60 Hz ac line standard, but within the manufacturer's rating of ±4 Hz.

In my station, this inverter produced a noticeable level of noise with no load and an objectionable amount with my load switched on. The noise with my load on was not as overwhelming as experienced with the PowerBright, however. Even so, the noise level on 75 meters increased nearly 20 dB (according to my S-meter) when I switched on my computer platform. That noise level decreased at higher frequencies, but was still audible on 10 meters.

Which Inverter is for You?

The answer to this question depends

Tripp-Lite PowerVerter PV-1250FC

Serial number: 9732BYOPV616900003

Manufacturer's Specifications
Power requirement: 10-15 V dc.
Output voltage: 120 V ac ±5 %.
Max power output (continuous): 1250 W.
Waveform: Modified sine wave.
Size (HWD): 6.9 × 8.6 × 8.3 inches; weight, 10.5 pounds.
Price: $270

ARRL Lab Measurements
Input current, no load: 1.7 A.
Output frequency: 60.2 Hz.

Load (W)	*Input (V dc)*	*Input (A dc)*	*Output (V ac)*	*Eff. (%)*
49	12.4	6	122.2	65.7
303	12.2	29	119.9	85.3
641	12.0	62	120.9	86.0
912	11.8	87	120.2	88.5
1230	11.6	122	120.2	86.8

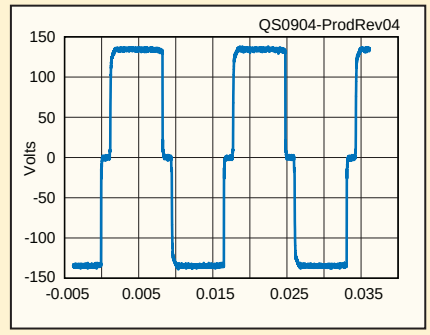


Figure 4 — Output waveform of the Tripp-Lite PV1250FC (MSW type) operating with a 1250 W load. Note the relatively low noise spikes compared to the other two MSW inverters.

Xantrex XPower 1750 Plus

Serial number: B11636821

Manufacturer's Specifications
Power requirement: 10-15 V dc.
Output voltage: 115 V ac ±5 %.
Max power output (continuous): 1500 W.
Waveform: Modified sine wave.
Size (HWD): 3.2 × 9.4 × 17.3 inches; weight, 9.4 pounds.
Price: $230

ARRL Lab Measurements
Input current, no load: 0.77 A.
Output frequency: 57.6 Hz.

Load (W)	*Input (V dc)*	*Input (A dc)*	*Output (V ac)*	*Eff. (%)*
46	12.6	5	115.6	73.0
443	12.1	45	113.9	81.4
755	12.0	76	111.1	82.7
1266	11.7	130	110.3	83.2
1538	11.5	156	117.3	85.7

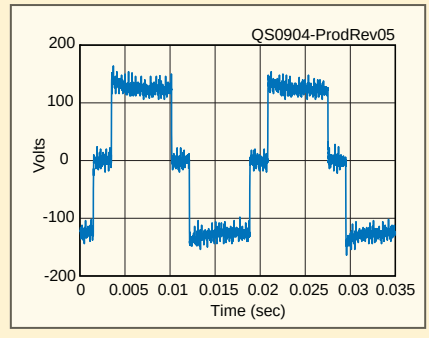


Figure 5 — Output waveform of the Xantrex XPower 1750 Plus (MSW type) operating with a 1500 W load.

Power Inverters and Conducted Emissions Limits

Some electronic devices intentionally generate RF but do not intentionally radiate it. For example, RF generated by computers, receivers and switching power supplies is intentional and necessary for such devices to function. This RF, however, is not intended to be radiated as it would be by a transmitter. Under Part 15 of the FCC rules, such devices are defined as *unintentional emitters.*

As with all Part 15 devices, unintentional emitters must not cause harmful interference to a licensed radio service such as Amateur Radio. In addition, Part 15 rules further establish the following two types of absolute limits for emissions from unintentional emitters.

Conducted Emissions

These emissions are conducted onto the house wiring and power lines via the device power cord. Part 15 provides absolute limits for conducted emissions from 150 kHz to 30 MHz. There are no conducted emissions limits above 30 MHz, in part because power lines are not particularly good transmission lines at these higher frequencies. Conducted emissions therefore become the primary problem when a physically large "antenna" such as power wiring is required at HF and lower frequencies.

Radiated Emissions

These are emissions radiated by the device itself. The absolute limits in this case are specified at 30 MHz and higher. There are no radiated emissions limits below 30 MHz. The relatively short wavelengths at 30 MHz and above are closer to the physical size of a typical Part 15 device, so the device itself is more likely to act as an "antenna." Power lines are relatively inefficient transmission lines at VHF and higher frequencies, so radiated emissions now become the primary problem.

FCC Part 15 Limits

FCC Part 15, Section 15.107, sets the limits for conducted emissions. Note that compliance measurements are not required for battery powered devices that are not designed to operate while connected to the ac power lines. The inverters reviewed here *are* the ac power source, derived from batteries, and are *not required* to meet conducted emission limits. Although the FCC Part 15 limits don't apply, emissions from inverters act like conducted emissions in every other respect, and they have the potential to cause interference to radio receivers.

Fortunately, the short power lines typically associated with power inverters reduce the potential for interference from conducted emissions. Using one to power an Amateur Radio station, however, can be a

Table 1
Part 15 Conducted Emission Limits
Quasi-peak detection measurements

Frequency (MHz)	*Limit (dBµV)*
0.15 - 0.5	66 to 56*
0.5 - 5.0	56
5.0 - 30.0	60
>30.0	None

*Decreases with the logarithm of the frequency.

Table 2
Power Inverter Conducted Emissions
Conducted emissions in dBµV measured in the ARRL Lab using CISPR quasi-peak detection.Shown are the six highest levels measured inside and outside the amateur bands.

Cotek ST1500-112

Freq	*Load (W)*		
(MHz)	*0*	*100*	*500*
0.155	66.0	65.9	63.0
1.280	49.7	49.7	50.2
5.180	44.0	46.8	49.9
9.000	51.1	51.1	58.6
11.636	41.5	46.1	58.0
22.540	30.7	31.9	44.6
1.990	47.4	47.9	48.4
3.670	45.3	47.5	49.2
7.010	43.9	46.3	50.1
10.136	47.4	49.4	59.2
14.166	43.7	43.7	51.6
21.150	32.4	32.8	46.0

PowerBright PW2300-12-1

Freq	*Load (W)*		
(MHz)	*0*	*100*	*500*
0.150	114.5	113.2	117.2
5.639	68.1	93.0	96.0
8.330	79.4	93.0	96.0
13.257	75.0	88.0	89.6
24.326	70.0	83.5	80.1
26.166	72.0	83.5	80.1
1.955	87.0	96.2	99.1
7.152	82.0	95.4	96.6
14.002	71.1	79.6	83.0
24.908	69.9	85.5	86.0
28.333	69.0	77.5	83.0
28.925	68.0	75.7	83.5

Samlex PST-100S-12A

Freq	*Load (W)*		
(MHz)	*0*	*100*	*500*
0.161	83.3	87.2	86.2
0.657	59.0	63.3	70.9
2.170	35.4	39.7	48.3
7.331	28.1	33.9	40.1
15.149	32.0	31.2	41.8
20.500	31.0	34.8	40.5
1.815	39.3	41.5	46.5
1.953	38.0	42.0	48.6
5.319	25.4	29.9	36.4
7.145	32.0	34.6	42.2
14.321	30.0	32.9	42.4
21.3336	24.5	28.9	35.7

upon your needs and how much money you want to invest. If your desire is to keep your computer running for a few hours, the solution is relatively simple and inexpensive. On the other hand, if you want be able to run your Amateur Radio station along with heat, refrigeration or household appliances, the solution will be more complex and costly. The two books mentioned in the "Inverter Types" sidebar can help you evaluate options.

My suggestion is to start with a needs assessment. Determine what equipment you need to keep running during a power outage, how long you will need to run each device, and how many watts the devices use collectively. You might want to categorize your loads so that only those requiring pure sine wave get it, and loads that will work with the less expensive inverters are treated accordingly.

You may also want to do a cost/benefit analysis that evaluates inverter power versus generator power given your particular power needs. Remember that the larger the load, the larger your investment in batteries, cables, charging equipment and inverter capacity. The input current at 12 V dc is roughly 10 times the output current at 120 V ac, which translates into one or more heavy duty batteries, chargers, very heavy cables, large fuses, connectors and so forth. The associated costs are significant, and the "accessories" may run more than the inverter.

Also, inverter ac power ratings usually

particularly demanding application. For this reason, the Lab decided that it would be useful to test the inverters using standard Part 15 procedures and instruments. This testing offers an objective way to compare emission levels among the inverters reviewed and allows direct correlation with other unintentional emitters and the FCC limits.

Test Setup

The ARRL Lab uses a line impedance stabilization network (LISN) and a calibrated Rohde & Schwarz ESH-3 EMC receiver to measure conducted emissions. Normally, the device under test is plugged into the LISN, which separates the unwanted RF from the desired 60 Hz ac power. The conducted emissions are then measured by the special Rohde & Schwarz receiver using CISPR quasi-peak detection.[5] In the case of power inverters, however, the LISN is plugged into the power inverter. In order to accomplish this, we used a set of adapter cables to reverse the LISN input and output.[6]

See Table 1 for Part 15 conducted emissions limits. Note that the limits are expressed in dBµV, or dB relative to a microvolt. In this case, 1000 µV of signal equals +60 dBµV. Table 2 shows the six highest levels of conducted emissions we measured inside and outside the amateur bands with the inverters operating under a range of loads.

It is important to note that Part 15 limits are not low enough to eliminate the possibility of interference but rather localize it. With power inverters, one may hear a buzzing sound across the LF, MF and HF spectrum. The severity of the interference can also depend upon such things as the placement and characteristics of the power cords and distance from the antenna. The lower the conducted emissions level, the better. — *Bob Allison, WB1GCM, ARRL Test Engineer*

[5]This measurement technique is specified in FCC Part 15. CISPR quasi-peak measurements are made using AM and a 9 kHz bandwidth and designed to assess the effect of interference of a received signal to the human ear. CISPR is the International Special Committee on Radio Interference of the International Electrotechnical Commission.

[6]This technique is described in *ANSI Standard C63.4-2003*, p 10, Figure 2.

Tripp-Lite PowerVerter PV-1250FC

Freq	Load (W)		
(MHz)	0	100	500
0.150	102.3	108.4	107.8
1.664	66.2	66.2	68.2
2.500	56.6	55.5	53.9
4.667	42.2	42.6	42.8
6.020	37.0	36.8	37.5
11.847	16.8	16.8	22.8
1.833	63.1	62.0	63.9
3.501	51.4	53.5	52.0
3.830	47.0	48.8	45.5
7.007	31.0	31.5	33.0
14.160	18.0	22.7	22.3
29.127	6.4	6.3	6.4

Xantrex XPower 1750 Plus

Freq	Load (W)		
(MHz)	0	100	500
0.150	106.5	106.7	108.2
1.340	77.7	83.9	93.0
2.678	77.0	79.0	91.8
7.333	62.1	65.1	75.8
13.493	57.0	67.4	76.7
26.610	51.2	52.0	53.9
1.856	64.3	83.1	94.9
3.656	69.2	71.9	85.3
7.161	61.2	76.5	76.7
14.015	60.8	66.0	77.0
14.171	61.3	63.2	73.0
28.289	42.3	37.0	53.8

assume a resistive load. Power factors that reduce these ratings for reactive loads, motors for example, should be considered. The Lab tested all of the inverters with an electric fan and a 580 W shop vacuum (induction motor). They all started and ran these devices with no problem.

Pure or Modified Sine Wave?

While MSW inverters can work at an Amateur Radio station, it is more likely that pure sine wave inverters will emit little or no interference, and attached electronic equipment will be happier.

It is my suggestion that you look for a good quality inverter that matches your load requirements. Too much over-sizing can be costly, and it is smarter to buy the best small inverter than the largest cheap one you can find. No-load current draw and efficiency are important factors to consider, as they affect battery life.

Maha MH-C9000 Battery Charger

Reviewed by Ken Stuart, W3VVN
ARRL Technical Advisor

Do any of the following situations sound familiar?

You're getting ready for ARRL Field Day. You have the rigs ready, pencils are sharpened, pads of paper and log books packed along with everything else you can think of. You will be taking some other items such as flashlights, camp lights, or battery operated weather radios. As you grab some nickel metal hydride (NiMH) or nickel cadmium (NiCd) cells from a storage bin and stuff them into a duffle bag, you wonder whether you will get full performance from these cells, or whether some of them will quit delivering power prematurely.

Or perhaps you found someone on your favorite Internet bidding site selling rechargeable cells by the carton at a price you can't pass up. Even if some of the cells can't hold a full charge, you know that there are probably enough that will be fully capable to justify the price. The only question is, just which cells are great performers, and which are weaklings? Also, brand new cells should be recycled a time or two to get them up to full capacity, but that takes time that you don't have.

Or maybe you have a drawer full of rechargeable batteries that you've collected over the years, and it's time to check out which cells are good and which are bad. And can those that are weak possibly be restored by recycling?

A Battery Charger that Analyzes Too

Maha/Powerex has a charger to answer all these questions and provide top-notch charging capability as well. And it won't break the piggy bank. Maha refers to it as the WizardOne Charger-Analyzer — the MH-C9000.

Unlike other chargers on the market today that simply charge, and maybe discharge for cell "reconditioning," the Maha MH-C9000 charger also will analyze the discharge capacity of a NiCd or NiMH cell automatically and display the results on a large LCD. In addition, the unit performs break-in of new cells as well as repetitive cycling for cell rejuvenation.

The MH-C9000 will accept any mix of up to four AA and AAA cells and process them individually. It's like having four independent single cell chargers in a single package. The

MH-C9000 is capable of other functions as well — functions that are generally not available except on expensive industrial production equipment. Specifications are shown in Table 3. Here's the rundown of its capabilities.

Charge

This is the basic charge-only mode. A cell is inserted, and the charging rate is incremented up or down via the front panel pushbuttons in 100 mA increments from the 1000 mA default. The range available is from 200 mA to 2000 mA (yes, that is 2 A). The cell is continually monitored and the charging current, terminal voltage, and milliampere-hours (mAh) of charge acceptance are displayed. Charging stops automatically when the cell indicates that it is fully charged by exhibiting a negative voltage slope. Charging will also terminate if the cell overheats or cell voltage exceeds the maximum allowable.

Refresh/Analyze

This is a single-cycle rejuvenation and cell evaluation mode. Using this function exercises the cell through a top-off charge, full discharge (to 1.0 V), and full recharge. Upon cell insertion, the charger requests the desired charging and discharging currents which are set via the front panel. Defaults are 1000 mA charge and 500 mA discharge, but you can enter other values within the limits of the charger.

The charger then charges the battery to its full charge state, allows it to rest for about an hour, discharges the cell to 1.0 V, and then fully recharges the cell. The charger measures stored cell capacity (mAh) during the discharge period, and displays it after the cycle is finished.

Break-In

Also known as *battery forming*, this function is provided to bring brand new cells up to their rated output or to revitalize cells that have been stored unused for three months or more. Unlike the other functions, the user is asked for the cell's mAh rating (C). The charger then determines the appropriate charging and discharging rates, and cycles the cell. Charging is done gently at the C/10 rate (battery capacity divided by 10) for 16 hours, followed by a one hour rest period and discharge, and then recharged once again at the C/10 rate for another 16 hours.

Discharge

This capability is also provided if you should wish to discharge a battery manually. Discharge current can be selected from the available levels of 100 mA to 1 A.

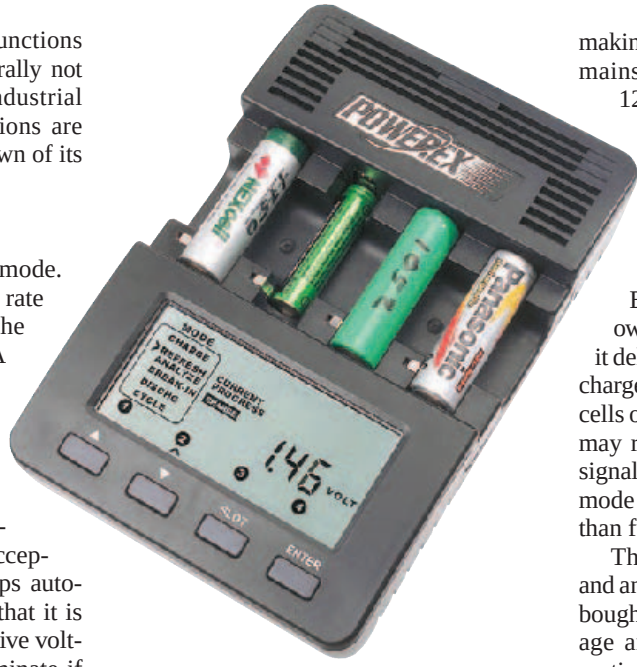


Table 3

Maha MH-C9000 Battery Charger

Manufacturer's Specifications

Charging current: 0.2-2.0 A, selectable in 0.1 A steps.

Topoff charging current: 100 mA.

Maintenance charging current: 10 mA

Discharging current: 0.1-1.0 A, selectable in 0.1 A steps.

Discharge termination voltage: 1.0 V.

Input power: 12 V dc, 2 A (power supply incl)

Price: $70.

Cycle

In this operation, the cell is subjected to a number of user selected charge/discharge cycles (up to 12). The charge and discharge currents are user entered. The CYCLE function is provided as a last ditch effort to restore aged cells that no longer accept a full charge. Occasionally, capacity can be at least partially restored by performing this cycling exercise. It can take days to perform, so it should be scheduled for a period when the battery slot(s) in the charger can be dedicated to that function.

A provided external power supply furnishes 12 V dc to the charger, with an input voltage range of 100 to 240 V ac, 50/60 Hz, making it usable on most worldwide power mains. The MH-C9000 will also accept 12 V dc from a car or boat system, so it can go on Field Day and emergency events.

Bottom Line

Maha's MH-C9000 charger can help you manage your collection of AA and AAA rechargeable batteries and keep them ready for emergency use. It can also help evaluate those mystery cells from the flea market.

Using the MH-C9000

I especially like this charger's individual cell charging circuitry. Each cell is processed based upon its own charge state and the information that it delivers to the charger. By contrast, other chargers that I have used usually charge two cells of the same case size in series. One cell may reach full charge before its mate and signal the charger to shut down the charge mode to both. This can leave one cell less than fully charged.

The charger's ability to safely refresh and analyze cells is a great advantage. I have bought a number of cells of indeterminate age and condition at a local hamfest. In particular, I acquired a dozen cells recently from one vendor and found a wide variation in their individual capabilities. After purchasing the MH-C9000, I ran about half of them through its rejuvenation cycling and found cell capacity increases of 30 to 50% after three or four cycles. Additionally, I subjected several very old NiCd cells to a few cycles and found them returned to almost full capacity.

Brand new cells are known to require several charge-discharge cycles before full capacity can be realized. This is referred to as priming (or sometimes as "forming" or "formatting") the cell.[7] Off-brand manufacturers do not invest the time to perform this function as a part of the manufacturing process, so new cells are initially only capable of as little as 10% of their rated capacity. With normal use, cycling the cells improves the storage capacity. This process has been likened to the break-in period for a new car engine. Name brand cells are usually partially formatted, so that they exhibit an initial high percentage of their rating. The MH-C9000 charger can perform this formatting automatically with its BREAK-IN function.

The Maha company offers this charger for the serious user of AA and AAA cells. It's affordable for the high-end capabilities it provides. Not only is this device beneficial for Amateur Radio activities, but radio controlled model enthusiasts will also welcome its capabilities as will anyone with children and toys that greedily gobble up all those alkaline cells!

Manufacturer: Maha Energy Corp, 18567 W Gale Ave, City of Industry, CA 91748; tel 800-376-9992; **www.mahaenergy.com**. *Price:* $70.

[7]For more information on priming and rechargeable batteries in general, see "Batteries in a Portable World" by Isidor Buchmann, available online at **www.buchmann.ca**. QST

Where is Bob?

Combine a number of available programs to make APRS even more useful.

Bob Bellini, N2IGU

My friends often ask me why I want my wife to know where I am. I have to explain that it is not about her knowing where I am, it is about the technology that can tell her where I am. It is all about the *mashup* of several programs and technologies that together can take automatic position reporting system (APRS) information from my car, calculate where I am and then display it on a Google map on the Internet.

Working With APRS Data

The Web site **www.findu.com** displays the last reported position of many stations from their APRS data. It has recently been updated to use *Google Maps*. I was impressed by the idea but wanted to do things a bit differently. I was not interested in the breadth of stations available. I was more interested in tracking the past positions for my APRS equipped car, bicycle and weather station.[1]

For several years I have been working with a home automation program called *MisterHouse*. This is a program written in the *Pearl* programming language by Bruce Winter, KCØEQV. The program has evolved over the years, with many contributors adding programs to the mix. The program and documentation can be downloaded from **www.misterhouse.net**. *MisterHouse* can be used for various functions such as controlling lights, heating and cooling, TV and VCR programming and telephone caller ID. The system can communicate with you through a Web interface or via voice recognition.

One of the programs written for *MisterHouse* was *tracking.pl* from Brian J. Klier, NØQVC. This program has many features but basically monitors an APRS station and decodes the APRS data into useful, speakable data that is announced (spoken) by the computer. The program can capture data from the local weather stations transmitting their data via APRS and graph it for display. It will also interface with the *APRS+SA* program by B. Hildebrand, KH2Z, which uses the maps in *Street Atlas* to display APRS stations on the Microsoft *MAP* Software.

But the functions of the *tracking.pl* program that I was most interested in were its ability to:

- Receive APRS data from stations,
- Calculate their position relative to home,
- Calculate their position relative to defined waypoints,
- Announce the position using the computer's speakers,
- Transmit the position via an APRS message.

One application of these features would be processing of my APRS data as I'm on my way home from work. I have a dual-band FM mobile transceiver in my car connected to a home built GPS receiver. It transmits the position of my car using the APRS format to the house packet station on 144.390 MHz. I also use a handheld transceiver connected to a Garmin eMap GPS receiver mounted to my handlebar when I go for a bicycle ride.

A terminal node controller (TNC) in the house is connected between a 2 meter transceiver and the computer running the *MisterHouse* software. The *tracking.pl* program monitors the RS-232 serial line connected to the TNC and reads the data. It logs it and searches for data from my station, N2IGU. When it finds data from my APRS station it interprets it to determine the exact location, speed, altitude, heading and symbol. The program is capable of interpreting several of the APRS data formats including the MIC-E format, a compressed data format to fit several pieces of information into a very small string. The program reads and interprets most of the APRS data it receives and can print it out, announce it over the computer's speakers and log it. A station can use many APRS formats to transmit data. The program I am using interprets most of but not all of the different formats. As I spend more time I will add more data format types to the program.

The program can then determine the position of my APRS station relative to home, or to a list of *waypoints* I have listed in a file. It will calculate the distance to each waypoint and announce the distance and bearing (direction) to the closest of those waypoints. If talking is enabled, the program uses the Microsoft *Text to Speech* program to announce my location and my distance to home as well as the nearest waypoint via the computers' speakers.

An example of the speech that the program produces is: BOB IS 2.5 MILES SOUTH OF US, AND IS STATIONARY. CURRENTLY 0.6 MILES SOUTH OF PHOENIXVILLE LIBRARY. By the way, there is an option to turn off the announcements if you get tired of listening to them.

Making it Happen

One of the problems I encountered even before trying to set this up with *MisterHouse* was setting up the packet path between

When* MisterHouse *finds data from my APRS station it interprets it to determine the exact location, speed, altitude, heading and symbol.

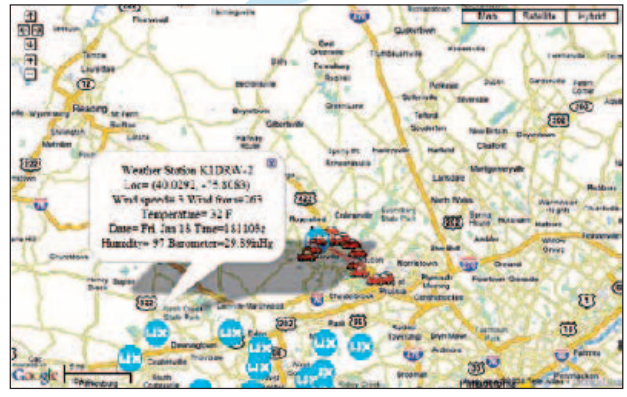


Figure 1 — Map display of local weather stations.

[1]For more information about APRS, see the Web site of its developer, Bob Bruninga, WB4APR, at **aprs.org**.

the car and home station. My goal was to be able to track my car's location so that I could travel 200 to 300 miles from home and still be heard. I found that by using WIDE3-3,N2IGU-1 for the path on my car's radio, I could receive my position reports from about 200 miles away. I have not been farther away yet so it may go even farther. That of course depends on the digipeater coverage between where I am and the house.

Getting Into Nuts and Bolts

The program that Brian wrote already captured the APRS data and broke it up into variables. My contribution to the program was adding the ability to capture that data into a concise form and transfer it to the Web server that hosts my "Where is Bob" Web page. I decided to use an XML formatted document for the data transfer. XML stands for eXtended Markup Language and is a human and machine readable format for transferring data and information. I modified the program to generate the XML file using the data the program captured from my APRS station. An example of a part of an XML file:

```
<markers>
  <marker lat="40.1342"
lng=" -75.4495" spd=" 1"
head="east-northeast" alt="
98.43" time=" 9:26 AM"
date="Mon, Dec 24" code=">"
table="/"/>
  <marker lat="40.0787"
lng=" -75.4058" spd=" 55"
head="northeast" alt="
180.45" time=" 9:32 AM"
date="Mon, Dec 24" code=">"
table="/"/>
```

The XML format is straightforward. Each file starts out with and ends with a line that indicates the type of data contained between the lines. In this case, the type is *markers*. Each line of data starts out with an attribute that defines that it is a marker. It is followed by attributes and values for each attribute. The *lng* (longitude) attribute is followed by its value "–75.4495," a string contained in quotes. There is one record or XML *Tag* for each position report. The other attributes in the XML file are for latitude, *lat*; speed, *spd*; heading, *head*; altitude, *alt*; time, *time*; date, *date*; APRS symbol code, *code*; and APRS symbol table, *table*. Each of these attributes is decoded from the APRS message transmitted from the car or bicycle.

Every time the program receives an APRS message from my station, it generates one of these XML tags and appends it to the XML file. The program has a variable to define how many of these XML tags to keep in the file. This will define how many position reports will be displayed on the map. After the file is updated it is uploaded to the Web server that hosts my Web page. This uses a simple file transfer program (FTP) to send the file. The program has parameters that define the name of the server along with the *userid* and *password* to use for the transfer. It also has a parameter to turn the transfers on or off. This data is used by the *WhereisBob.html* program to display an APRS symbol at each position. If you move your mouse over one of the symbols and click on it, a pop up appears that displays the details of that position marker.

Weather or Not

I also made some modification to the program to capture weather station data received over the air in APRS messages. It also generates an XML file with the weather data and that can also be displayed on a Google map as shown in Figure 1. This XML file is also uploaded every 15 minutes to the Web server that hosts my Web page. This provides me the ability to view all of the weather stations in the area and by moving my mouse over the APRS weather station symbol on the Google map. Clicking on it will pop up an information window with the most recent data from that weather station.

Modifying the original program that Brian wrote was relatively simple. The work to interpret the information in the APRS messages was already done. I just added some software to output it into an XML formatted file and upload it to my Web server. The real challenging work started when I tried to use *Google Maps* to display this information. I started with the documentation provided on the *Google Maps* Web page, **www.google.com/apis/maps/documentation/**. This site was extremely helpful because it provided examples of hypertext markup language (HTML) and *javascript* code that I could use. In many cases I was able to cut and paste code from the documentation pages into my program to add features. This program, *WhereisBob.html* can be seen at **www.RobertBellini.com/WhereisBob.html** with any Web browser that can view *Google Maps*. The data from my weather station can also be viewed at **www.RobertBellini.com/Weather.html**.

To actually see the raw weather data in the XML file you can look at **www.RobertBellini.com/APRSWeather.xml**. The raw APRS Position data from my car (as shown above) can be viewed at **www.RobertBellini.com/aprs.xml**. Most browsers will display the data and highlight the attributes and values. Internet Explorer will also allow you to export the data in the XML file to an *Excel* spread sheet. I use this capability once in a while to view the weather stations in the area and run calculations or sorts of the weather data.

I began the *WhereisBob* program with a simple display of APRS symbols on a Google map for each APRS position report defined in an XML record. This first involved generating a key to access the *Google Maps* application programming interfaces (APIs). This was a simple process described in the documentation. I was able to generate a key that allowed my Web site to use the *Google Maps* in my *WhereisBob.html* program. This is included into the initialization of the program and authorizes my page to use the Google tools.

Get Everything on a Map

In the documentation I found out how to initialize a map. This included the size of the map, the zoom level of the map and the location the map is centered on. The map display can also be defined to display a colorful map, a satellite picture, or a hybrid of a satellite picture with the map overlaid on the picture. I chose to center the map on my home location where I was also able to display an APRS symbol for my house. I also included the capability to use my own icons on the map instead of the Google provided ones. I was able to utilize the APRS symbols for my car, bicycle, house and weather station.

By using the examples provided in the *Google Maps* documentation, I was able to get some of the basic functions like the car icons in the proper positions based on the location information contained in the XML file. Then I found a way to include a pop-up information window that would appear when a viewer clicked on one of the car icons. This INFO WINDOW was set up with a CLICKEDON event associated with each icon. Inside the INFO WINDOW I was able to display the remaining information in the XML marker, including the heading, latitude, longitude, speed, altitude, date and time.

Too Much Information?

I started to get concerned about whether it was a good idea to display my speed on the Web page. I was not sure of the legal concerns if I exceeded the speed limit and had it displayed for everyone, including the law enforcement to see. But for the sake of technology I decide to put it in for now. Maybe I'll figure out a way to protect myself in the next revision.

Connecting the Dots

The next thing I discovered in the documentation was the capability to add in *pollylines*. These are lines that I used to connect the icons together. This could be used "connect the dots" to display the path I was taking. Since I only transmit my position every two minutes, and not all of my transmitted pack-

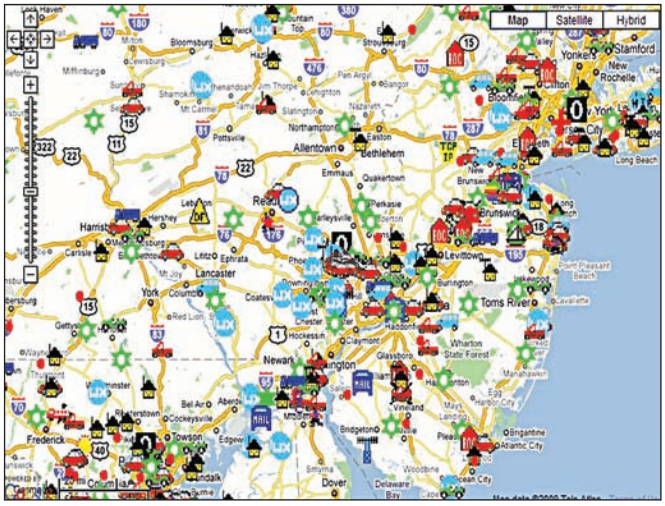


Figure 2 — APRS stations heard by my radio displayed on *Google Maps*.

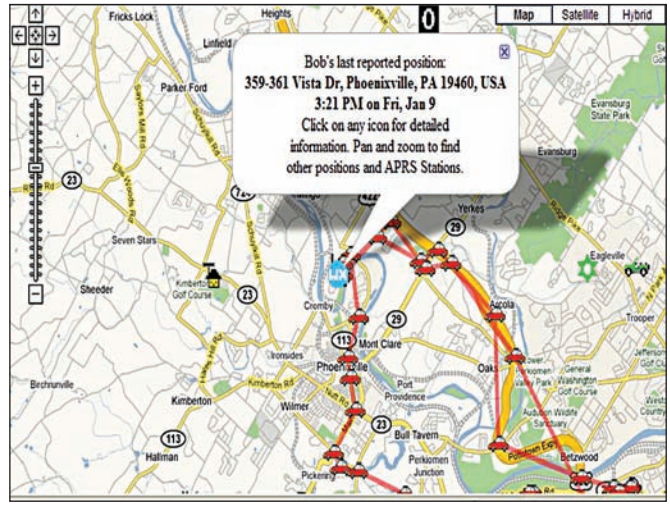


Figure 3 — Bob's last position with address displayed.

ets make it back to my home station, there are large gaps in the position reports. Because of this the pollylines do not necessarily follow the road. But you can get a general idea where I was and where I was going.

Yet to Come

One of the things I will look into for the future revisions is the ability to dynamically set the path of my return messages to go back to the station I am tracking. For example, in the car I use N2IGU-5, but in the handheld I use N2IGU-3. I would like to send the response back to the station that sent the position report. This would require that I set the path on the TNC for every message I transmitted. I would also tailor the message to include the sender's SSID. For example, a response to the handheld would be N2IGU-3 IS 3.2 MILES FROM THE LIBRARY. The response to the car would be N2IGU-5 IS 4.7 MILES FROM THE MALL.

In this revision, I track the weather stations that I can hear on the radio. There are many other local weather stations that use the APRS format but do not transmit using RF. They send their data over the Internet to the Citizens Weather Observer Program at **www.cwop.org**. This information is also picked up by **www.findu.com** and **aprs.fi** so it can be displayed there. I would like to get that data from one of those sources to be displayed on my map someday.

I have also given some thought to displaying other APRS stations that I can receive from my radio on my maps. This may overwhelm the display with a lot more stations, depending on the zoom level and the number of stations in the area. I decided one day to try it out. I modified the *MisterHouse* program, *tracking.pl* to store the information I receive for each station into an array variable, called APRSLOCAL, just as I do with the weather data. I have the array variable set up so that the call sign, including the SSID, is the array's index. Thus, with this two dimensional array I can only store the latest data I receive. I decided that I do not want to have a large database to store history such as **aprs.fi** or **www.findu.com**.

Every 15 minutes the *tracking.pl* program writes out the local APRS data to files on my computer. It then uses the file transfer protocol (*FTP*) program to upload this data to my Web server along with the weather data. I modified the *WhereisBob.html* program to also display the local APRS data as seen in Figure 2. This was a bit challenging because I decided to display the APRS symbol from the standard APRS tables (primary and secondary) that was encoded into the APRS message.

Another Layer

Geolocation is the capability to locate an object on a map based on some data, typically an Internet protocol (IP) address. Google has taken this concept and used it to define a location on a map (latitude and longitude) from an address. This is what they use to generate driving directions. There are many sources of this data including the US Census Bureau. Reverse geolocation is the capability to define an address based on the latitude and location of a point.

I thought this reverse geolocation capability would be a cool feature to add to my tracking capability. There are two places I thought I could use it. First, it would be easy to add to the map display so that when my last reported location was displayed, it would also display the actual (or at least nearby) address of my location. Second, it would be really cool to transmit the address of my location over the radio in an APRS message. In addition to sending out an APRS message that says that I am 2.3 MILES FROM HOME it would now also send a message that says I am NEAR 301-317 APIAN WAY, COLLEGEVILLE, PA. This would also be announced over the computer's speakers at home.

First, I started to modify the *WhereisBob.html* program. This was relatively simple because Google was helpful with documentation and examples. I was able to use the examples to modify my program to determine and display the address associated with my last position. When my last position is displayed in a pop-up information window the address is also included as shown in Figure 3.

This work is just an example of how different technologies can be used together, now referred to as mashups, to enhance the delivery of information. Utilizing the APRS technology, which is already well established, combined with the new mapping and satellite imaging technologies available from Microsoft, Mapquest and Google, anyone can do things we never even imagined just a few years ago.

Bob Bellini, N2IGU, an ARRL member, has been an active ham for over 20 years, using mostly digital modes. Initially he started with the Mount Beacon Amateur Radio Club in upstate New York and now lives in Phoenixville, Pennsylvania. Bob is a Licensed Professional Engineer working for Lockheed Martin as an Information Technology Architect for large computer systems. He has a Bachelor's of Engineering (Electrical) from Manhattan College and a Master's of Science (Electrical Engineering) from Syracuse University. In his spare time Bob teaches robotics to middle and high school students to promote engineering in young minds. He can be reached at 359 Vista Dr, Phoenixville, PA 19460 or at **rbellini@comcast.net**.

VK Alpine Winter Mini-expedition

Two brothers enjoy skiing and radio in the Australian Alps.

Stephen Warrillow, VK3SN, and Gerard Warrillow, VK3GT

Figure 1 — The region of southern Australia the authors put on the air.

If asked about Australia, most people can readily list some of the classic icons associated with VK land: kangaroos, hot desert plains and boomerangs. Probably very few outside of the antipodes are aware that every winter parts of south-eastern Australia undergo a deep freeze. The alpine region makes up less than 1% of the continent's landmass, but is still larger than some European countries (see Figure 1). Renowned for being a huge, but fairly flat continent, Australia's alpine region is not high by global standards (its highest peak is Mt Kosciuszko at 7310 ft above sea level), but much of it is extremely rugged, remote and relatively inaccessible.

For over 10 years now a group of VK hams have taken Amateur Radio into this inhospitable region every winter as part of an ultralight exercise in self-reliance. The adventure centers on using cross-country (X-C) skis to explore regions of the Victorian section of the Alps, with each member of the team carrying all the necessary equipment and food to sustain themselves for 4 days. Ham radio has become an essential part of the trip, mainly for the fun of working distant stations from an austerely beautiful environment using low power (QRP) gear, but also as a vital means of communication with the outside world in the event of an emergency.

Each member of the team must, to a large extent, be able to take care of himself. Only the genuine essentials can be taken in order to keep weight and bulk down as far as possible.

The recent revolution in radio gear has helped. Licensed members of the team carry various versions of modern submersible multiband handheld transceivers, such as Yaesu's VX-7R. These devices are remarkably robust and waterproof. Li-Ion batteries are vastly superior to previous technologies and the use of larger "homebrew" whip antennas strapped to the side of a backpack permits reliable communication at low power, dramatically prolonging battery life. Being up so high allows excellent access to distant VHF/UHF repeaters and quite reliable contact with civilization where cell phones simply have no coverage.

Figure 2 — A typical alpine hut where trekkers camp overnight.

This is not the case, of course, dropping down from the peaks, where HF is the only option. For HF work, we use a Yaesu FT-817. This little radio is a real treasure. Using a fine wire dipole strung between snow gum trees and a small tuner (Elecraft T1) it is possible to move around the bands without leaving the warm safety of a mountain hut or snow cave. The real challenge is how to power the rig. The best solution we have discovered is to carry compact SLA batteries, which we trickle charge from rollable solar panels (PowerFilm R15-600; **www.powerfilmsolar.com**). Such an approach is remarkably effective and provides an acceptable trade-off between weight and optimal power capacity.

Expedition 2008 — Day 1

Our 2008 trip was one of the best yet. We decided to head up in late July to a region known as the Bogong High Plains, which is a substantial plateau sitting at 6200 feet above sea level. The snow had accumulated to about 4 feet in depth and conditions were ideal. The group left Melbourne to drive the 5 hours or so up to the Alpine region and we left our vehicles at the Falls Creek Ski Resort.

After checking that all the gear was properly packed up, the vehicles were left behind and we headed out on skis along snow covered fire trails and then across open country. Crossing frozen streams and climbing up to the high plains we were treated to truly spectacular views across the roof of Australia.

Our reverie was cut short by news coming through on our liaison 2 meter frequency that a skier from another party appeared to

be seriously injured. Some of our team who had gone ahead encountered a group of army Special Forces soldiers out on an alpine survival exercise. One of the soldiers (the unit's medic as it happened) had been seriously injured in a fall and now appeared quite distressed. The army guys were quite surprised to discover that our team included a physical therapist, two paramedics, a radiographer, a veterinary nurse and a critical care physician. We stayed to assist the injured soldier and were glad that our extensive medical kit was available to stabilize his condition and make him comfortable. An emergency retrieval was arranged and he was transferred out with the assistance of the local emergency services using over-snow vehicles.

Staying up high is not really an option overnight, so we headed down to one of the few remaining mountain huts nestled in a nearby valley (see Figure 2). These are very basic structures, mostly remnants from the old days when cattle were grazed on the high plains in the summer months. They generally consist of a corrugated iron roof, rough timber walls and a basic fireplace; they are a real haven in the winter. Anyone is welcome to shelter in them provided that these delicate structures are treated with respect. Protecting the huts is hugely important, as, apart from their historical significance, they are a lot more practical than building an igloo or snow cave for winter shelter.

Once we'd set up and put coffee on to boil, it was time to play radio. Getting wire into the trees in the snow can be a real challenge but fishing weights and strong line certainly help. We use RG-174 coax to run from an ultra-lightweight, homebrew balun into the rig. Losses on HF are trivial and it seems to work well. First off, calls were made to let family at home know we were safe and well. Then for some fun! While QRP work demands a little patience, it is very rewarding to speak to some distant amateur knowing that those few watts of power are sufficient to bridge such an expanse (see Figure 3). Despite the current low level of sunspot activity, we always seem to have a decent number of contacts and really appreciate the efforts that these skilled operators make to pull our weak signal in from the ether.

One of the benefits of being so far from the rest of the world is the almost complete absence of noise. From 160 meters all the way up through the HF, we were troubled by nothing more than the occasional static crash of distant thunderstorms. As the weather closed in with heavy snow and a whiteout, we settled in for the night with a warm drink and worked 160 and 80 meters contentedly.

Figure 3 — Stephen, VK3SN, making a contact from inside the hut.

Day 2 — Fresh Powder and Fine Weather

The next morning we woke to find much fresh heavy snow. These are nearly perfect conditions, as it remained cold enough to keep the snow dry and powdery. On X-C skis it is possible to cover fairly decent distances quite efficiently and we made good time back up to the main plateau, through several stands of snow gum forest before climbing above the tree line again. Once higher up, we felt the full force of the strong winds we had been sheltered from down in the valley. While the snow was perfect, the gale made for heavy going, except when it swung around and came from behind. From this point on, it was possible to glide forward and with jacket open like a kite, hitch a free ride on the wind.

We made it to one of the other huts and decided it would make a good lunch spot. While enjoying lunch, the weather turned and we experienced a "whiteout." On a clear day, one can see mountains over 60 miles away, but when the weather turns bad, visibility is dramatically reduced — on this occasion down to less than 20 feet. We decided that heading back to base (about 9 miles away) was the best bet and let the others know our intentions on our 2 meter liaison frequency. At times like this the marvels of satellite navigation really come to the fore. Using GPS, we headed out into heavy mist, snow and wind, following the blinking arrow on the LCD display. Despite the challenging conditions, we all returned in good time to what had become our designated base camp.

On arriving back to the relative shelter of the camp, we found that those who'd stayed behind had been most industrious. The foundations and walls of a large igloo had been constructed and after pausing for a warming cup of hot soup, the rest of us joined in to assist. We put our backs into the task and a few hours later we were standing inside a very impressive igloo.

While the wind screamed outside and heavy snow falls persisted, inside was amazingly quiet and surprisingly comfortable. After setting down insulated sleeping mats and putting the kettle on a fuel stove to make coffee, we organized getting antennas fed through into our new base (see Figure 4). Now we had a real talking point — operating solar powered HF from an igloo in VK land; improbable, but true! Working mainly 40 and 80 meters was extremely effective and even though the balun and antenna became heavily iced up, performance seemed quite reasonable. Some battery performance problems did emerge in the cold conditions, but placing the battery inside the operator's jacket to use body heat for warming worked well. A very useful aspect of playing radio that afternoon was obtaining updated weather reports from several helpful hams who checked the forecast online and advised us that a high pressure system was due through and would bring some relief from the mini-blizzard we were experiencing.

Day 3 — Waking Up to a Good Day

On day 3 we enjoyed much improved weather and decided to ski up to the summit of Mount Nelse, close to the highest point in the state. Progress was slow, but steady as we approached the summit, which is marked by an old ice covered trig surveying point. The view in all directions was quite stunning and in the bright sunshine, sunburn became the biggest risk. Using our handheld transceivers, we worked in to several distant VHF and UHF repeaters, some of which had IRLP capabilities so that we could chat with friends back home and in Europe. The capacity of these bands to cover remarkable distances when line-of-sight is possible never ceases to amaze. We easily worked in to one distant IRLP linked repeater that was over 125 miles away and had successful contacts into Great Britain — now try doing that on a cell phone!

Mount Nelse had a large cornice of compacted ice — beautiful but dangerous. The trig point marker identified the summit and the limit of where it was safe to venture. Heading further out on the plains, we obtained excellent views of the massive Mount Bogong plateau, which is Victoria's highest mountain. The Big River

Figure 5 — Gerard, VK3GT, and Mat, VK3HFI, inside the igloo.

Figure 4 — Igloo on the air.

valley, nearly 3000 feet below us, could be glimpsed through ravines dropping away from the plains. With near perfect weather and visibility, the team dispersed to enjoy heading wherever conditions suited them. Keeping in touch on 2 meters was handy but risks in such great conditions are fairly minimal anyway. On arriving back we discovered that the solar panels laid out on the snow had heated up in the sunshine and melted down several inches. Lesson learned — next time hang them in a tree or place them on an insulating mat!

During the afternoon, we again had good success working the lower HF bands. By evening 80 meters was great with 0.5 W sufficient to cross the 150 odd miles back to Melbourne reliably on phone. There was much less activity on 160 meters, but some of our most satisfying contacts were into a few of the regular weekend nets on this band. With a mug of old port, a block of dark chocolate and still a bit of power left in the batteries, we enjoyed a great night of radio contacts and yarns about previous trips (see Figure 5). Savoring the experience seemed all the more important knowing we would be heading back to civilization the following day.

Day 4 — Homeward Bound

The following morning required an early start. Winding up icy wire antennas and packing gear took a little time, but we were soon ready to break camp. We crossed over the high plains and came round near the frozen lakes above Falls Creek to arrive back to the vehicles after midday.

As we journeyed back the 5 hours home, it was good to reflect on our experience. We had enjoyed another fantastic adventure into a snow-covered wilderness familiar to very few. The gear had performed well and the importance of a good medical kit and navigation aids had been reinforced. Once again, radio was an integral part of the trip, providing reliable communications and contributing to our safety. Besides these important aspects, it brought a fun means of sharing our adventure with hams from near and far, something we (and I hope they) really appreciate. We are indeed fortunate to have the resource of Amateur Radio available to us. The more often we utilize our band access in innovative and engaging ways, the better we can attract new hams to the hobby and also maintain our operating privileges. Now to start planning for the next trip!

All photos courtesy of Gerard Warrillow, VK3GT

Stephen Warrillow, VK3SN, has been licensed for 10 years and is a member of the Wireless Institute of Australia (WIA), the North East Radio Group (NERG) and the ARRL. He obtained his Advanced operating license in 2003 while completing specialist medical training in the United Kingdom, where he also holds the call sign MØCYT. Stephen is a physician specializing in critical care medicine, medical education and clinical research. His Amateur Radio interests include HF mobile, portable operation in austere environments and wire antennas. Wherever possible he combines radio with hiking, cycling, skiing and travel. Other interests include Australian native gardens, wine and music. You can reach Stephen at PO Box 416, Rosanna, Victoria 3084, Australia or at **swarrillow@hotmail.com**.

Gerard Warrillow, VK3GT (previously VK3JPA) has been licensed for 8 years, holds an Advanced operators license and is a member of the Wireless Institute Civil Emergency Network (WICEN). He has traveled extensively throughout Australia and Europe and has operated in the UK while living there for several years. Gerard is a senior radiographer experienced in CT, MRI and ultrasonography. His main radio interests include ultralight portable QRP operation, homebrew portable gear and multiband mobile work, all of which complement his other favorite pursuits of mountain biking, off trail cross-country skiing and long distance hiking. Gerard can be reached at PO Box 416, Rosanna, Victoria 3084, Australia or at **gwarrillow@hotmail.com**. QST

'Rah for Technology!
America's Oldest College Amateur Radio Club Turns 100

With alumni such as Hiram Percy Maxim, W1AW, and "Mr Top Band" Stu Perry, W1BB, it stands to reason that the MIT Radio Society has a rich history.

Michael J. Keane, K1MK

On April 30, the MIT Radio Society will celebrate the 100th anniversary of its founding. Now known as W1MX,[1] the Radio Society's first license issued in 1913 carried the call sign 1LC. The Society has long prided itself as being "America's Oldest College Amateur Station."[2] The club traces its origin back to events put into motion by a letter to the editors of *The Tech*, the MIT student newspaper:

There are a large number of men now at the Institute who are more or less interested in wireless telegraphy and it is the aim of some of the more enthusiastic to try and form a "wireless" society. The advantages of such a club would be innumerable and considerable help and information could be gained from the results obtained by the different members.[3]

The signers of this letter were three "of the more enthusiastic": E. B. Moore, A. P. Morgan and E. M. Mason, all freshmen members of the Class of 1912. *The Tech* subsequently reported:

Friday, April 30, 1909, will be recorded in the annals of the M. I. T. Wireless Society as an epoch-making day. Men interested in radio telegraphy and telephony, met as a society for the first time on that day and adopted a constitution and elected officers.[4]

Moore was elected first president of the MIT Wireless Society, while Morgan served as vice president. These men were no strangers to technology. At the age of 16, before coming to the Institute, Morgan had authored a book, *Wire and Wireless Telegraphy*, and was writing a monthly column entitled "Helpful Knowledge on Electricity" for *The Draftsman* magazine. Morgan started to make a name for himself as an author even before leaving the Institute. He had begun writing books and magazine articles while a student at MIT. He wrote the first edition of his *Wireless Telegraph Construction for Amateurs* while attending MIT. Three decades later, ARRL Assistant Secretary Clinton B. DeSoto, W1CBD (SK), would describe this 1910 book as "the standard handbook for amateurs of its time."[5] Morgan's writing proved to have substantial longevity; perhaps his most long-lived work was *The Boy Electrician*. Originally published in 1913, later editions of the book remained in print into the 1960s.

MIT Leads the Way

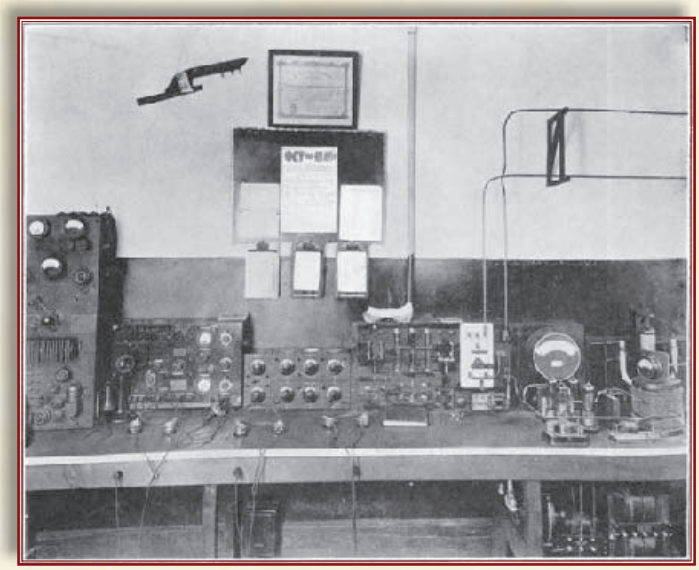
The year 1914 saw the birth of a new, national Amateur Radio organization, the American Radio Relay League. One of its cofounders, Hiram Percy Maxim, a member of the MIT Class of 1886, had become interested in wireless several years earlier through the activities of his son, Hiram Hamilton Maxim, MIT Class of 1923; the younger Maxim went on to become vice president of the Society in 1919.

The coming of the World War I silenced all amateur operation in the US. In April 1917, amateurs were ordered off the air by the Navy: Antennas were to be lowered, transmitters and receivers disconnected and otherwise rendered inoperable. Faced with these circumstances, the MIT Wireless Society, like the ARRL, chose to cease operations for the duration.

Following the end of the World War I, the MIT Wireless Society resumed its activities. By February 1919, the Society was making plans for how to rebuild the club's station once the wartime order prohibiting amateurs from operating their stations was lifted. The ban on receiving was lifted in April 1919, but the Navy Department kept the transmitting restrictions in force. That same month the MIT Wireless Society voted to change its name to the MIT Radio Society. On April 9, 1920, the Society became an ARRL affiliated club.

A front page story in the August 28, 1919 issue of *The Tech* under the headline "Attack on Radio Sending Ban Headed by Hiram P. Maxim '86" included details of how members of the Radio Society were contributing to the effort to get our transmitting privileges restored:

Most directly connected with the undergraduates of the Institute is the campaign conducted by members of the Technology Radio Society who have made personal appeals to their respective state senators and representatives in Washington. These students have served their country as hundreds of other amateurs have, by operating radio stations on both land and sea in the past two years when their aid alone solved the



1XM in 1922. Note the transmitter with its control panel on the extreme right. The portable phone set at the left of the receiver is used for local traffic.

problem of radio operators for the government service. Many of these young men gave up time in their Institute curriculum at a period when they most needed it, and gave themselves over to the government for whatever service they could render. Even at the present time several Institute students are in charge of German stations with the Army of Occupation. More stirring than all is the utmost sacrifice, which many of our amateurs have made, stretching wires across No Mans Land or performing some equally hazardous deed for Uncle Sam.[6]

Following passage of House Joint Resolution 217, which directed the Secretary of the Navy to remove restrictions on Amateur Radio stations, the Navy Department finally announced the removal of all restrictions on September 26, 1919.

A Part of History

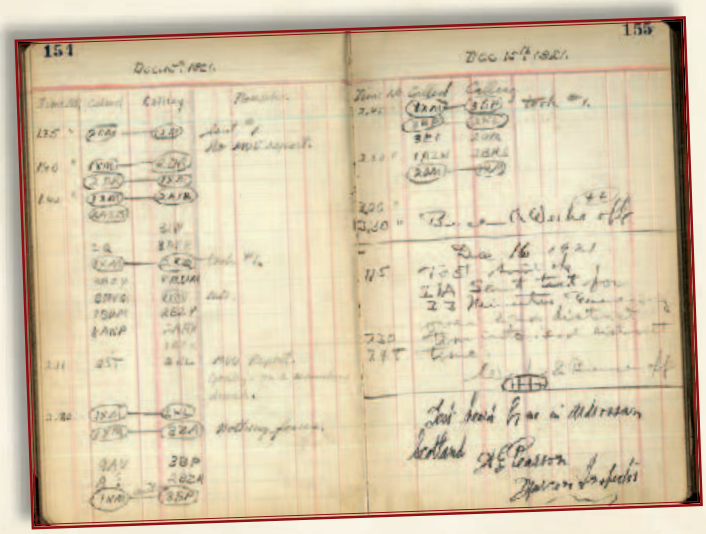
In March 1923, H. P. Maxim spoke at the First District dinner banquet in Boston. In his speech, Maxim declared that the recent achievements of 1XM have made it the "foremost college radio station in the country." Was that The Old Man just saying some kind words while visiting his alma mater? Well, *QST* did print something similar: "From practically every point of view, 1XM is one of the best stations in America."[7] So, what were these achievements and why were they so notable?

In July 1920, the MIT Radio Society received the call 1MX, and another call, 1XM. The 1XM call designated a special land station license for experimental purposes. At that time, a license other than an ordinary amateur license was a distinct advantage if one were interested in experimenting with generating and receiving continuous wave transmissions. Because ordinary amateur licenses were issued for just a single wavelength (200 meters), having an experimental license afforded students at the Institute the opportunity to experiment with CW on different, quieter wavelengths. In July 1924, the Department of Commerce, with prompting by the ARRL, gave amateurs access to new bands below 200 meters.

And experiment they did. The first achievement of note was made early in 1921, when 1XM's signals were reported by an amateur in the Panama Canal Zone, a distance of more than 2000 miles.

The Trans-Atlantic Tests

In the fall of 1921, Paul Godley, 2ZE, conducted the Second Trans-Atlantic Tests. The first round of tests the previous year had been so remarkably unsuccessful that the ARRL was convinced to arrange for Godley to take American receiving equipment over to England and listen for US amateur stations. Finding the conditions in London not to his liking, Godley proceeded to set up his listening post in a tent on the Scottish moors at Androssan. At 0600



1XM's log from the Second Trans-Atlantic Test, signed and certified by Marconi Inspector and test referee D.E. Pearson.

GMT on December 11, 1921, Godley copied 1XM's 500 Hz interrupted CW signal as the station was signing off. Although 1XM was not the first US amateur station to be copied by Godley in Europe, 1XM was among that elite group who could say "We Got Across!"[8]

What made this achievement noteworthy was that 1XM had not pre-registered as one of the sending stations for the test, nor was 1XM calling during one of the open periods with the intent of being heard by Godley. 1XM's signals were picked up in Scotland serendipitously while the station was otherwise engaged in routine operations. 1XM was also one of the US stations whose signals were received by British amateurs during the 1921 tests.

One of the receivers that Godley took to Ardrossen was an Adams Morgan Paragon RA-10/DA-2. A. P. Morgan, MIT Wireless Society founder and its first vice president, was a founding partner of the Adams Morgan Company — MIT was on both ends of that transmission!

In 1922, the attention of the amateur world was drawn to 1XM on April 15 and again on October 19 when its signals were heard by 6ZAC in Wailuku on the island of Maui in Hawaii. The distance of more than 5000 miles was, at that time, the record for long distance amateur transmissions.

In November 1922, 1XM's transmissions were copied in England without prior arrangement with English amateurs. During the 1922 Trans-Atlantic tests the following month, signals from 1XM were heard in England, France, Holland and Switzerland. For the first five days of the tests, but 1XM's 50 W signal was heard three out of the five nights. The power was increased to 250 W for the second half of the tests, and 1XM was heard in both France and England on every one of the five nights. The March 1923 issue of *QST* listed 1XM as one of "The Best American Amateur Transatlantic Sending Stations."[9]

Demonstrating that in its highest form engineering is the art of the useful, in spring 1923, 1XM commenced transmission of standard wavelengths for the calibration of amateurs' receiving sets. These weekly broadcasts, which were accurate within 0.5%, covered from 100 to 540 meters in 10 and 20 meter jumps. Traceability for the standard wavelengths was via Clapp/Stratton calibrated wavemeter. Both James Clapp and Julius Stratton (both members of the Class of 1923) were members of the Society while students at the Institute. Stratton went on to serve as President of MIT from 1959-1966.

Happy Birthday W1MX

Looking back 100 years, the world of 1909 seems to have little in common with the world today. Yet, the first decade of the 20th century was a time of rapid technological development. Marconi had harnessed radio waves, spanning the Atlantic with his wireless in 1901. The Wright Brothers had conquered the air in 1903 at Kitty Hawk. Construction of the Panama Canal began in 1904. The excitement created by the scientific and engineering marvels of the age stirred the imaginations of young people. A century later, technology still presents a special fascination and, like their predecessors, young men and women on college campuses with common technical interests continue to come together in groups and clubs.

As it enters its second century, the MIT Radio Society remains alive and active. The radios may have changed greatly but the amateur spirit has not. In commemoration of the centennial anniversary of its founding, the MIT Radio Society will be operating as W1MX/100 from April 30-May 14 and issuing a special W1MX/100 QSL card.

Notes

[1] See **www.arrl.org/files/qst-binaries/**.
[2] *QST*, "Strays," Jul 1958, p 67.
[3] *The Tech*, April 2, 1909.
[4] *The Tech*, May 3, 1909.
[5] *QST*, "Book Reviews," Jan 1940, p 57.
[6] *The Tech*, May 25, 1923.
[7] *QST*, "Amateur Radio Stations: 1XM, Cambridge, Mass," Mar 1923, pp 51-52, 69.
[8] *QST*, Jan 1922, front cover.
[9] *QST*, "The Best American Amateur Trans-Atlantic Sending Stations," Mar 1923, p 20.

Michael J. Keane, K1MK, MIT Class of 1979, received an SB in Electrical Engineering and an SB in Physics from the Institute. He received an MS in Astronomy from the University of Arizona and a PhD in Astrophysics from the University of California Santa Cruz. The State Government Liaison for the ARRL Connecticut Section, Michael lives with wife Khrystyne, K1SFA, and sons Lynn and Sean in Watertown, Connecticut. He can be reached at **k1mk@alum.mit.edu**.

Sky Chatting

Why just chat in a "room" when you can have the whole world?

Steve Sant Andrea, AG1YK

Well, you are home from work or school, your chores are done, dinner is over and it's time to play radio. At mid week there are no contests to jump into and with the sun below the tribander, the DX is getting weak. Still, your push-to-talk finger is a little itchy and needs some exercise.

Ham radio is a land whose geography covers many technical peaks and activity attractions. From contacting astronauts on the International Space Station to flying radio controlled planes, all hams have a common desire to learn about new people, places and things. In the commotion surrounding all of today's DXpeditions, contests and technical surprises, sometimes it is nice to sit back and have an old fashioned ragchew — a pleasant conversation shared with another ham somewhere off in the ether.

Today's social networking sites, such as Yahoo!Groups or Facebook, provide earthbound folks with a similar experience. Chat rooms focus on particular subjects or activities. If you are interested in sports, there is a room filled with others who share your interest. Gardening your passion? Click the link and enjoy instant fellowship amid the green thumb set. The down side to all this easy access is that you always know where you are and what the others are chatting about. And where's the adventure in that?

Adventure in Every Ragchew

Amateur Radio is a different sort of chat experience. When you send out a CQ you don't know who is going to answer. The ham who returns your call could be across town, across the country or across the ocean. The one thing you do know is that they have a fascination with radio and the freedom it gives to talk to everyone, everywhere.

But now what? How do you have a conversation with someone who you don't know at all? How do you go from the easy predefined world of computer chatting to the more adventurous one of ham radio ragchewing?

Any good conversation begins with giving answers and asking questions.

A Little Detective Work

While the frequency you are using isn't a "room" limited to football fans or photography buffs, you do know something about your contact. To start with, from his or her call sign you can tell what country they are in.

Once you have established contact with another ham there is the traditional ham radio handshake — your name, city, state/country and a signal report. This first exchange gives you the basic information about who and where your contact is and some idea as to whether you will be able to keep the contact going. There is your first clue. We all live somewhere and it's easy to talk about where you live and interesting to hear about what other places are like. Only in ham radio is an atlas a conversation starter! Look up the other ham's location and note any interesting features or places.

On the next exchange you both generally pass along some information about your weather and equipment. This is the opportunity to open up the conversation. Mention something you noted in the atlas. If geography isn't your thing, add a comment about a new mode you are trying or some radio project you are involved in, but there is no reason to stick with radio. Adding a tidbit about some other activity you enjoy will often spark an interesting conversation.

Talk about the great fishing in your area. How your roses are doing this year. The NASCAR race you saw last weekend. The bargain you picked up at a tag sale last month. Throw some thoughts out there. Even if none of them catch, they will encourage the other station to do the same and, soon enough, something will click.

Recently, I had a contact where I passed along my temperature as –2° and the other ham came back with a similar temperature and how he had just come in from feeding his horses. Not knowing much about horses myself, I responded with a comment about how hard such temperatures must be on them. He surprised me by explaining that the horses didn't mind such weather. This then became a short discussion about the care and feeding of horses. On another occasion I contacted an operator who mentioned he was an audio engineer. As I was in the process of converting some old records to digital, this segued into a discussion of various audio processing software packages.

The bottom line here is that hams make contact through a desire to explore, to see who is out there, what kind of world they live in and how it is different — and the same — as their own.

To get more out of your ham radio experience — quit chatting, get talking!

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

DX Dialoguing

While technical topics can be a starting point for any ragchew, limiting yourself to only radio related subjects ignores the most powerful aspect of ham radio — the people you contact can be from all the lands (and seas!) of the earth, from all walks of life, all ages and cultures.

That said, you do have to exercise some good judgment in dealing with a DX contact. While having a conversation with a ham in India or South America can provide a fascinating insight into other lands and cultures, you must be considerate. Many DX stations are primarily interested in making short contacts and may not want to linger. If you get the feeling that a DX station wants to move on, pass along your best wishes. Also, you must remember that many DX stations are not fluent in English. While you frequently hear DX stations running through contact exchanges in English in what seems like a smooth and easy manner, this may only mean they have "picked up" enough English for that purpose. Many are not fluent enough to hold a conversation in another language. How's *your* Swahili anyway?

When you do contact a DX station that would like to "have a chew," be sensitive to the fact that he or she is from a different culture than yours. Subjects that are commonly discussed here in the US may not be so comfortable for a station in Asia. The complete democracy of radio allows us to interact with a wide range of people but we must, in turn, be sensitive to the fact that other cultures can have very different comfort zones from ours. Talking about your kids or grandkids (or parents for that matter!) is common here but in some cultures these subjects are taboo. If a DX station seems "cold" to a subject don't press it. Move on to something else. It's a big ionosphere and there is plenty to have a chew about.

Party Time on 40 Meters!

Hams are happy as broadcasters prepare to vacate 7100-7200 kHz.

Brennan T. Price, N4QX

Shortly after this issue of *QST* is mailed, radio amateurs around the world will enjoy a marked improvement in operating conditions on 40 meters. On March 29, broadcasters are scheduled to vacate the 7100-7200 kHz segment in ITU Regions 1 and 3 (essentially the world outside of the Americas — see Figure 1). Most amateurs in these regions will gain access to this band, if their administrations haven't let them in already.

Here in ITU Region 2, the 7100-7200 segment should be free of the broadcast signals that have made communications on 40 meters difficult ever since the introduction of broadcasting into the band in 1938.

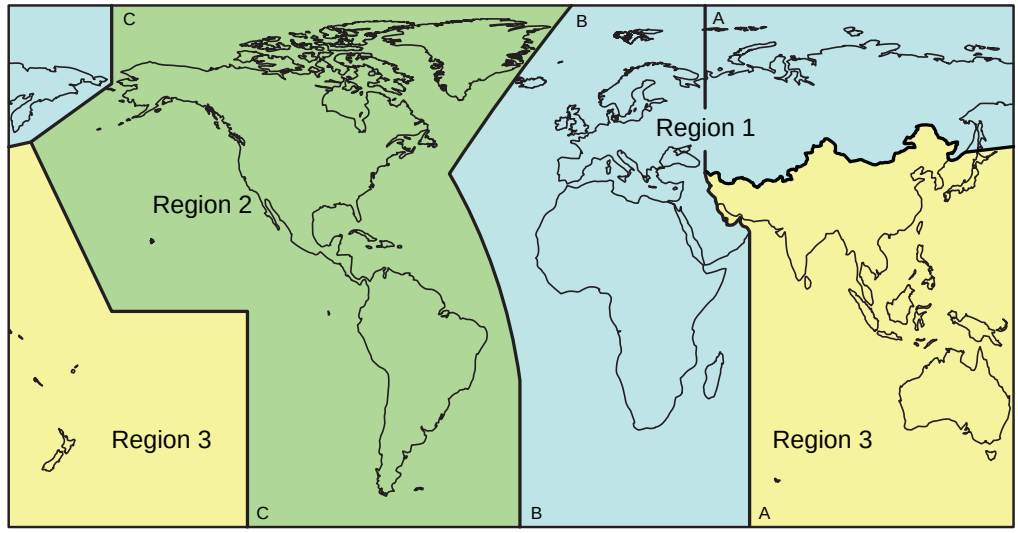


Figure 1 — The Regions of the International Telecommunication Union. Only Region 2, the Americas, has enjoyed full Amateur Radio access to 7000-7300 kHz since 1938.

Unlike a lot of changes in the landscape of Amateur Radio spectrum, this one does not require American operators to learn new rules or propagation characteristics. United States hams will — subject to their license class — still be able to use CW, RTTY and data from 7100-7125 kHz, as well as CW, voice and image from 7125-7200 kHz. But for the first time since before World War II, amateurs will not have to shoehorn their operations in this band between numerous and loud shortwave broadcast stations. Nor will DXers working the United States from Europe and Asia on 40 meter phone be required to work split (listen on one frequency and transmit on another). They will be able to pick a free frequency between 7125 and 7200 kHz, and we W-land hams can answer them on simplex.

As we approach this milestone, it is worth reviewing the history of the 40 meter band, the work done at the 2003 World Radiocommunication Conference (WRC-03) to improve the standing of amateurs on 40 meters, and what the state of the band will be once March 29 arrives.

A World War and a Cold War

A few long-lived and long-licensed hams will remember the days before the 1938 Cairo Conference, when the band we enjoy in the United States, 7000-7300 kHz, was exclusively allocated to amateurs worldwide. But HF was ideally suited for broadcasting in an era where the pre-World War II propaganda machines were gearing up for the horrible conflict to come. The relatively reliable one-hop propagation offered around 7 MHz at all stages of the solar cycle was — and is — ideal for getting a message behind enemy lines. In Cairo, the 7150-7300 kHz segment was reallocated to broadcasting outside of the Americas.

The propaganda war did not end with World War II, as the Soviet Union and the Western Allies fought the battle of ideas in Europe and elsewhere. At the 1959 World Administrative Radio Conference (WARC-59) in Geneva, the 7100-7150 kHz segment became Amateur Radio's casualty of the Cold War, going to broadcasters in ITU Regions 1 and 3. This segment became a home for Radio Free Europe, the BBC, Radio France Internationale, Deutsche Welle and countless Eastern Bloc stations. Even though the United States opposed the expansion of broadcasting at WARC-59, certain European transmitters of the Voice of America eventually came to occupy the band.

Fortunately for hams in the Americas, ITU Region 2 maintained the full 300 kHz for Amateur Radio use. For many Novices (and later, Technicians with HF privileges), the 7100-7150 kHz (and before that, 7150-7200 kHz) segment was the home of one's first HF contacts, including this writer's operating as KF4UZB in 1998. But RF knows no political boundaries, and broadcasters outside of the Americas were routinely heard in the Americas, particularly at night. Making matters worse, during the Cold War many of the broadcasts were jammed. The utility of the band was not been as great as it could have been.

Realignment at WRC-03

As early as 1979, ITU conferences attempted to mitigate the incompatibility of the amateur and broadcast services by relocating broadcasters. But at WARC-79, the fixed service was not willing to give up spectrum to allow broadcasters to relocate. In fact, for about 24 hours at WARC-79, the 7100-7300 kHz allocation in Region 2 was at risk; only unanimous and determined

opposition of Region 2 administrations and support from some outside the region saved the status quo. While the 1979 conference brought ample gains for Amateur Radio in terms of the new 30 meter, 17 meter, and 12 meter bands, the 40 meter issue would remain unchanged for more than two decades.

Another attempt to resolve the issue was made at WARC-92, but all that was accomplished was an allocation of another 50 kHz to broadcasting — effective 15 years later, in 2007, with an invitation to "consider the possibility of aligning the allocations to the amateur service around 7 MHz, with due regard to the requirements of other services."[1] The World Radiocommunication Conference in Istanbul in 2000 took up that challenge, placing the issue on the agenda for WRC-03 in Geneva.

When WRC-00 ended, it looked as if fixed service interest in HF had waned to the point where the issue could be addressed. As Dave Sumner, K1ZZ, noted in these pages, "Satellites, fiber optic cables, and other media had reduced their dependence on HF."[2] But after September 11, 2001, military and government interests began to look at HF with new appreciation, given its capability to provide long range communications with little infrastructure.

Against this landscape, WRC-03 began with a wide variety of proposals on the table and three players — amateurs, broadcasters and military/government interests — looking for spectrum. Over the weeks in Geneva, it became clear that there was too much resistance to a worldwide amateur allocation of 300 kHz, but fortunately for amateurs, the worst-case scenario — the loss of the 7100-7300 kHz segment in Region 2 — was also off the table.

Eventually, fixed service interests agreed to let broadcasters relocate, and broadcasters agreed to vacate 7100-7200 kHz. The implementation date was a point of contention, with one proposal suggesting as far out as 2033. There were even a few administrations holding out for the status quo until the very end. Ultimately, footnotes to the table of allocations were adopted to accommodate the remaining objections, and an implementation date of March 29, 2009 was agreed.

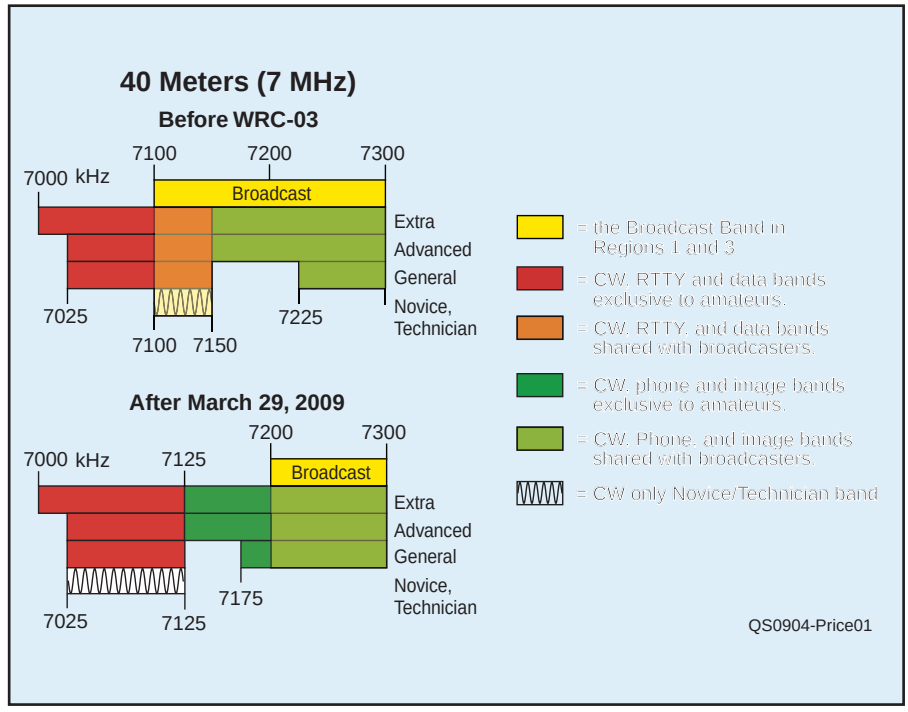


Figure 2 — On the top, mainland United States 40 meter operating privileges as they existed before WRC-03, with the segment shared with Region 1 and 3 broadcasters indicated. On the bottom, the same chart of privileges and sharing effective March 29, 2009. Everyone wins.

What You'll Hear and What You Won't

Now that this date is at hand, amateurs can look forward to a bit of relief from broadcast stations below 7200 kHz. The March 29 date was chosen to coincide with a traditional seasonal schedule change for HF broadcasters, and broadcasters have been planning accordingly for some time. Not all broadcasters abide by the planning process, so it is likely that some broadcast signals will remain below 7200 kHz for some time after March 29 — but the utility of the band will be dramatically improved, and it should eventually be possible to get virtually all of the broadcasters shifted out of the band.

The footnotes added to overcome the last objections at WRC-03 will mean that it may be possible to hear a fixed or mobile service station between 7100-7200 kHz after March 29.[3] These operations are confined to a small number of countries, however, none of which are in Region 2 or in Europe. Further, the strength and intrusiveness of such operation is significantly less than that of a broadcast station. For the most part, amateurs should hear each other — and only each other.

Forty meters has become much more accessible to United States amateurs than it was when WRC-03 convened. The state of the band in the United States — then and now — is illustrated in Figure 2. Novices and Technicians may operate CW from 7025-7125 kHz, shifted slightly and expanded significantly than the 7100-7150 kHz I enjoyed as KF4UZB. With the removal of the Morse telegraphy testing requirement, all Technicians may now use this band. General class licensees now enjoy phone privileges on 7175-7300 kHz, up from 7225-7300 in 2003. Advanced and Extra Class operators now have more phone privileges on 40 meters, from 7125 kHz to the top of the band. Whatever your license class, your privileges on 40 meters will be more enjoyable on March 29.

Get on the air and have fun!

Notes

[1]D. Sumner, K1ZZ, "WARC-92 Finds Room for New Radio Services," *QST*, May 1992, pp 25-28.

[2]D. Sumner, K1ZZ, "WRC-03 from the Amateur Perspective," *QST*, Sep 2003, p 41. Much of the factual background in this article was gleaned from Dave's report.

[3]The applicable footnotes read as follows:

5.141A Additional allocation: In Uzbekistan and Kyrgyzstan, the bands 7000-7100 kHz and 7100-7200 kHz are also allocated to the fixed and land mobile services on a secondary basis.

5.141B Additional allocation: After March 29 2009, in Algeria, Saudi Arabia, Australia, Bahrain, Botswana, Brunei Darussalam, China, Comoros, Korea (Rep. of), Diego Garcia, Djibouti, Egypt, United Arab Emirates, Eritrea, Indonesia, Iran (Islamic Republic of), Japan, Jordan, Kuwait, the Libyan Arab Jamahiriya, Morocco, Mauritania, New Zealand, Oman, Papua New Guinea, Qatar, the Syrian Arab Republic, Singapore, Sudan, Tunisia, Viet Nam and Yemen, the band 7100-7200 kHz is also allocated to the fixed and the mobile, except aeronautical mobile (R), services on a primary basis.

Brennan T. Price, N4QX, is ARRL's Technical Relations Manager. Most of his time is currently spent contributing to preparations for WRC-2011. He may be reached at **bprice@arrl.org**.

ARRL Board of Directors Sets Legislative Agenda, More at 2009 Annual Meeting

Eyeing the next decade, the ARRL Board of Directors lays the groundwork for the future.

S. Khrystyne Keane, K1SFA
ARRL News Editor

ARRL Board of Directors held its 2009 Annual Meeting on January 16-17 in Windsor, Connecticut, under the chairmanship of President Joel Harrison, W5ZN. Radio Amateurs of Canada President David Goodwin, VO1AU/VE3AAQ, and IARU President Larry Price, W4RA, were guests of the Board.

The Board considered and acted on a number of organizational and regulatory issues. Election of the Executive Committee, committee appointments and awards were also on the agenda for the Annual Meeting.

JON BLOOM, KE3Z

The ARRL Board of Directors held its 2009 Annual Meeting in Windsor, Connecticut on January 16-17.

Organizational Issues

ARRL Strategic Plan: At its July 2008 meeting, the Board voted to develop a timeline to review and revise the ARRL Strategic Plan. The Board directed Chief Executive Officer David Sumner, K1ZZ, to release the Plan's long-range goals to the membership and to solicit comments from members "on the future direction and priorities of their national organization." At this meeting, Sumner led an in-depth discussion of the membership input. The Executive Committee is tasked with developing materials for use in completing the Plan revision at the July 2009 Board meeting.

ARRL Membership and Deployed Active Duty Military: The Board voted unanimously to amend Bylaw 5, stating that the Executive Vice President is authorized to maintain ARRL membership privileges without charge for the duration of a member's active military deployment outside the ARRL operating territory as described in Bylaw 30, with or without the delivery of *QST* at the member's option. Bylaw 30, among other things, defines the areas outside the 50 states that comprise the ARRL's operating territory. This action brings into the Bylaws a policy adopted earlier by the Board.

Budget: The Board voted to adopt the 2009-2010 Plan (as amended), as presented by the Administration and Finance Committee.

Scouting: The Board voted to offer assistance to the Boy Scouts of America and their 2010 National Scout Jamboree. By representing Amateur Radio and participating with K2BSA at the Jamboree in conjunction with the Boy Scouts, the ARRL plans to build on the success of past National Jamborees where

JON BLOOM, KE3Z

ARRL Rocky Mountain Director Brian Mileshosky, N5ZGT, confers with First Vice President Kay Craigie, N3KN; President Joel Harrison, W5ZN, and Executive Vice President and Secretary David Sumner, K1ZZ, during the meeting.

JON BLOOM, KE3Z

Southwestern Director Dick Norton, N6AA, and West Gulf Director Coy Day, N5OK, listen attentively to a presentation during the meeting on Friday. Seated behind them are Vice Directors Donahue, Woll and Woolweaver.

JON BLOOM, KE3Z

Midwest Director Bruce Frahm, KØBJ, New England Director Tom Frenaye, K1KI, Northwestern Director Jim Fenstermaker, K9JF, and Pacific Director Bob Vallio, W6RGG (with Vice Directors behind them), watch a presentation during Saturday's meeting. ARRL Chief Financial Officer Barry Shelley, N1VXY, is in the background.

thousands of youth learned about the value and enjoyment of Amateur Radio. Teaching the Radio merit badge program, license classes and VE exam sessions have been parts of the quadrennial event that attracts more than 40,000 Scouts and leaders.

Technology Task Force: This group, created in 1999, was formed to develop a strategy and plan of work for exploring new technologies, assessing their applicability to Amateur Radio and also developing a plan as to how to incorporate such new technology in the Amateur Radio Service. Since its inception, the Technology Task Force has carried out studies and offered recommendations — particularly with regard to digital voice, high-speed multimedia and software-defined radio. The Board resolved that the exploration and promotion of new Amateur Radio communications technologies shall continue to be an essential element of the ARRL's mission and that the original mission of the Technology Task Force may now be carried out more effectively by other means. With sincere thanks and gratitude, the Board voted to dissolve the group.

Awards Conferred at Annual Meeting

At the 2009 Annual Meeting, the ARRL Board of Directors voted to convey two awards for 2008: The Bill Leonard, W2SKE, Professional Media Award and the ARRL Humanitarian Award.

The Bill Leonard, W2SKE, Professional Media Award

Ted Randall, WB8PUM, was named the recipient of the Bill Leonard, W2SKE, Professional Media Award. Every week, Randall hosts the *QSO Radio Show*, featuring guests who have ties to the amateur community, such as country and western artist Ronnie Milsap, WB4KCG, Amateur Radio licensing instructor Gordon West, WB6NOA, and Monitoring Times publisher Bob Grove.

This annual award honors a professional journalist whose outstanding coverage in TV, radio, print or multimedia best reflects the enjoyment, importance and public service value of Amateur Radio. The award was created as a tribute to the late CBS News President Bill Leonard, W2SKE. Leonard was an avid Amateur Radio operator, most active on the air during the 1960s and 1970s. As the recipient of the Bill Leonard Award, Randall will receive a plaque and a cash prize of $500.

"I want to thank you all for this award, on behalf of the radio show, more than for myself," Randall said. "I believe the award will add credibility to the show and will help us continue to get to our goals. This is just one of the many reasons why doing the *QSO Radio Show* is so important to me. The folks who 'are' Amateur Radio and the ARRL have stories to tell that the rest of the world needs to hear. Little on radio today is authentic and compelling. The QSO Radio Show brings all these special people into the homes and listening posts of people in every continent. We are taking a story of goodwill and friendship, the story of Amateur Radio, 'up close and personal' to millions of listeners around the world. We are also collecting a fraternity of folks together, around what comes natural to us, the radio. We saw this magic take place in 2008 on Field Day, with Field Day locations calling in from everywhere, including Iraq. Magicians appear to perform magic on stage, but what these folks did is real magic!"

ARRL Humanitarian Award

The Board voted to confer the 2008 ARRL Humanitarian Award to the amateurs of the Sichuan Radio Sports Association, the Chinese Radio Sports Association (CRSA) and the many Amateur Radio operators in China who assisted with communications support during the May 2008 earthquake in that country. According to the CRSA — the Chinese IARU Member-Society — Chinese government officials and the news media recognized that when communications failed after the earthquake, Amateur Radio operators stepped in to provide vital links. CRSA acknowledged that the main organizer of local Amateur Radio traffic, Luo Minglin, BY8AA, "continuously coordinated VHF/UHF communications for a 100 km radius from Chengdu, the capital of southwest China's province of Sichuan. More repeaters were set up in both Beichuan and Mianyang — among the worst hit areas outside the epicenter — to form an effective Amateur Radio communication network."

According to Programs and Services Committee Chairman Bruce Frahm, KØBJ, the committee felt that the Chinese amateurs and their organizations "exemplified the highest level of dedication to public service."

中国无线电运动协会
CHINESE RADIO SPORTS ASSOCIATION

Summary of Major Board Actions

The *Minutes* of the 2009 Annual Meeting of the Board, Moved and Seconded, are published only on the ARRLWeb at **www.arrl.org/announce/board-0109**. If you do not have Internet access, you may request a written copy of the *Minutes* by writing: ARRL Secretary, 225 Main St, Newington, CT 06111.

Minute	Purpose	Action
Organizational		
16	Amendment of Bylaw 5 *Bylaws updated to reflect Board policy regarding ARRL membership and active duty deployed military.*	Approved
17	Admission of Emirates Amateur Radio Society to IARU Membership. *Instructed Secretary to cast "aye" vote with the IARU in this matter.*	To Secretary
18	Admission of Kazakhstan Federation of Radiosports and Radioamateur to IARU Membership. *Instructed Secretary to cast "aye" vote with the IARU in this matter.*	To Secretary
19	Dissolution of ARRL Technology Task Force *The missions of this Task Force can be carried out more effectively by other means.*	Approved
23	Report of Administration and Finance Committee *The Board approved the report concerning personnel matters.*	Approved
24	2009-2010 Plan *The Board approved the plan (as amended) for the upcoming fiscal year.*	Approved
25	Whistleblower Policy *This action brings ARRL in line with State of Connecticut policy.*	Approved
26	Establishment of 403(b) Pension Plan for ARRL Employees *This action brings ARRL in line with State of Connecticut policy.*	Approved
27	Funds Allocated for ARRL Web Site Development *This capital expenditure allows completion of the development of the new ARRL Web site.*	Approved
28	Implementation of ARRL Brokerage Account *Allows for trading of securities for the ARRL portfolio.*	Approved
29	2010 National Scout Jamboree *The ARRL will offer assistance to Boy Scouts of America and participate with K2BSA for the quadrennial event.*	Approved
33	ARRL Strategic Plan *Based on member input, the Executive Committee will develop materials to start revising the ARRL Strategic Plan for 2009 Second Meeting.*	To Executive Committee
Legislative and Regulatory		
22	Legislative Objectives for 111th Congress *The Board will focus on five goals this Congressional session, including CC&Rs, BPL and emergency communications.*	Approved
34	Call Sign Allocation Study *The Executive Committee will study the FCC sequential, vanity and special call sign programs and make their recommendation to the Board for a filing with the FCC.*	To Executive Committee
35	Amateur Radio and Driving *Instructed CEO and General Counsel to draft policy statement and recommend language to protect licensed radio amateurs to conduct mobile amateur communications.*	To CEO and General Counsel
Committee Elections and Appointments		
7	Executive Committee Appointments *ARRL President Joel Harrison, W5ZN, made appointments to the ARRL Executive Committee.*	Conveyed
7	Election of ARRL Foundation Directors *Directors of the ARRL Foundation serve three year terms.*	Approved
21	ARRL Committee Appointments *ARRL President Joel Harrison, W5ZN, made appointments to ARRL committees, including the Administration and Finance Committee and the Programs and Services Committee.*	Conveyed
Awards and Recognitions		
20	Lifetime Achievement Award to IARU President Larry Price, W4RA *Dr Price was recognized for his positive image and influence that it enjoys in the international telecommunications community, especially at the ITU.*	Conveyed
31	*2008 ARRL International Humanitarian Award* to the amateurs of the Sichuan Radio Sports Association, the Chinese Radio Sports Association and the many Amateur Radio operators in China *The long-term relief operation mounted by these individuals and organizations during the May 2008 earthquake centered in the Wenchuan area of Sichuan Province exemplifies the highest level of dedication to public service.*	Conveyed
32	*2008 Bill Leonard, W2SKE Professional Media Award* to Ted Randall, WB8PUM. *Mr Randall is host of QSO Radio Show and has provided ongoing coverage of Amateur Radio through his profiling of key figures and personalities.*	Conveyed

Summary prepared by S. Khrystyne Keane, K1SFA

DAVE PATTON, NN1N

On behalf of the ARRL Board of Directors, President Harrison presented IARU President Larry Price, W4RA, with a Lifetime Achievement Award. Price, a former ARRL President, was recognized for his work on behalf of Amateur Radio, both in the US and on the international stage, over a span of four decades.

IARU Member-Society Admissions: The Board voted unanimously to instruct the Secretary to cast ballots in favor of admitting the Emirates Amateur Radio Society and the Kazakhstan Federation of Radiosports and Radioamateur to the IARU.

ARRLWeb Redesign: A group from Fathom, a contractor based in Hartford, presented the company's progress on a new design for the ARRL Web site. As recommended by the Administration and Finance Committee, the Board voted to approve a capital expenditure to move into the third phase of the design development.

Legislative and Regulatory Matters

Legislative Objectives: The Board voted to approve five legislative objectives for the 111th Congress:

- Objective #1: The ARRL seeks legislation to extend the requirement for "reasonable accommodation" of Amateur Radio station antennas (a requirement that now applies to state and local regulations) to all forms of land use regulation.
- Objective #2: The ARRL opposes legislation that encourages the deployment of RF technologies such as broadband over power line (BPL) systems unless adequate safeguards against interference to licensed radiocommunication services are included in the legislation.
- Objective #3: The ARRL opposes legislation that would diminish the rights of federal licensees in favor of unlicensed emitters, especially unintentional emitters.
- Objective #4: The ARRL seeks recognition of the unique resources, capabilities and expertise of the Amateur Radio Service

in any legislation addressing communications issues related to emergencies, disasters, or homeland security.

■ Objective #5: The ARRL supports the complementary legislative objectives of other radiocommunication services, particularly the public safety and scientific services that require spectrum access and protection from interference for noncommercial purposes that benefit the public.

Call Sign Allocation Study: The Board voted to instruct the Executive Committee, with advice and input from the Programs and Services Committee, to study the FCC sequential, vanity and special call sign programs.

Amateur Radio and Driving: The Board noted that local municipalities, as well as state legislatures, have made laws or are considering laws that apply to drivers who use cellular telephones while driving. Recognizing that this sort of legislation often inadvertently prohibits — or can be construed to prohibit — Amateur Radio mobile communications, the Board instructed the Executive Committee to develop a policy statement and recommend language that protects the ability of licensed radio amateurs to prudently conduct mobile amateur communications.

Upon the resignation of West Gulf Director Coy Day, N5OK, after the Board meeting, Vice Director Dr David Woolweaver, K5RAV, moved up to become West Gulf Director. Oklahoma Section Manager John Thomason, WB5SYT, was appointed to fill the Vice Director vacancy.

Other Items

Committee Elections and Appointments

Executive Committee: The Board elected the following Directors to the ARRL Executive Committee: Bill Edgar, N3LLR, Atlantic Division; Dick Isely, W9GIG, Central Division; Jay Bellows, KØQB, Dakota Division; Tom Frenaye, K1KI, New England Division, and Bob Vallio, W6RGG, Pacific Division. Members of this committee serve one year terms.

President Harrison appointed the following Board members to committees:

Administration and Finance Committee: Jim Fenstermaker, K9JF, Chairman, Northwestern; Jim Weaver, K8JE, Great Lakes; Dennis Bodson, W4PWF, Roanoke; Brian Mileshosky, N5ZGT, Rocky Mountain; Dick Norton, N6AA, Southwestern; Vice Director Cliff Ahrens, KØCA, Midwest, and Treasurer Jim McCobb, K1LU.

Programs and Services Committee: Bruce Frahm, KØBJ, Chairman, Midwest; Greg Sarratt, W4OZK, Southeastern; Coy Day, N5OK, West Gulf; Mickey Cox, K5MC, Delta; Frank Fallon, N2FF, Hudson, and Vice Director Greg Widin, KØGW, Dakota.

Ethics and Elections Committee: Greg Sarratt, W4OZK, Chairman; Brian Mileshosky, N5ZGT, and Jay Bellows, KØQB.

Ad Hoc Scouting Committee: Brian Mileshosky, N5ZGT, Chairman; Bill Edgar, N3LLR; Jim Fenstermaker, K9JF, and Staff Liaison Larry Wolfgang, WR1B.

Ad Hoc Committee on the ARRL Foundation: Vice President Rick Roderick, K5UR, Chairman; Tom Frenaye, K1KI; Jim Fenstermaker, K9JF; Chief Executive Officer David Sumner, K1ZZ, and Chief Development Officer Mary Hobart, K1MMH.

Chairman and Liaison Appointments

Public Relations Committee: Bill Morine, N2COP, Chairman; Mike Raisbeck, K1TWF, Liaison, New England Vice Director.

Historical Committee: Vice Director Gary Johnston, KI4LA, Chairman, Great Lakes.

Legal Defense and Action Committee: Jay Bellows, KØQB, Chairman.

Electromagnetic Compatibility Committee: Dennis Bodson, W4PWF, Chairman.

Band Planning Committee: Vice President Rick Roderick, K5UR, Chairman.

Microwave Band Planning Committee: Tom Clark, K3IO, Chairman.

RF Safety Committee: Greg Lapin, N9GL, Chairman.

VHF/UHF Advisory Committee: Kermit Carlson, W9XA, Chairman.

DX Advisory Committee: Bob Allphin, K4UEE (announced after the meeting).

Contest Advisory Committee: Dick Green, WC1M, Chairman.

Amateur Radio Direction Finding Coordinator: Joe Moell, KØOV.

The complete Minutes of the 2009 Annual Meeting of the ARRL Board of Directors are available at **www.arrl.org/announce/board-0901**. The next meeting of the ARRL Board of Directors is scheduled for July 17-18, 2009. QST

Feedback

◊ In "The W4SSY Spudgun" [Mar 2009. pp 67-69], Byron Black, W4SSY, reports that he has been informed that OSHA recommends against use of PVC for above ground compressed air. The problem, per James R Divine, PhD, PE, WB7DJX, is not so much that the PVC can fail as that if it does fail, it shatters, resulting in a hazard to everyone around. Further, as the temperature drops, it becomes more and more brittle, and thus should not be used in cold weather. In any case, the area should be kept well clear. Wrapping the air chamber with reinforced duct tape may help, but it is not a proven technique. The author has supplied supplemental information that can be found on the *QST* binaries Web site at **www.arrl.org/files/qst-binaries/**.

◊ In "Announcement — Second ARRL Homebrew Challenge" [Feb 2009, p 75], the caution about a "beryllium substrate…" should have said "beryllium **oxide** substrate…." Check the new Homebrew Challenge Web site at **www.arrl.org/qst/hbc/** for rules clarifications and reader questions and answers.

◊ In "Product Review — TelePost LP-PAN Software Defined IQ Panadapter" [Feb 2009, pp 44-50], it was stated that mono to stereo adapters for the output connectors were not available from RadioShack. Brian Torr, N6IIY, noticed that RadioShack sells what they call an "Aircraft 2" adapter that converts a ⅛" stereo jack to two ⅛" mono plugs. It is RadioShack part number 42-2495. They also sell a Y adapter to convert an ⅛" stereo jack, such as on the laptop's sound card, to two ⅛" mono jacks, part number 274-375.

◊ In "The World Above 50 MHz" [Jan 2009, pp 87-89] the Internet address for the Summitek Instruments company document on "Passive Intermodulation Measurement Techniques" was incorrect. The correct Web address is **www.summitekinstruments.com/passive/docs/pimprimer.pdf**.

◊ In "Designing and Building Transistor Power Amplifiers" [Mar 2009, pp 40-43], the 2SC5739 power transistors are correctly identified in Figure 2, but are referenced errouneously in the text.

◊ In "World Above 50 MHz" [Mar 2009, pp 89-91] the MDS values in Table 2 for the SDR-5000 and the K3 were transposed. The K3 should show an MDS of –138 dBm, while the SDR-5000 should be shown as –132 dBm.

◊ The author's footnote references were inadvertently left out of "A Lost Dit of Vibroplex History" [Feb 2009, pp 58-59]. The footnotes and the text that they reference are as follows:

Horace G. Martin invented the Autoplex and the Vibroplex in New York City in the early years of the 20th Century, but the first Vibroplex manufacturing plant was located in, of all places, the little town of Norcross, Georgia. [J. Ceccherelli, "Vibroplex — The Company and its Classic Key," *QST*, Jan 2003, p 48]

William R. Holly, K1GH, adds some detail on the Norcross connection in his definitive history of the Vibroplex Corporation. [W. R. Holly, *The Vibroplex Co., Inc. 1890 to 1990*, The Vibroplex Co, Inc, 1990]

According to published reports, young Buck Buchanan learned telegraphy from a depot operator by the name of Dave Wall. ["Edward F. Buchanan," *The Atlanta Georgian and News*, Dec 6, 1910]

As is well-known, Martin became highly proficient, a world-class operator. [J. Casale, Ed., "Horace G. Martin, Part One: The Telegrapher," *The Old Timer's Bulletin*, Nov 2002]

It would be tempting to conjecture that Martin and Buchanan became acquainted when both worked as telegraphers in 1904 in New York City. [Holly, p 5]

The partners of the firm, including Edward F. Buchanan, whom *The New York Times* described as "the young Napoleon whose strategy had failed to connect" even spent some time under arrest. [*The New York Times*, Aug 26, 1908]

The Horatio Alger kid found himself back at the Atlanta Western Union office where he applied for a job saying, "Just make me a plain old op." ["Edward F. Buchanan," *The Atlanta Georgian and News*, Dec 6, 1910]

Laura L. Smith Named to Amateur Radio Enforcement Role

Laura L. Smith of Pennsylvania has been named by the FCC to fill the vacancy created when Riley Hollingsworth, K4ZDH, retired in 2008 as Special Counsel for the Spectrum Enforcement Division of the FCC's Enforcement Bureau. Hollingsworth served in that position for more than 10 years as the FCC's enforcement watchdog over the Amateur Radio Service.

A 1990 graduate of the Pepperdine University School of Law, Smith began her legal career with the FCC, working in the Mass Media Bureau and Wireless Telecommunications Bureau. She also served as Deputy Division Chief of the Public Safety and Private Wireless Division. Smith is currently licensed to practice in the Commonwealth of Virginia.

In 1998, Smith left the FCC to become Executive Director of Governmental Affairs for the Industrial Telecommunications Association (ITA), now Enterprise Wireless Alliance. In that role, she monitored FCC and legislative proceedings and participated in all regulatory proceedings relevant to the private wireless industry. In 2001, Smith became ITA's President and Chief Executive Officer. While in that position, she was instrumental in the formation of the Consensus Group, a group of public safety and private wireless entities responsible for drafting the "Consensus Plan," a proposed resolution for interference in the 800 MHz band; this was adopted by the FCC in 2004.

Smith returns to the FCC after serving Of Counsel with the Maryland law firm of Shulman Rogers. While there, she dealt with telecommunications matters and provided counsel to numerous entities in the private radio and public safety communities. Smith has served as an industry consultant and written columns for a variety of trade publications including *Mobile Radio Technology Magazine* and *The Private Wireless Magazine*.

In an October 2008 letter to then-FCC Chairman Kevin Martin, ARRL President Joel Harrison, W5ZN, urged Martin to name a successor to Hollingsworth: "The appointment of a replacement Special Counsel in this position is of critical importance to the Amateur Radio Service, as the delay in finalizing the appointment stands to undermine in very short order an exceptionally successful and low-cost program of enforcement in the Amateur Service."

Calling the FCC's Amateur Radio enforcement program "spectacularly successful," Harrison reminded Martin of the "long period in the late 1980s and 1990s during which the Commission was essentially uninvolved in enforcement in the Amateur Service. The Amateur Service, consisting of some 680,000 licensees of the Commission, is in essence a self-regulating service; however, due to the shared frequency allocations in the Service and the long distance propagation of amateur communications, a very few rule violators can cause severe disruption in the Service. On the other hand, even a minimal Commission presence has a very strong deterrent value."

When Hollingsworth was appointed as Special Counsel for Amateur Radio Enforcement, Harrison noted that Hollingsworth "established a visible presence in the Service and very quickly, and with very little investment of Commission resources, using little more than the awareness of an enforcement presence, created strong deterrence against rule violations."

Upon learning of Smith's move to the Amateur Radio enforcement role, Harrison remarked that he was "very pleased to see the Commission move forward with the hiring of a new Special Counsel responsible for enforcement of the Amateur Radio Service rules. Ever since Riley Hollingsworth announced his retirement, we have met with the Enforcement Chief numerous times and corresponded with then-FCC Chairman Martin to ensure this position remains intact at FCC. The Commission acknowledges the self-regulating environment we maintain, but also understands that we need their assistance occasionally to resolve a few situations. They have continually reassured us that this is an important matter for them, and Ms Smith's hiring confirms that."

COY DAY, N5OK, RESIGNS FROM ARRL BOARD OF DIRECTORS

After more than 12 years as a member of the ARRL Board of Directors family — 10 of them as West Gulf Division Director — Coy Day, N5OK, resigned from ARRL elected office, on January 20. Per the *ARRL Articles of Association*, Vice Director David Woolweaver, K5RAV, has taken over as Director. ARRL President Joel Harrison, W5ZN, in consultation with Woolweaver and Day, appointed Oklahoma Section Manager J. John Thomason, WB5SYT, as Vice Director. The next election for West Gulf Division Director and Vice Director will be in 2010.

Day, who was Chairman of the League's Ethics and Elections Committee when he resigned, said, "I have really enjoyed interfacing with and serving the membership in my term as West Gulf Division Director — traveling around, going to club meetings, going to hamfests — I've just enjoyed being with other amateurs the most. I've also enjoyed representing the membership at the Board of Directors meetings, talking, finding out what they need and what they are feeling and bringing that back to the Board." Before being elected to the Board of Directors, Day served as West Gulf Vice Director and Oklahoma Section Manager.

"I could not step down if I was not confident that David would do a great job as Director," Day said. "He's been such a great Vice Director. He's already served on committees and done so many things within the West Gulf Division. David's doing a great job and I know he will continue to do great things as Director of the West Gulf Division."

Woolweaver called Day a "tireless contributor to Amateur Radio for two decades," and said Day's long service "has been marked by honor and integrity. It has been my privilege to serve with Coy for the past seven years as his Vice Director. I know that everyone in the West Gulf Division will join me in wishing

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

JANA THOMASON, N5KMJ

Coy Day, N5OK; ARRL COO Harold Kramer, WJ1B; West Gulf Vice Director John Thomason, WB5SYT, and West Gulf Director Dr David Woolweaver, K5RAV, at the 2006 Austin SummerFest.

Coy well in his retirement."

An Extra class licensee, Thomason has been an ARRL member for more than 20 years and has served as Oklahoma Section Manager since 2003. "The opportunity and honor to serve the West Gulf Division as Vice Director is exciting," Thomason said. "It is my desire to diligently work with Director Woolweaver to ensure Division members are informed, to provide input and feedback on policies and procedures pertinent to the League's missions and to accomplish what is necessary to have the interest and the availability to inform through developed relationships with Division members and League headquarters staff."

With the Oklahoma Section Manager position vacant, Membership and Volunteer Programs Manager Dave Patton, NN1N, in consultation with Woolweaver and Thomason, appointed Dean Feken, KL7MA, of Perry, as the new ARRL Oklahoma Section Manager. Feken, an Extra class licensee, served as Oklahoma Official Observer Coordinator since spring 2004 and as Official Observer since fall 2003. Feken's term as Section Manager continues through September 30, 2010.

"It has been a pleasure to work with Coy Day on the ARRL Board," said ARRL President Joel Harrison, W5ZN. "Coy's integrity is admirable and something that everyone should model. We will miss his wisdom and smooth manner on the Board, and wish the best for Coy and his wife Judy."

ARRL Chief Executive Officer David Sumner, K1ZZ, concurred: "In addition to the gentlemanly demeanor that most people who know him associate with Coy, what I will always remember about his service on the Board are the high standards that he set — for himself, as well as for the ARRL staff."

ARRL RELEASES POLICY STATEMENT ON MOBILE AMATEUR RADIO OPERATION

On January 30, 2009, the ARRL Executive Committee adopted a policy statement on mobile Amateur Radio operations. The statement, prepared at the instruction of the ARRL Board of Directors, addresses the growing number of proposed state and local laws and ordinances regulating the use of cellular telephone and text messaging, inadvertently affecting Amateur Radio mobile communications.

In its statement, the Executive Committee urges state and municipal legislators to limit the scope of their proposals, limiting them to devices such as full duplex wireless telephones and related handheld or portable equipment. Alternatively, it suggests that licensed Amateur Radio operation be listed specifically as an exclusion to the proposed regulations.

"At the start of each new session, you see a flurry of this type of proposal in state legislatures across the country," said ARRL Regulatory Information Manager Dan Henderson. As of February 5, 2009, the ARRL is aware of proposals in 16 states — Colorado, Georgia, Hawaii, Idaho, Illinois, Indiana, Iowa, Maine, Missouri, Montana, Oregon, South Carolina, Texas, Utah, Virginia and Wyoming, as well as several local city or town proposals.

"These proposals are usually intended to regulate cellular telephone and text messaging by drivers as a matter of safety but, when they are written in very broad terms, can include Amateur Radio mobile operations in the 'net' they cast," Henderson continued.

The Executive Committee's statement gives a concise background of the role the Amateur Service plays in public safety and service communications. It also highlights the differences between communications conducted by cellular telephone and those using Amateur Radio. Finally, the statement offers some suggested statutory language for state motor vehicle codes that would protect Amateur Radio mobile operation.

"The wording of a bill's language is the key component," Henderson said. "Some of the proposed bills have been precise in defining what is covered. When the bill is specific about 'cellular telephones and text messaging devices,' Amateur Radio is safe, since an Amateur Radio transceiver is not one of those two devices."

Overly broad language in the bill creates the biggest problem. To address this problem, the policy statement includes suggested language for defining the devices covered by the bill, wording for the exclusion of Amateur Radio if desirable, and a recommendation on defining prohibited acts.

The ARRL acknowledges that driver inattention is a leading cause of automobile accidents. The policy statement raises the fact that cell phones utilize full duplex communications — where the user is talking and listening simultaneously. The Executive Committee statement said, "Two-way radio use is dissimilar from full-duplex cellular telephone communications because the operator spends little time actually transmitting; the time spent listening is more similar to, and arguably less distracting than listening to a broadcast radio, CD or MP3 player. There are no distinctions to be made between or among Amateur Radio, public safety land mobile, private land mobile or citizen's radio in terms of driver distraction. All are distinguishable from mobile cellular telephone communications in this respect."

The statement emphasizes that Amateur Radio has a 70 year history of two-way mobile operation quite similar to commercial dispatch mobile radio systems and that "The ARRL is aware of no evidence that such operation

FCC News

♦ **Copps Named Acting FCC Chairman:** On January 22, President Barack Obama named current FCC Commissioner Michael Copps as Acting Chairman of the Commission. In early January, sources close to the President mentioned Julius Genachowski would be nominated as Chairman. Copps will serve as Acting Chairman until a new Commissioner/Chairman is confirmed. "I am honored to be designated as Acting Chairman of the FCC," Copps said in a statement released by the FCC. "I thank President Obama for his confidence in me and for this opportunity to serve. I know that I have a truly gifted and terrific team to work with. I pledge every effort I am capable of to help steer the Commission through its current transition to new leadership."

ARRL Chief Executive Officer David Sumner, K1ZZ, congratulated Copps on his appointment. "Whenever we have sought a meeting with him or his staff, his door has always been open to us," he said.

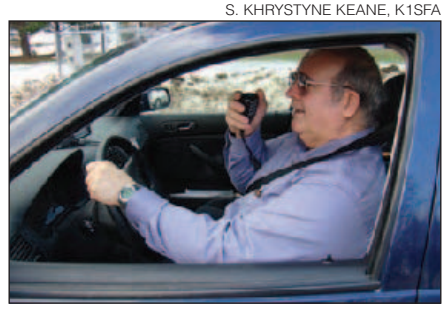
Currently serving a second term as FCC Commissioner, Copps began his first term with the Commission in 2001. Before his appointment to the FCC, he served as Assistant Secretary of Commerce for Trade Development at the US Department of Commerce, where he was previously Deputy Assistant Secretary of Commerce for Basic Industries. Copps came to Washington in 1970, joining the staff of Senator Ernest Hollings (D-SC) and served for more than a decade as his Chief of Staff. He has also held positions at a Fortune 500 company and at a major trade association. Before coming to Washington, Copps was a professor of American history at Loyola University of the South. He received a BA from Wofford College and earned a PhD from the University of North Carolina at Chapel Hill.

contributes to driver inattention. Quite the contrary: radio amateurs are public service-minded individuals who utilize their radio-equipped motor vehicles to assist others, and they are focused on driving in the execution of that function."

Also underscored in the statement is a Joint Resolution of the United States Congress [SJ Res 90/HJ Res 199 (1994)] that recognized "the achievements of radio amateurs, and to establish support for such amateurs as national policy," found, and declared, among other things that "reasonable accommodation should be made for the effective operation of Amateur Radio from residences, private vehicles and public areas, and that regulation at all levels of government should facilitate and encourage amateur radio operation as a public benefit."

The ARRL Policy Statement recognizes the responsibility of the amateur community to conduct its activities in a manner that does not create unsafe operation of their motor vehicle. "Safety has to be a top concern at all times," Henderson concluded.

S. KHRYSTYNE KEANE, K1SFA



The full text of the ARRL policy statement is found at **www.arrl.org/govrelations/MobileAmateurRadioPolicyStatement.pdf**.

For additional information, contact ARRL Regulatory Information Manager Dan Henderson, N1ND, at 860-594-0236 or via e-mail at **n1nd@arrl.org**.

In Brief

• **John Kanzius, K3TUP (SK)**: John Kanzius, K3TUP, of Erie, Pennsylvania, passed away February 18 from pneumonia at his winter home in Florida. He was 64. Kanzius was best known for his research in finding a cure for cancer using radio waves, specifically 13.56 MHz. In 2002, he was diagnosed with leukemia, and in 2005, based on research he conducted in his home kitchen, Kanzius teamed up with top cancer researchers. Using nanoparticles — metallic objects measured in billionths of an inch — heated by RF using a machine that Kanzius invented, the researchers were impressed: "The research scientists at Rice University were stunned to see that my device could heat nanoparticles at the 13.56 MHz frequency," Kanzius said.

John Kanzius, K3TUP (SK)

In 1966 at age 22, Kanzius came to Erie, Pennsylvania to work for JET Broadcasting. After 24 years as a broadcast engineer, he was appointed vice president and general manager of the company in 1980. After retiring to Florida, Kanzius was diagnosed with leukemia in 2002. He summarized his chemotherapy in a February 2008 article in *QST* as "Hoping we kill the cancer before we kill the person." In October 2003 — thinking there had to be a better treatment — Kanzius had the idea to kill the cancer cell with radio waves, not a new idea. But Kanzius went a bit further: Instead of using needles, as was currently used, why not "trick" the cancer cells into absorbing a metal target — sent by RF — into the inside of the cancer cells, leaving the healthy cells alone?

Kanzius credited his father for his inspiration: "Trying to build an array that would heat particles one billionth of a meter in length was challenging. But building equipment all of my life was inspired by my dad, W3NRE, who was licensed in 1934." In the February 2008 issue of *QST*, Kanzius told ARRL Media and Public Relations Manager Allen Pitts, W1AGP, that if it were not for his Amateur Radio background, "and all the days of experimentation to improve my station, this new procedure for treating cancer, which continues to show such promising results, would probably not be on the cutting edge at the largest cancer center in the world [M. D. Anderson]." Kanzius is survived by his wife Marianne and two daughters, Sherry Kanzius and Toni Palmer, and two grandchildren. To read more about how Kanzius was using RF to cure cancer, see **www.wedothatradio.wordpress.com/2008/03/31/31/**.

• **ARRL Foundation Officers Elected**: The ARRL Foundation elected officers for 2009 during its annual meeting on January 22. Tom Frenaye, K1KI, President; Dick Isely, W9GIG, Vice President; Mary Hobart, K1MMH, Secretary, and Jim McCobb, K1LU, Treasurer. Each of the officers served in 2008 "These officers have demonstrated the leadership and commitment to the goals of the ARRL Foundation and received a vote of confidence from the Board for another term," Frenaye said. "In re-electing the slate of officers for another year, the Foundation recognizes the importance of leadership continuity in the organization's commitment to Amateur Radio."

SECTION MANAGER NOMINATION NOTICE

To all ARRL members in the Colorado, Eastern Washington, Georgia, Los Angeles, Sacramento Valley, San Francisco, South Texas, West Virginia and Western Washington 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.

(See **www.arrl.org/FandES/field/org/smterms.html#sample**.)

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 June 5, 2009. If more than one member is nominated in a single section, ballots will be mailed from Headquarters on or before July 1, 2009, to full members of record as of June 5, 2009, which is the closing date for nominations. Returns will be counted August 18, 2009. Section Managers elected as a result of the above procedure will take office October 1, 2009.

If only one valid petition is received from a section, that nominee shall be declared elected without opposition for a two-year term beginning October 1, 2009. If no petitions are received from a section by the specified closing date, such section will be resolicited in the October 2009 *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*

Ten Year Anniversary of SKYWARN Recognition Day

The 10th annual SKYWARN Recognition Day (SRD) event was held on December 6, 2008. SRD is an on-the-air celebration that recognizes the important and integral relationship that Amateur Radio has with the National Weather Service (NWS) — especially through the SKYWARN program. This event has been cosponsored by the ARRL and the NWS since 1999.

According to David Floyd, N5DBZ, Warning Coordination Meteorologist, NWS, Goodland, Kansas, this event is "a way to recognize the commitment made by Amateur Radio operators in helping keep their communities safe. During the 24 hour special event, Amateur Radio operators visit their local National Weather Service office and work as a team to contact other hams across the world."

The NWS maintains a Web page for information. The 2008 event statistics from the Amateur Radio stations that operated at NWS venues are still arriving at press time. To learn more, check out **http://hamradio.noaa.gov**.

How well did the 2008 event fare from your perspective? Here are some representative stories that help explain just that. Thanks for your support and participation.

Opportunities Open in Alaska

Rich Courtney, NL9H, Kodiak, Alaska
ARRL Alaska Section Emergency Coordinator
nl9h@arrl.net

I am the Section Emergency Coordinator (SEC) and I also work for the National Weather Service (NWS) here. Participation in SRD 2008 represented a new level of effort for Alaska. We organized our effort starting in October and brought three forecast offices (Anchorage, Fairbanks and Juneau) up and three (smaller) Weather Service Offices (Kodiak, Valdez and Bethel) online as well. This represented approximately a 600 % increase in participation, along with coordination from within the NWS to manage the contacts. We operated on HF, Internet Radio Linking Project (IRLP), EchoLink and Winlink. We made a lot of contacts within the state.

Last June, Alaska Section Manager Jim Larsen, AL7FS, asked me to be the SEC and we have been reorganizing ever since. There is a renewed sense of spirit within our state about preparing for emergency communications. We (SM, SEC, DECs and ECs) met by phone conference a week prior to setting up for the exercise and discussed what we were going to do. We did some outside the box thinking and it went very well. We now meet every third Thursday of the month to discuss our efforts.

The centerpiece of our effort was a 1 hour tsunami warning emergency communications exercise. We passed voice traffic on most modes and message traffic on VHF packet. Not perfect by any stretch of the imagination, but we had a heck of a good partnership with one of our served agencies, the NWS. It was the first time that we reached across the 29 emergency districts and did any kind of coordination with the state. This statewide cooperation will continue.

COURTESY GARTH CROWE, N7XKT

Members of the North East Wyoming Amateur Radio Association assemble in front of NWS Office in Rapid City, South Dakota.

COURTSEY GARTH CROWE, N7XKT

Wyoming Section Manager Garth Crowe, N7XKT, and LeeAnne Sachau, WY7DTW, operate WXØUNR from the NWS office in Rapid City, South Dakota.

Wyoming and South Dakota Combine Forces

Garth Crowe, N7XKT
ARRL Wyoming Section Manager
n7xkt@arrl.org

The NE7WY (North East Wyoming Amateur Radio Association) made the 60 mile trip to Sundance, Wyoming, for breakfast. Then, we carpooled to the NWS office in Rapid City, South Dakota, which is 100 miles from my home in Gillette, Wyoming, to participate in the SRD celebration. The entire group of radio operators enjoyed a tour of the office and we made a number of radio contacts, too.

Indiana Operators Visit NWS in Louisville

David McKim, W9WXN,
Official Emergency Station and Harrison County SKYWARN Coordinator
w9wxn@arrl.net

Our local Harrison County Indiana ARES/SKYWARN group volunteered to operate from the NWS forecast office in Louisville, Kentucky (located just on the other side of the Ohio River). WX4NWS made 321 contacts, worked 36 other NWS offices on the air, contacted 40 states and 1 foreign country. It was a big success! Our group included David McKim, W9WXN; Scott

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

Taylor, K9SET; William Carter, KG4AFK, and Virgil Smith, KB9TAA. We had a lot of fun helping the NWS with this event and we hope to do it again next year.

Bergen County, New Jersey, OEM on the Air

Mike Adams, WA2WMT
ARRL District Emergency Coordinator
wa2mwt@arrl.net

Amateur Radio operators from the four major radio clubs in Bergen County, New Jersey, met at the Ramsey Office of Emergency Management in Ramsey on Saturday, December 6. Eighteen licensed ham operators manned the OEM's radio room and attempted to contact NWS offices throughout the United States.

The operators were successful in reaching the following stations: KØMPX, Minneapolis, Minnesota; NØF, Sioux Falls, South Dakota; NØGF, Grand Forks, North Dakota; WØNWS, Omaha/Valley, Nebraska; WX1BTV, Burlington, Vermont; WX4JAX, Jacksonville, Florida; WX4PTC, Peachtree City, Georgia, and WX7LKN, Elko, Nevada.

Officers and members of the Bergen Amateur Radio Association (BARA), the Metroplex Amateur Radio Club (MARC), the 10-70 Repeater Association and the Ramapo Mountain Amateur Radio Club (RMARC) participated. Amateur Radio operators included: Michael Adams, WA2MWT; Stephen Adams, AB2XU; John Acovino, KB2VVO; Ronald Bosco, WB2GAI; Mayor Christopher Botta, KA2CQH; Richard Busch, KC2PYB; Stephen Goeller, K2BTP; Bruce Greenwood, K3OEM; George Halpin, WA2HFH; Robert Halpin, KC2LOK; Paul Hennion, KC2FMJ; Howard Holden, WB2AWQ; Lou Janicek, N2CYY; Walter Lange, AE2AA; Armand Lucchesi, WA2SHA; Justin Mattes, KC2GIK; Herbert Van Den Houten, N2OPJ, and Ralph Venturini, KC2RAH. Non-hams included Councilwoman Deirdre Dillon, Nicholas Venturini, Ernest Larrat, DEMC Glen Karpovich, Margaret Halpin and Richard VanDerWall.

"When you have the Bergen County (BC) SKYWARN Coordinator, the BC National Traffic System New Jersey VHF Net Late Session (NJVN-L) Net Manager, the interim BC Emergency Coordinator for emergency communications and several RACES Municipal Radio Officers in one radio room, it shows that the public service aspect of Amateur Radio is alive and well in Bergen County," stated Michael Adams, Ramsey's Emergency Management Coordinator.

West Virginia was Represented

Tim Greene, N8UHG, and I visited the Charleston NWS office representing the Black Diamond Amateur Radio Association for this event. — *Liz Myers, W8LIZ, Vice President, Black Diamond Amateur Radio Club*

The Kanawha Amateur Radio Club, of Charleston, West Virginia, participated using our club call W8GK. We used the special event call sign, W8W, for the event — "Whiskey 8 Weather." According to the log about 70 contacts were made. — *Jim Damron, N8TMW*

Sacramento, California, Participates

Eric Kurth, KCØVZU
Sacramento National Weather Service Forecast Office

The Sacramento NWS Forecast Office participation in the 2008 event was a great success! Over 25 participants were involved from area Amateur Radio groups and the NWS. The office used the special event call sign W6S for the day. Local groups involved in the event were River City ARCS, the Metro Fire and Sacramento City Civilian Emergency Response Team (CERT) radio teams, the Folsom CERT radio team, Sacramento Sheriff's Amateur Radio Program (SHARP), San Joaquin ARES and Yolo ARES. Loaned equipment included radios, antennas, generators, tents, chairs, tables. Metro Fire CERT and Sacramento SHARP each made a major contribution by allowing us the use of one of their emergency vehicles.

Approximately 125 radio contacts were made across the United States, including states such as Texas, Michigan, New York and Virginia. The event began at 4 PM PST on Friday, December 5, and ended at 4 PM Saturday, December 6, with operators working through the night. Four NWS employees participated, including WCM Kathy Hoxsie, KC8CLO; Amateur Radio Focal Point and General Forecaster Chris Hintz, K6DX; General Forecaster Eric Kurth, KCØVZU, and Senior Forecaster Steve Goldstein. For more information, log onto **www.wrh.noaa.gov/sto/swd/Skywarn.php**.

POWERPOINT PROGRAM ON NTS

The "National Traffic System — An Introduction" is a *PowerPoint* presentation that provides an introduction to the National Traffic System (NTS) including an introduction to National Traffic System Digital (NTSD). Thanks to Greg Szpunar, N2GS (ARRL Official Relay Station and NTS Digital Relay Station) and to Dave Struebel, WB2FTX (ARRL Section Traffic Manager of Northern New Jersey and NTS Eastern Area Digital Coordinator) for writing and creating this program. To see and download the program, visit **www.arrl.org/FandES/field/NTS.ppt**.

UPCOMING EMERGENCY COMMUNICATIONS EVENTS

April 4-5, 2009: Communications Academy, Seattle Washington

The 11th annual Academy will be at South Seattle Community College. It is open to anyone with an interest in emergency communications, volunteer or professional. The presentations are designed to promote the development of knowledgeable, skilled emergency communicators who will support their local communities during a disaster or emergency response. Visit **www.commacademy.org**.

April 6-10, 2009: National Hurricane Conference, Austin, Texas

ARRL and Amateur Radio will, once again, have a presence at this annual conference but this year in an expanded format. The conference will be held at the Austin Convention Center. On Tuesday, April 7, from 1:30 to 5:30 PM, ARRL will sponsor a special session geared toward Amateur Radio and emergency communications issues concerning the past and future hurricane seasons. This session is free and Amateur Radio operators and other interested persons are invited. On Wednesday April 8, as part of the conference proceedings, Amateur Radio will be covered in two topic sessions geared toward the emergency management community. More information on the conference is found at **www.hurricanemeeting.com**.

May 1-3, 2009: EMCOMMWEST '09, Reno, Nevada

Since 1999, EMCOMMWEST has been specifically oriented toward emergency communications in the West. EMCOMMWEST '09 will be expanded with new speakers and events. Log onto **www.emcommwest.org** for more information.

Monterey, California Joins the Celebration

Matt Mehle, KCØTER, Monterey NWS

We want to say thanks to everyone for the help and support, whether it was providing radios, setup, antennas, cleanup or the use of repeaters. The final tally comes to 165 QSOs, which is a new record, and 41 weather offices, which is the Northeaster Certificate. Operators and helpers included Bob Spencer, W6HMC; Dave Burbidge, W6IIQ; Tom May,W6YXX; Matt Mehle, KCØTER; Linda Bittner, K6GRL; John Orzel, KG6ZAN; Larry Murphy, KE6PPE; Bill Dale, N2RHV; Jim Lacalamita, WB6YAM; Tom Tengdin, WB9VXY; Andrew Parker, WV1B; Todd Weatherford, KI8CX, and Virginia Spencer, W6VLS. Cap Pennell, KE6AFE, and several others were there to help set up and tear down.

ROB MACEDO, KD1CY

The operators get WX1BOX in Taunton, Massachusetts, on the air. Shown (from left) are Dennis Dura, K2DCD; Jim Palmer, KB1KQW; Carl Aveni, N1FY, and Rob Macedo, KD1CY.

WX1BOX Operates from Taunton, Massachusetts

Rob Macedo, KD1CY, Eastern Massachusetts Section Emergency Coordinator and ARES SKYWARN Coordinator for NWS Taunton, MA

kd1cy@arrl.net

After a historic summer severe-weather season by New England standards, we were greeted — 5 days after SRD — with an epic ice storm that wreaked major havoc in our County Warning Area, north of the Massachusetts Turnpike and west of Interstate 495 through northeast, central and western Massachusetts and southern New Hampshire. It resulted in our largest ARES Mutual Assistance Team deployment since the September 11, 2001 terrorist attacks. The emergency resulted in a 27 consecutive hour SKYWARN activation that spanned one overnight. At the height of the storm, we had close to 400,000 people without power in Massachusetts with a similar number in New Hampshire. It was quite the mess, but luckily I live on the coast where we only had heavy rainfall and wind issues from that particular storm. We then had four additional SKYWARN activations after that for snow/wind issues, which also kept us busy.

During the event, WX1BOX logged 313 unique contacts, 364 total contacts with duplicates and 62 NWS Forecast Offices. This represented our highest numbers ever in this event. We had 14 radio amateurs and two weather forecasters participate. They were as follows: Mike Neilsen, W1MPN; PJ Howe, N1PJ; Dennis Dura, K2DCD, ARRL Manager, Emergency Preparedness and Response; Jim Palmer, KB1KQW; Phil McLaughlin, KB1CYO; Joanne McLaughlin KB1FVN; Bill Boyes, KB1G; Rob Macedo, KD1CY; Gregg Glynn, W1VFB; Jason Sample, KB1PQB; Chris Sample, KB1QKI; Andrew Barden, KB1NEG, and Glenn Field, KB1GHX. We also welcomed Warning Coordination Meteorologist Eleanor Vallier-Talbot, Outreach Coordinator.

Notes from the National Hurricane Center

Julio Ripoll, WD4R

WX4NHC Amateur Radio Assistant Coordinator

During the 2008 SRD event, we worked many NWS stations on HF, Automatic Packet Reporting System (APRS) and EchoLink/IRLP. Some stations that we worked were as close as Florida and as far away as Australia. The coldest weather report we received was 12° F from Alaska and the warmest was 80° F from Hawaii.

Many stations we contacted were very jealous when we gave them our weather report of 79° F and sunny. We also trained a new WX4NHC operator; Enrique Morales, KB4BX, who will augment our bilingual staff for the next hurricane season.

Georgia on the Air

The 10th anniversary of SKWARN Recognition Day (SRD) once again saw some great participation by the Peachtree City, Georgia, office of the National Weather Service. We have participated every year since the beginning of SRD. This year was no different. Twelve Amateur Radio operators, including the Meteorologist in Charge of the Peachtree City NWS had lots of fun making just short of 400 contacts during the 24 hour event.

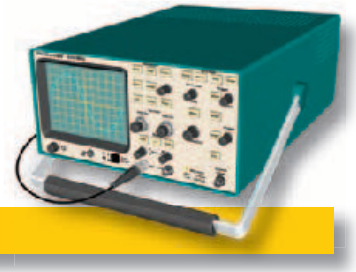
A great big thanks to the following hams for making this a fun and successful occasion: Jim Burchfield, W4JB; Larry Cody, N4LEC; Huey Kenmar, KI4NGD (Assistant DEC); Scott Tyndall, KJ4BIZ; David Benoist, AG4ZR, (Deputy SEC); Scott Royle, KK4Z (SEC); Joe Domaleski, KI4ASK; Mary Catherine Domaleski, KI4HHI; Eugene Morgan, N8ACE; Lynn Morgan, W9ZEN; Lynn Bianco, KN4YZ (Assistant SEC) and Lans Rothfusz, KD5EJN (Meteorologist in Charge, NWS Peachtree City).

While this is a fun event, we need to remember the critical importance of the SKYWARN program and its support of the National Weather Service. SKYWARN operators at the Peachtree City office logged several hundred man-hours supporting the mission of the NWS in 2008. Last year was a fairly active year that saw a deadly tornado go through downtown Atlanta in March.

— Thanks to the radio amateurs who staffed the Peachtree City, Georgia, NWS, and to Susan Swiderski, AF4FO, ARRL Georgia Section Manager QST

W1ZR

The Doctor is IN



PROJECTS AND INFORMATION FOR THE ACTIVE AMATEUR

Q Bernie, W4EDX, asks: I use a 25 foot high, 140 foot long antenna, fed in the center with 30 feet of 450 Ω twin lead. I presently couple the 450 Ω line through a ferrite bead choke balun and then have 15 feet of 9913 coax to a MFJ-986 tuner. I use this antenna on 80 through 10 meters. I realize the SWR on the 9913 is very high and a mismatch loss occurs. Bringing the 450 Ω directly to the tuner is not an option at my location. I have a 4:1 remote current balun that I could use in place of the ferrite bead current balun. My question is, which would have the least system loss? The remote balun is a transformer type balun and the ferrite bead balun does not have those losses. I realize the design of the remote balun comes into play but assuming it is as good as it can be, which system probably will deliver the most power to the antenna? My thoughts are maybe the transformer balun if properly designed because of the 4:1 ratio.

A Good question, and a very good idea to have the coax run of low loss Belden 9913 or similar quality coax, even though the run seems quite short.

I modeled your antenna (see Figure 1) using *EZNEC* and it does offer fairly high SWR on almost all bands, as you would expect. The best match to the coax is on 40 meters (3:1). The worst match is on 80 meters at which point the SWR is around 100:1, but the 9913 has such a low loss to start with on 80 meters that the loss in your 15 feet of coax is less than 0.2 dB.

The worst case band for loss with your current 1:1 balun based system is 17 meters, at which point the 32:1 SWR results in a total coax loss of 1.2 dB, about 25% of your power.

If we go the other way, we have a different problem. The typical 4:1 transformer balun is designed to transform 200 Ω to 50 Ω. If the 200 Ω SWR is higher than around 4:1, it no longer transforms as expected and introduces additional losses. Your 200 Ω SWR ranges from 64:1 on 20 meters to moderately low on the higher bands on which the balanced line provides a much better match to the antenna. I would expect that the 4:1 balun would be a slight improvement on bands of 17 meters and above (0.5 dB better on 17 meters, if the balun were lossless, for example).

My recommendation would be to keep the 1:1 balun. If you really want to do the best you can with this system, move the tuner to be right next to the 1:1 balun. It could be a remote auto tuner, or you could walk to a manual tuner with your portable antenna analyzer and adjust it where it is. On the other hand, a maximum loss of a bit more than 1 dB would be within my tolerable range.

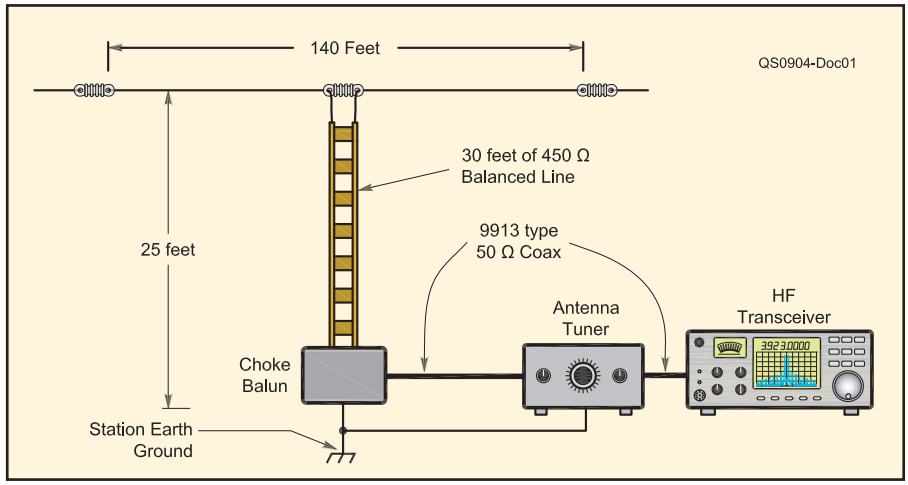


Figure 1 — Configuration of the W4EDX antenna system. For best performance across the HF bands, use the shortest length of coax possible and use a 1:1 balun or coax common mode choke at the transition of the balanced line to the coax.

Q Dave, N9HF, asks: I saw a schematic somewhere in which the output of two identical 13.8 V dc power supplies were connected in parallel in order to double the usable output current. Could you show us how it is done, safely?

A Unfortunately, this is not a trivial problem and I am not aware of a published solution. Perhaps a kind reader knows of one? There is (expensive) commercial equipment available that can do this (for example, see **www.weidmuller.com/downloads/pdfs/datasheets/Diode_Modules.pdf**), but I'm not aware of anyone who makes or sells this kind of gear for the amateur market.

The issue is to make sure that the load is shared equally by each power supply. It won't be unless each supply puts out exactly the same voltage, and has exactly the same resistance (internal + wire + connection). At high current, it takes very little difference to make it not come out right and have one power supply putting out more than its rating. A dual regulator system could likely be devised to force the currents to be equal, but I haven't seen that done.

If a power silicon diode is placed in series with each power supply output, there won't be a problem with one supply putting power into other power supplies, with possible strange reaction by regulators. You will lose about 0.6 V through each of the diodes. This should be safe, however, in that if a supply tries to put out more than its design limit, it should shut down or open a fuse. While safe, it won't be very satisfactory since if one goes, each of the others will rapidly follow suit.

By the way, a similar issue comes up if you attempt to parallel batteries. If they are identical and identically charged, it will work — for a time. Unfortunately, as the batteries age, one will start to discharge faster than the other and the better one will try to charge the weak one, sharing its output current between the desired load and the weak battery. Ultimately, both batteries will be discharged. In the case of batteries, it is better to switch or patch between them. That won't help in your case of needing additional capacity from ac operated supplies.

Q Tom, W8AAZ, asks: I've got a question about old time ham antenna theory. Old timers in the prewar days seemed to specifically advise against using bare stranded wire for antennas. They seemed to think that 12 or 14 gauge enameled copper was about the best material for wire antennas. They claimed that stranded wire was not an ideal conductor for HF radio frequencies, even though sufficient for AM broadcast reception. Bare wire is prone to oxidize and none other than 6AM (Don Wallace, W6AM, SK) told of hams dropping down their antennas every Saturday to steel wool the oxides off of the wire for better efficiency. He was also in favor of the enameled solid wire. But nowadays pretty much all wire antennas are made with stranded copper or copper weld type stuff. Do you know of any measurable impact of deterioration from the elements?

A I have not seen anything to indicate that stranded wire has any effect on antenna performance. I use insulated stranded copper plated steel wire for my antennas and they seem to operate just as expected — although I'm sure I wouldn't notice a dB or 2 difference if it were there. If the strands are in close contact, I believe stranded wire should act very much like solid wire of the same diameter.

Using insulated wire does have an effect, depending on the thickness and dielectric constant of the insulation. The signal propagating down the wire surface will be slowed, typically by 1 to 2%. Thus the antenna should be shortened by that amount if it is desired to maintain resonance. This is not a performance issue, and it may make it easier to fit in a given space. I would think nonconducting oxidation would have a similar effect, but due to its thickness, it may be less significant.

I have speculated that corroded stranded wire that is oxidized to the point at which the individual strands no longer make contact may well act quite differently than solid wire. I have not made any measurements, nor seen any studies on this so it remains speculation. My insulated stranded wire avoids the question quite nicely and is less affected by contact with trees, however.

Another advantage of stranded wire is that it is generally more flexible than solid wire and, as a result, is less likely to break from fatigue.

Q Charles, VE3CQH, asks: I fabricated a transmit receive (TR) and mute switch to combine my 1.2 W Little Joe transmitter and Drake R-7A receiver with a homebrew antenna tuning unit (ATU) from January 2003 *QST*, and a G5RV antenna. Testing the mute function first, with power to the Drake and nowhere else, I experienced electric shocks while handling the coaxial cables to the ATU and antenna. My digital volt meter (DVM) recorded a brief potential difference of over 1000 V between their shields, subsiding immediately to 0 V and rising again in a minute or so to over 1000 V during a subsequent test. At the time I was being blessed with over 8 inches of blowing snow and temperatures around 0° F, ideal conditions for generating static electricity. Today, having cleared the driveway of most of the snow and with no snow falling, I found no potential difference between the cables.

My antenna is about 60 feet from the cellar shack and about 25 feet high. The 450 Ω ladder line section is fed with RG-11A/U cable that runs underground and beneath the gravel driveway in a 1½ inch PVC conduit. The antenna and feed line are not grounded at any point until the coax is connected to the ATU. (I disconnect all for lightning safety, while not on the air.)

Is it possible for massive static electrical charges to build up in a buried, not grounded, coaxial cable shield? I suppose the classic counter to this condition must be a series lightning arrestor. I should add that this Little Joe nets frequent 40 meter schedules and 579 reports with a ham in Virginia.

A Gads, I'm glad you weren't seriously zapped in the process! This sounds like static electricity from charged snowflakes accumulating on your antenna system. I have heard of, but not personally experienced this, even though we do get our share of snow in Connecticut.

A lightning arrestor might be a good idea, for lightning protection purposes, but will take a considerable voltage before it fires. Voltages that won't be high enough to fire the arrestor might still cause uncomfortable and perhaps even dangerous shocks.

What some folk do is to connect either an RF choke, or a high value resistor (perhaps 1 MΩ) from the center conductor of the coax to ground. This should keep a static charge from accumulating and not reduce your transmitter power to the antenna because the impedance is so high. Some, but not all, arrestors provide a dc grounding feature that does the same thing — check the specifications.[1] Note that unlike a lightning, or RF, ground this ground connection need not be a terribly low impedance one to work.

[1]This is not a quality issue. Some coax cables carry dc as well as RF, to power remote equipment. Arrestors designed for this type of service generally can't provide a dc ground connection.

♦ ***Your doctor received a number of comments about his suggestion (in the January 2009 column on page 68) to replace a windowpane with clear plastic to provide a way to bring open wire conductors through a wall to keep them from coupling to metal window frames. The note I received from Tony Brignole, WA4KHN, retired Tech Service Manager for the Lucite (acrylic) division of DuPont thoroughly covered all the points.***

Tony first noted that Plexiglas is a registered trademark of the Rohm and Haas Company and is an acrylic, not a polycarbonate, as I mistakenly stated.

He notes that either polycarbonate or acrylic would work fine in this application. He continues to say that as a rule polycarbonate is more break resistant than acrylic. Another general rule is to go up one size in acrylic to obtain the same strength as with polycarbonate. Thus, if you were thinking of using ⅛ inch polycarbonate you would go to 3⁄16 inch acrylic. He notes that 3⁄16 or ¼ inch thick acrylic would be great for window pane replacement and that uncoated acrylic is considerably more weather resistant than uncoated polycarbonate.

Polycarbonate's strength decreases rapidly with exposure to sunlight or UV and frequently becomes cloudy after a relatively short exposure to direct sunlight if not coated. Another consideration is that acrylic is more notch sensitive than polycarbonate. Polycarbonate appears more rubbery or elastic than acrylic. If you use acrylic it is important to drill the acrylic cleanly and file out or round off any notches or rough edges. One method of cutting acrylic is to score it with a sharp edged tool such as glass, and then break it over a sharp square edge. The acrylic and polycarbonate cutting tool has a scraper to get rid of any burrs that can cause problems.

Acrylic is also cheaper and generally more readily available than polycarbonate. Both are available in small sections at major hardware and home supply stores.

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; www.arrl.org/tis/.

QST

Strays

W1AW SCHEDULE CHANGE

◇Effective March 9, 2009, the following revision will be made to the W1AW Schedule:

■ The 160 meter CW frequency will be 1802.5 kHz.

For more information, see the Hiram Percy Maxim Memorial Station W1AW Web page: **www.arrl.org/w1aw**.

SHORT TAKES

DX Engineering FCC050-H05-A Feed Line Current Choke

Gooch's Paradox: RF gotta go somewhere.

Ideally, all the RF your radio generates is radiated into space by your antenna, minus the losses that occur along the way. Problems arise when some of this radiated RF ends up in troublesome places, like on the outer braid of your coaxial feed line.

I had been experimenting with a low-profile Inverted-L antenna for 160 and 80 meters. The 140 foot L-shaped wire was shoehorned into my postage-stamp-sized back yard through the use of a couple of well placed trees at the property lines. A remote automatic antenna tuner at the base of the antenna provided multiband operation.

While the antenna appeared to work well, strange things were happening back in the shack. Specifically, whenever I keyed the transceiver with more than 30 W output, the DSL Internet modem in my station went insane, as did my computer keyboard.

With a little help from *QST* Technical Editor Joel Hallas, W1ZR, the culprit was quickly identified: My coaxial feed line was picking up RF from the antenna and transporting it back into my station.

Enter the FCC050-H05-A

My feed line had become an ideal pathway for common-mode currents. This was due to the fact that there was insufficient grounding at the tuner, so the coax shield acted like "one more ground wire" taking its share of the ground current back to the station.

Of course, one cure is to improve the RF ground at the station. With my station being on the second floor of my house, this isn't easily accomplished. A couple of tuned counterpoise wires in the shack would likely help, but with the station being a discreet part of the home office, I knew that solution wouldn't go over well with my spouse.

Another solution is to place an RF choke at the antenna end of the feed line. You can make one by wrapping about 20 turns of feed line into a coil, for instance, but I use heavy low-loss coax (not easily coiled) and there wasn't much surplus length available at the antenna.

I opted for a more elegant approach: the DX Engineering FCC050-H05-A feed line current choke. The FCC050-H05-A is designed for use with coaxially fed, 50 Ω antennas of many varieties including verticals with elevated radials. The choke is built like a proverbial tank, which makes sense since it is rated at 2 kW from 1 to 60 MHz. Inside the heavy duty aluminum case are two large ferrite cores through which the shielded feed line passes a number of times before making its exit. This gives the FCC050-H05-A significantly higher common mode impedance and a larger effective core area than similar line isolators, including conventional enameled wire or bead baluns. At either end of the case are SO-239 coaxial connectors.

An interior view of the FCC050-H05-A.

Installation

Before installing the FCC050-H05-A, I decided to test its insertion loss on several bands. Here are my results:

50 MHz = 0.6 dB
28 MHz = 0.3 dB
14 MHz = 0.2 dB
3.5 MHz = 0.1 dB

As you can see, the loss rises to slightly over ½ dB at 6 meters, but that is perfectly acceptable. So far so good.

I installed the FCC050-H05-A outside, right at the input of the antenna tuner. There is a terminal on the outside of the choke enclosure in case you want to connect it to a dedicated ground (such as a copper pipe) to improve performance. This isn't necessary in most cases and I didn't attempt it. It is important to note, however, that you should *not* attach your antenna ground system to this terminal.

The choke case is not waterproof and DX Engineering states that this is okay. In fact, according to the instructions, "The FCC [feed-line current choke] is not affected by moisture and may be left outside in all types of weather, including heavy rain, as long as it is positioned so that water will drain from the case."

My temptation was to seal it with silicone adhesive, but after some thought I decided not to. It is obvious from the design that nothing short of total immersion in a bucket of water would be detrimental to the choke. If you do seal the case, DX Engineering cautions against using any silicone adhesives that use acetic acid (the products that have a sharp, vinegar smell) since these can corrode aluminum.

Did It Work?

You bet! With the FCC050-H05-A at the antenna, my RF woes ceased instantly. The keyboard no longer locked up and the DSL modem performed happily even when I was running 100 W output. Despite its being exposed to the elements 24/7, I'm confident that this durable choke will provide reliable service for many years.

Manufacturer: DX Engineering, PO Box 1491, Akron, OH 44309, tel 800-777-0703, **www.dxengineering.com**. *$69.95.*

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

NØAX

HANDS-ON RADIO

Experiment #75 — Series to Parallel Conversion

Radio hardware designers, like magicians, have a repertoire of interesting and useful tricks. As with magic, the simple and familiar tricks are often the most useful because they can be used in many ways and many situations. So it is with circuit transformations.

Equivalent Circuits

Transformations are really all about *equivalent circuits*, the ability to replace one section of a circuit with a different set of components without changing any of the voltages and currents. Most equivalent circuits are *one-port* equivalents in that they are applied at a pair of terminals called a *port*.

Let's start with a very simple equivalent circuit. Suppose you have a circuit composed of a single 12 Ω resistor. It's sealed up in an opaque box and you connect to it through a pair of terminals. This pair of terminals is the port. What equivalent circuits can you think of that would appear to be a 12 Ω resistor from outside the box? I'm sure you can think up several: twelve 1 Ω resistors in series, two 24 Ω resistors in parallel, a 6 Ω resistor in series with the parallel combination of a 24 Ω and 8 Ω resistor, etc.

There are an infinite number of resistor combinations that produce a 12 Ω resistance between those terminals. These are all equivalent circuits for the single 12 Ω resistor. Using an ohmmeter, you could never know the difference between any of the combinations.

Why Equivalent Circuits?

Why are equivalent circuits so common in electronics? In a word, simplification. General class licensees learned to do simple equivalents to pass the exam — converting series and parallel combinations of resistance, capacitance and inductance into a single equivalent component that acted just the same as the combination of components they replaced. Why do calculations for multiple components, when a single equivalent component will represent the combination just fine?

Another simplification is that components, sections of circuits and sometimes even entire pieces of equipment can be replaced with a simple equivalent circuit with which it is easier to model or calculate behavior. Another example that comes quickly to mind is an RF signal generator. For all intents and purposes, to the external world it appears to be an ac voltage source in series with a 50 Ω resistor. That's oversimplifying the generator, but in most cases that simple model will do just fine. (The Thevenin and Norton equivalent circuits are good examples of this type of simplification and are discussed in Hands-On Experiment #32.[1])

Equivalent circuits can also change the form of a circuit so that it is easier to analyze or use in a design. An equivalent circuit might provide a better way to describe the behavior of the circuit. At any rate, having a set of mathematical tools to change one type of circuit into another is a valuable skill.

[1]Previous Hands-On Radio columns are available to ARRL members at **www.arrl.org/tis/info/HTML/Hands-On-Radio**.

AC Equivalents

What about ac circuits with capacitors and inductors — do they have equivalents, too? Yes, but because the behavior of those circuits changes with frequency, the equivalent circuit is generally only an exact replacement at one frequency.

A simple component (R, L or C) is more complex than you might think. For example, an inductor has loss associated with the resistance of the wire. A capacitor's dielectric dissipates some of the stored energy as heat. A resistor's leads act like small inductors. All of these *parasitic* effects can be significant in certain applications. Consequently, test instruments that measure component value also measure the parasitic values and can provide the measurement as one of several different equivalent circuits.

The most common equivalents for measurements of capacitors and inductors are parallel R and series R, respectively, as shown in Figure 1. For capacitors, a parallel resistor most closely represents the effects of loss in the dielectric. For inductors, losses in the wire are best represented by a series resistance. Resistors are measured in the same way, except that R is the primary component and series L or parallel C are the parasitic effects.

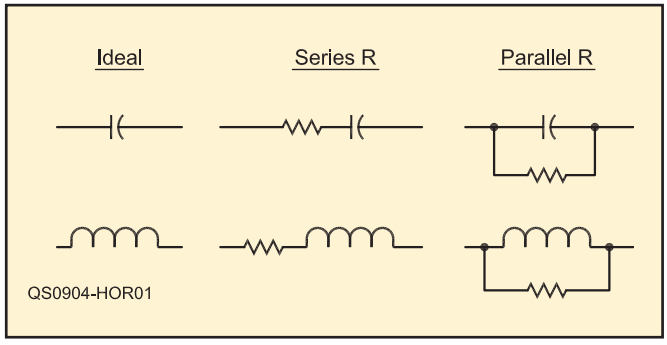


Figure 1 — Losses in non-ideal capacitors and inductors are modeled as series and parallel resistances. Parasitic capacitance and inductance in resistors are modeled as parallel and series components.

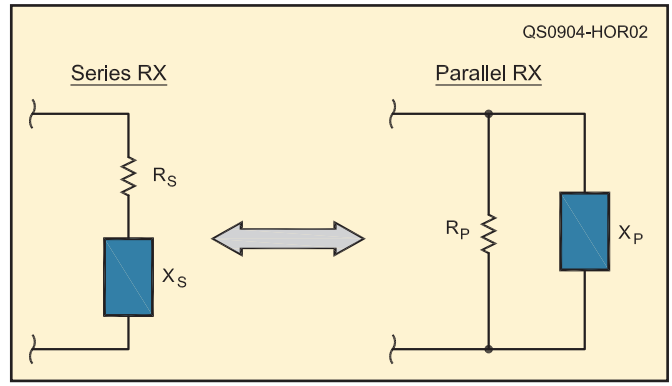


Figure 2 — Series circuits containing resistance and reactance can be transformed into parallel circuits (and vice versa) to simplify circuits and aid in design tasks.

H. Ward Silver, NØAX ♦ PO Box 927, Vashon, WA 98070 ♦ n0ax@arrl.org

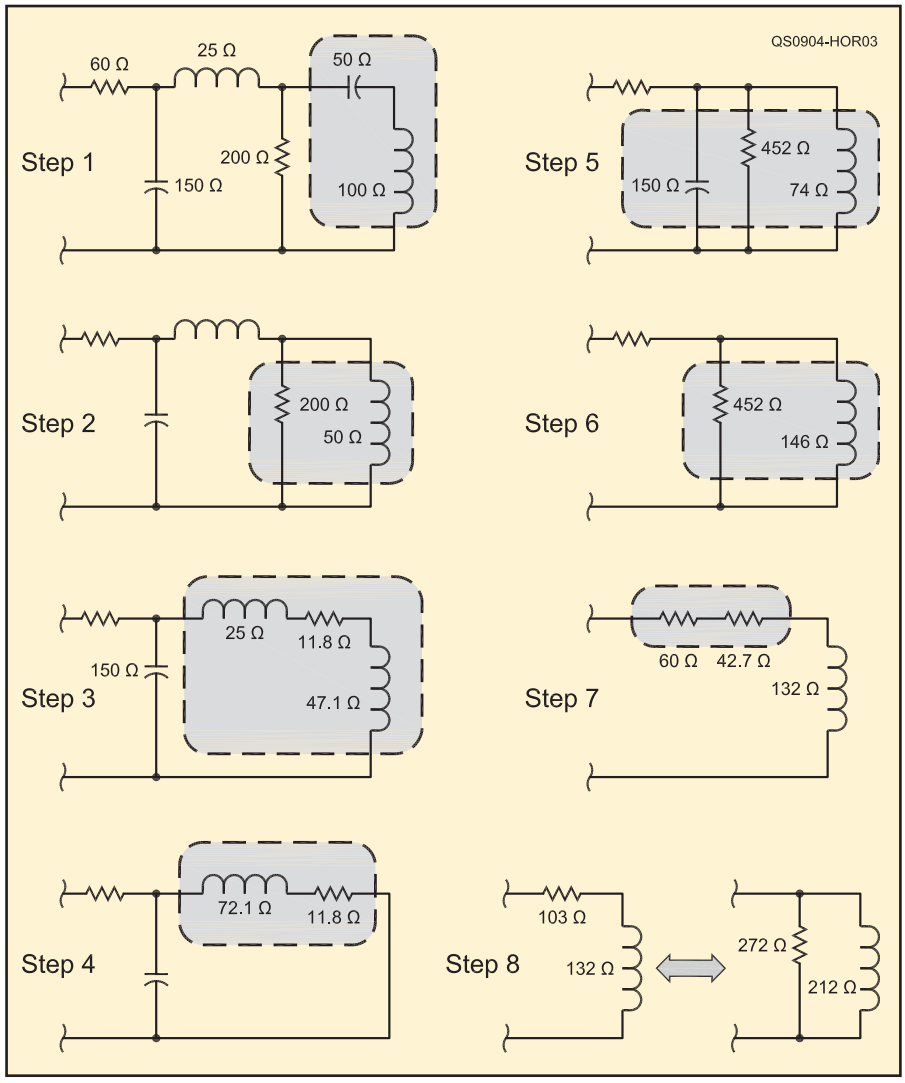


Figure 3 — A series of step-by-step transformations simplifies the complex circuit at the upper left into a simple series-RX or parallel-RX equivalent.

Series to Parallel Transformation

You already know how to work with combinations of series and parallel resistances to turn them into their simplified equivalents. Parallel and series reactances can be combined, as well. Yet at some point, it is often useful to convert between a series R-X circuit and its equivalent parallel R-X circuit as shown in Figure 2. Two circuits are ac equivalents if the same current flows with the same phase angle when a given voltage of the same frequency is applied to both circuits. (Remember that the equivalent is only an exact replacement at a specific frequency.)

When you have reduced the circuit to a single resistance and a single reactance, either in parallel or series, use the following formulas to convert between series and parallel circuits. If the circuit can be drawn as R in series with X, it can be converted to R in parallel with X as follows:

$$R_P = \frac{R_S^2 + X_S^2}{R_S} \qquad X_P = \frac{R_S^2 + X_S^2}{X_S} \qquad \text{[Eq 1]}$$

If the circuit can be drawn as R in parallel with X, it can be converted to R in series with X as follows:

$$R_S = \frac{R_P X_P^2}{R_P^2 + X_P^2} \qquad X_S = \frac{R_P^2 X_P}{R_P^2 + X_P^2} \qquad \text{[Eq 2]}$$

These formulas assume that the absolute value of reactance is used, so that X is always a positive number. The reactance will be of the same type (capacitive or inductive) before and after the series-parallel transformation.

Let's start with two simple examples. In the circuit of Figure 2A (series RX), let X_S = –50 Ω (capacitive) and R_S = 50 Ω. Use formula set 1 to convert to the parallel combination of X_P = –100 Ω (still capacitive) and R_P = 100 Ω. In the circuit of Figure 2B (parallel RX), work the problem backwards, using formula set 2.

Step by Step

Figure 3 shows a more challenging problem — reducing the circuit shown at Step 1 to its series or parallel equivalent. This takes eight steps of simplification, the component values to be transformed or combined circled by a dashed line. The sequence shows the circuits getting progressively simpler until the only circuits left are the series RX and parallel RX equivalents. (Values shown are the results of the required operation.)

Wherever there are reactances in series, combine them by subtracting X_C from X_L. One more formula is required. Combine parallel reactances by using the formula

$$X_{total} = \frac{-X_L X_C}{X_L - X_C} \qquad \text{[Eq 3]}$$

Again, use only the magnitudes of the reactances. If the result is negative, X_{total} is capacitive and if positive, X_{total} is inductive.

Start at the far right of the circuit, combining the two series reactances, leaving 50 Ω of inductive reactance.

- Transform parallel RX into series RX with formula set 2.
- Combine the series reactances, leaving 72.1 Ω of inductive reactance.
- Use formula set 1 to transform series RX into parallel RX.
- Use formula 3 to combine the parallel reactances.
- Transform parallel RX to series RX using formula set 2.
- Combine the series resistances, leaving 132 Ω of inductive reactance in series with 103 Ω of resistance.
- Use formula set 1 to transform series RX to parallel RX.

Recommended Reading

The "Electrical Fundamentals" chapter of *The ARRL Handbook* sections on reactance and impedance go into more detail about transformations.[2] Most circuit texts will cover the "Wye-Delta" or Y-Δ transformation that makes an appearance in radio circuits to change T networks into π networks.

Next Month

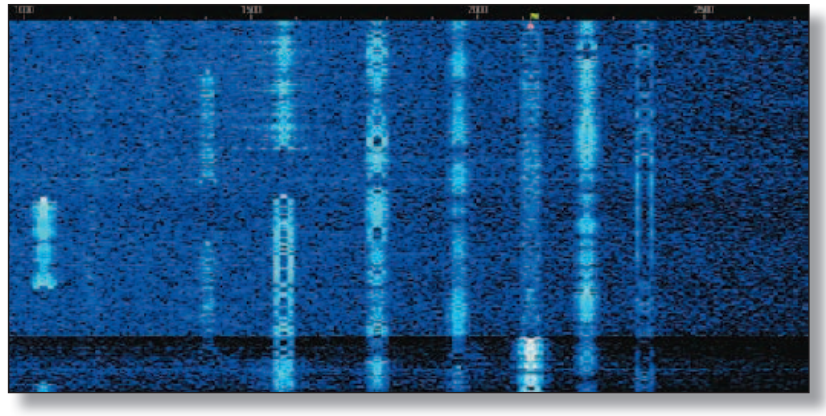
The lowly diode, simplest of all semiconductor devices? Not quite so simple, as we'll see next month as you compare several types and find out how they're used. QST

[2] *The ARRL Handbook for Radio Communications*, 2009 Edition. Available from your ARRL dealer or the ARRL Bookstore, ARRL order no. 0261 (Hardcover 0292). Telephone 860-594-0355, or toll-free in the US 888-277-5289; **www.arrl.org/shop/; pubsales@arrl.org**.

PSK — 10 Years On

This year we celebrate the 10th anniversary of one of the most popular Amateur Radio digital modes ever created.

Steve Ford, WB8IMY



In the middle of a humid New England summer in 1999, I received a curious e-mail message from Peter Martinez, G3PLX. It seemed that Peter had been experimenting with a new type of HF digital communication built around a single phase-shifting carrier. This unusual mode operated at a signaling rate of 31 baud within an RF bandwidth of less than 50 Hz. Peter called it PSK31.

My interest was definitely piqued, but what really grabbed my attention was the fact that Peter was working his magic with a software application that ran under *Windows* and used a sound card to handle the analog/digital conversion.

I was incredulous. "You mean the same sound card I'm using to listen to game noises can actually be put to use for digital communication?" Peter assured me that this was indeed the case and sent along a copy of the software.

After creating a crude transmit/receive switching interface, I booted up Peter's software and went hunting for PSK31 signals. There were only a handful in those days, but after nearly a week of searching and calling, I made contact with a fellow in Alaska. He said, to my astonishment, that he was running only 20 W to a dipole antenna. As the software extracted perfect text from his barely audible signal, a chill raced down my spine. In that moment I knew that Peter had stumbled onto something big.

Getting the Word Out

I quickly made arrangements to republish a PSK31 article by G3PLX that had recently appeared in the Radio Society of Great Britain's *RadCom* magazine. Our version went to press in the November/December 1999 issue of *QEX*, *QST's* sister publication for experimenters. At the same time, Peter and I collaborated on a *QST* article titled "PSK31 — Has RTTY's Replacement Arrived?" It debuted in the May 2000 issue.

The timing could not have been better. There were an awful lot of amateurs with *Windows* PCs in 2000, and most of those also had sound cards. Within weeks after the May *QST* hit the streets, you could tune around 14.070 MHz at any time and hear the gentle warblings of PSK31 signals.

The next jolt occurred later in 2000 when Skip Teller, KH6TY and Nick Fedoseev, UT2UZ, released their free *DigiPan* software. Unlike Peter's program that required operators to carefully tune individual PSK31 signals, *DigiPan* swept through the entire receive audio passband and displayed every signal it encountered. It displayed the signals as thin lines on a continuously scrolling "waterfall." To tune in a signal, you simply clicked your mouse cursor on the line of your choice.

DigiPan was an enormous hit and its "panoramic reception" technique became the standard. At the same time, both sound cards and sound card software were rapidly evolving. By 2001 we saw several new sound card modes such as MFSK16 and a growing number of commercial off-the-shelf sound card interfaces.

Even RTTY (radioteletype) operators, who prior to 2000 had been using hardware terminal units and multimode controllers, gradually made the shift to sound card technology. The RTTY transition was greatly accelerated by the introduction of *MMTTY*, a high-performance RTTY sound card application created by Makoto Mori, JE3HHT.

So Did PSK31 Replace RTTY?

Well … yes and no. Ten years after the debut of PSK31, RTTY remains the king of digital contesting. There are a number of PSK31 contests, but none that have yet matched the popularity of the established RTTY competitions. RTTY also holds the top spot for digital operations during DXpeditions. Some DXpeditions will use PSK31 on occasion, but most still prefer RTTY.

There is a reason for the RTTY preference among contesters and DXers. When it comes to reception, PSK31 tends to exhibit a "capture effect" where only the strongest signal among many is demodulated. In contrast, a RTTY operator can often pick up whole call signs or fragments of call signs even when several stations are calling at once. This is a strong advantage during a contest, or when you are on the "business end" of a DXpedition.

But PSK31 has clearly replaced RTTY for casual HF digital conversation. Depending on conditions, you'll always find someone to chat with around the common PSK31 watering holes at 3.580, 7.070, 10.140, 14.070, 21.070 and 28.120 MHz.

PSK31 Today

PSK31 has become a favorite among digitally savvy hams, especially those operating in antenna restricted environments. I routinely work amateurs who say they are running only 10 or 20 W to indoor antennas. Even with the poor HF propagation conditions we face today, the extraordinary performance of PSK31 allows these hams to enjoy operating and DX chasing whenever the bands are open.

Other "flavors" of PSK such as PSK63, PSK125 and PSK250 have entered the stage since 1999. And now PSK31 is turning up as a "feature" built into several transceivers, along with devices such as the NUE-PSK (**www.nue-psk.com**) that do not require computers at all.

Peter Martinez is still at work today, still innovating. But he will always be remembered by thousands of amateurs throughout the world as the man who introduced us all to a new way of "talking" — just in time for a new century.

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

Superior Audio from a $5 Boom Arm Mic

A boom mic keeps your hands and desk free — this one doesn't cost much.

Ron Wagner, WD8SBB

My request for better audio started some years ago when I returned to ham radio. I had been absent for quite a few years because of personal issues, finishing a degree, wife, daughter, house, dog, cat you know. Once I returned, I got a station set up and soon upgraded to Amateur Extra.

I am an engineer by profession. I always want my professional projects to be the very best they can be within any imposed limitations. I have that same passion for all my radio hobby projects. Generally, my major limitation centers around the project cost, which I am sure most can relate to. When I look at all my typical radio projects, I must admit that I have spent an excessive amount of money and time in one area — audio quality.

I have a natural "gift" in my extreme bass voice. Many people just love the sound of my voice and I often get compliments. It's a nice voice for soothing a young child, providing bass in a song or to present from a podium. But alas, my *radio announcer* voice has been the bane of my SSB contacts.

I have purchased, tested and sold many hundreds of dollars of equipment and mics without ever getting really good audio. I have tried equalization, in-line capacitors, special elements, you name it. I could never get crisp, clear, articulated audio. The folks who have regular contacts with me know the number of times I have asked for audio reports. They know that it does not offend me to hear, "throw it out." It is just a matter of fact that my voice seems to cause issues for mics and associated amplifiers, modulators and filters in SSB radios.

I am not an audio or acoustic engineer, but I have learned a lot while trying to fix my audio problems. I believe that my voice has so much energy in the low frequencies that it actually causes distortion within the mic itself. My observations include that, based on mic design, by backing off, I can marginally improve my audio. Then with the mic farther away from my mouth, I have to move up the transmit audio gain. The higher gain in turn gets all the noise in the house modulated onto my signal. If I turn down the gain and get close to the mic, the way many communication mics are generally designed to operate, I drive the mic with excessive bass and rumble in the mic all over again.

My best compromise audio solution has been to use an old hand mic from a 2 meter FM set on my Drake TR7 HF station. Although the hand mic has gotten acceptable reports, the recordings I have of myself are just marginally acceptable. In the back of my mind I was just never happy that I did not have excellent audio. After all the idea of a phone contact is to be understood while you are speaking. I suspect the reason for my limited DX contact list is that the DX stations honestly cannot understand me very well. In my opinion, being heard with crisp articulated audio is still a key to getting the contacts.

Until recently, I had somewhat resigned myself to not making many DX contacts, nor having broadcast quality audio. I had also come to the conclusion that buying, testing and selling mics and gadgets had become nothing more then a slow drain of my limited radio funds, not to mention a source of frustration.

Yet Another Attempt

The other week, I was going through my collection of quality electronic reclamation equipment preparing some of it for disposal (aka cleaning out the garage). I found an old *Trimline* style telephone that we had replaced some years ago. Upon seeing the phone, I suddenly thought of how the telephone industry had to deal with my voice. I knew that cheap telephones are not an option in my house because of my voice. Perhaps

Figure 1 — Cotton padding is used to hold the mic in the tube and attenuate extraneous sounds.

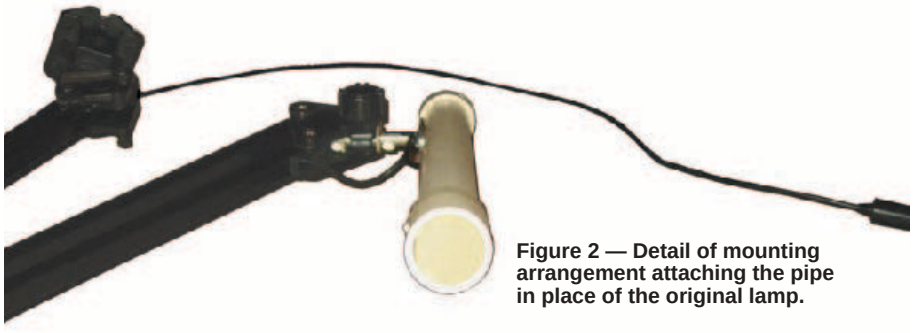


Figure 2 — Detail of mounting arrangement attaching the pipe in place of the original lamp.

Figure 3 — The paper clips reduce the spring force by extending the springs.

this old, better quality telephone had something magical in its design and components.

A quick job with a screwdriver revealed a circuit board with a single integrated circuit and some other miscellaneous parts. After a closer inspection, I found a tiny little mic under the printed circuit board. From its shape and size, my guess was that it was an electret type mic. Since I had previously tested electret mics with marginal results, I was somewhat disappointed. I did remember reading, however, that electret mics can provide high quality sound with very flat frequency response. I decided the effort would be minimal to test the mic, and was hoping that a magical, very high quality component might be hidden in this old telephone mic. A few more screws later, I had recovered the telephone's mic for testing.

A few days later, I connected the telephone mic to my rig. I had borrowed, modified and used a basic electret schematic from the ARRL Web site for testing several times in the past.[1] This time I again built a circuit on a small breadboard and connected the mic to my TR-7 via miniature coax. I added an external push to talk (PTT) switch and gave the thing a try on the dummy load. It seemed to modulate the rig okay, but I was wondering how it really sounded. I took out my ICOM R-10 general coverage receiver and connected it to the tape deck. I then set the receiver to frequency and proceeded to test.

By listening to the tape, you can actually hear what you sound like on the air. This configuration keeps your body's internal acoustic system from masking your audio quality. Try to play the tape back on your shack's speaker system. It can sound very different than quality stereo speakers or headphones. Try to keep the signal strength from overloading the receiver by using a well shielded dummy load, your RF gain control and if necessary a resistor across the antenna input of the receiver.

The Results

I was really impressed with the little telephone mic's performance. The tape recording of my radio transmission was truly excellent even while I was "on top of" the mic! Unfortunately, the little mic also picked up every background noise there was in the house. I was fairly sure that I could fix the background noise pickup given that the mic had come from a confined acoustical environment that had limited background noise. With the mic still on a prototype breadboard, the following weekend I checked into the Van Wert Area Emergency net on 3920 kHz and asked for some feedback. My testing was validated with reports such as "not sure what you changed, but don't change it back," "sounds good" and "lots of bass, but that is exactly what you sound like in real life."

I was really excited. For once not only did I sound better, but I also sounded like myself. My testing, as well as on the air reports from folks who know me and have met me in person, had indicated that I had a winning mic with excellent audio. Now how was I going to package the mic, and how would I reduce the background noise pickup?

Packaging the Project

The ARRLWeb article showed an electret desk mic stand made from PVC pipe. I don't really like desk mics as they always seem to be in the way on the desk. I started thinking about the contesters' photos I had seen. Many seem to have an arm type boom with a mic on it. I thought that might be a neat way to go. But how was I going to mount the tiny mic to the boom, and how was I going to justify $50 to $100 for a microphone boom arm for a junk box mic? There was also still that little technical issue of the mic's background noise pickup to be solved.

The background noise pickup was first on the list of things to try to remedy. Many mics use some type of spring or cotton padding to hold and insulate noise from coupling to the mic element. I decided to try a piece of ¾ inch CPVC pipe along with some cotton padding. The article on the ARRLWeb warns about recessing the mic inside the tube. My testing indicated that recessing a mic in tubing will make the mic's frequency response change to become echo-like. In my case, the mic configuration was using padding, as shown in Figure 1, and the pipe was to be a much larger diameter than described in the article (¾ inch CPVC versus ½ inch PVC, almost two times the inside diameter).

My tests indicated that the depth I had used and the way I packed the mic did not appreciably change the tonal quality of the mic, and most importantly had reduced the background noise pickup so it was almost non-existent. I next added a small *pop screen* made from lightweight packing foam. It had no adverse tonal effects. I now had a stick mic that seemed to be almost optimal compared to all previous mics and audio paraphernalia I had tried. Now with a well packaged, good sound quality mic, that only left the image of the contesters' boom arm going through my mind. How could I get one of those on the cheap?

A Plan Comes Together

A few nights later, I noticed my arm light in the shack and thought that it looked a lot like a mic boom arm. I bought my arm light

[1]Notes appear on page 80.

at a local office supply store for about $20. Another engineer at work told me the local Goodwill store had some arm lights. I found one that looked easy enough to disassemble and modify. For the sum of $2.50 plus tax, the light was on the way home with me.

I took the springs off the arm. Then I took my Dremel tool and ground off the little rivets that held the light itself to the T of the arm. I took a couple of pairs of pliers and reshaped the T that held the light. First I made the T flat, then I carefully curved the ears so that my CPVC pipe would lay into the top of the T. I drilled two ⅛ inch holes in the CPVC pipe to match the rivet holes of the T. Using short bolts and nuts I mounted the pipe to the T of the arm (see Figure 2). I repacked the cotton and strung a length of RG-174 down the arm in place of the electrical cord. I then added the springs back to the arm.

I had anticipated that I would need to add a little ballast weight to the arm to compensate for the differences in the weight of the light fixture compared to the CPVC mic. What I had not anticipated was how much the light weighed. Seemed that no matter what I did, the arm continually wanted to snap straight.

My first thoughts were to reduce the spring force by extending the springs with wire. I tried the idea using paper clips as the extension links, as shown in Figure 3, and it generally worked. The arm had positive tension for all of my operating positions. There were a few spots at which the springs would sag and not hold the arm. The dead spots were in positions that would be with the mic folded away, but it was not what I wanted. I returned the springs to normal, and proceeded to tape lead wheel weights on the mic until the boom arm balanced.[2] I now had an idea how much weight was needed, and went to visit with a friend who does shot shell reloading. He gave me small shot pellets to use inside my CPVC pipe. I used a small piece of wooden dowel rod with masking tape as a plug to keep the shot in the bottom of the pipe. I now get good results with any arm position. Now and then the arm will coast slightly, but otherwise it works great. The completed mic ready for electronics is shown in Figure 4.

Figure 4 — Completed mic ready for electronics.

Final Touches

I added a small box at the base of the arm to store the minimal circuitry and battery. I used a miniature audio transformer in a 10k to 500 Ω arrangement in my project (the impedance of the mic is determined by the value of the resistor in this specific case). Although I could drive the low impedance input of my rig with the mic without the transformer with only a slight tinny frequency response, I used the audio transformer for matching and to assist with RFI elimination. It seems to have cured a nasty RF issue on 40 meters for me with this mic. The 0.01 µF dc blocking capacitor was chosen to roll off the low frequencies of my voice. A 4 to 10 µF capacitor may be better suited for an average voice. From the transformer I ran more cable to meet and connect to my primary Drake TR7 station. The simple circuit is shown in Figure 5.

I am in the midst of adding more to the audio system. I am working on a switch system so that I can move the mic between rigs. I will use another audio matching transformer to adjust impedances as needed. I also plan to paint the CPVC pipe black to match the arm.

You might be asking why I used the extremely long length of CPVC pipe for my mic. I did so because the length of the arm mechanism is too short to reach me while I am leaning back in my operator chair ragchewing. You can use a shorter length based on your needs.

Results

Not counting the parts from my junk box, I have invested only about $5 in my microphone system. It is the best system I have ever had! My mic and boom arm have given me loads of enjoyment in the challenges of electrical and mechanical construction, as well as tremendous satisfaction during usage. I encourage you to try one yourself. You will be hard pressed to get a highly functional, better sounding mic for your money.

Notes

[1]**www.arrl.org/members-only/tis/info/pdf/99hb2229.pdf**.

[2]Used lead wheel weights can be had for the asking at many tire dealers or alignment shops. Lead shot is available in many sizes at sporting goods stores.

Photos by the author.

Ron Wagner, WD8SBB, was first licensed in the late '70s. Ron now holds an Amateur Extra class license and is an ARRL Life Member. He has degrees in Electronics and Computer Science as well as various professional certifications. Ron has been employed for over 20 years in the computer industry, primarily in computer communications, and is currently employed by the Harris Corporation as a Network Engineer. He enjoys engineering, tinkering and building mechanical and electronic projects. You can reach Ron at 5065 S Kessler-Frederick Rd, Troy, OH 45373 or via e-mail at **wd8sbb@arrl.net**. QST

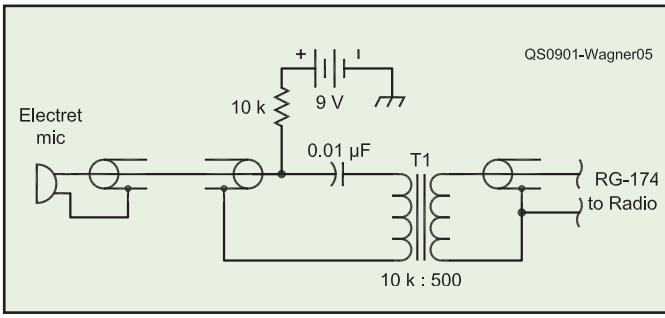


Figure 5 — The simple electret mic interface circuit. Many radio mic connections include a pin with a dc voltage intended to power electret mics — check your radio manual to see if you can avoid the battery.

AG1YK

HINTS & KINKS

TV ANTENNA ANT NEST

◊ In July 2006 we moved to the great state of Texas. The house had an antenna for TV reception in case one wanted to view local stations. I happened to have a 2 meter beam I wanted to put up and decided to use the TV mast, so down came the TV antenna.

We have a recycle program here in Georgetown, which takes aluminum, but the box used for bottles, cans and plastic was of a size that meant I had to cut up the 8 foot long double boom and elements of the old TV antenna. A limb lopper was hanging there on the garage wall so I tried that. It worked just fine on the thin gauge aluminum.

What surprised me was after the first cut, out fell thousands of carpenter ant eggs and ants! In this part of the country, these ants do remarkable damage similar to termites. We had the tree limbs cut back from resting on the house and sprayed for insects, thinking the ants were being held at bay but lo and behold, they were up there out of sight with free access to the house via the mast above the roof.

If you have one of those old TV antennas, you might want to check for insect nests up there. Who knows what you will find! — *73, Ted Walker, KJ7V, 109 Oakland Dr, Georgetown, TX 78628,* **kj7v@arrl.net**

LADDER LINE CENTER INSULATOR

◊ I have had this center insulator up for over 6 years and it's still holding. It is made from a 0.75 inch T and an underground sprinkler riser. I drilled the T as shown in Figure 1, keeping the spacing for the ladder-line equal.

LEN KEPPLER, KC7XH

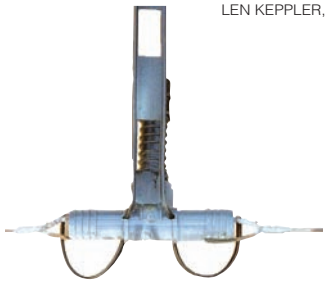


FIgure 1 — The sprinkler T repurposed to be a dipole center insulator. The addition of two wire ties for strain relief makes the assembly ready for raising.

Loop the ladder-line around and use cable ties to hold it on and take up the strain. I think the total cost was around $2. — *73, Len Keppler, KC7XH, 6050 Shady Pines Rd, Helena, MT 59601,* **keppler@wildblue.net**

ACORN ANTENNA ALTITUDE APPARATUS

◊ I have discovered a simple and effective method for getting ropes into trees that does not involve climbing, throwing, launching or any other physical feat. Faced with the prospect of donning my William Tell tights again this year, I decided I needed a better method. In considering various approaches it suddenly occurred to me — what, after all, is the best thing in the world for getting up into a tree? Why a squirrel of course!

STEVE SANT ANDREA, AG1YK

Figure 2 — A simple device for getting your antenna support rope up into a tree.

I found myself an acorn, wire tied a fishing weight to it and then connected a piece of nylon fishing line to the sinker as a pilot (see Figure 2). Just place the device at the base of a tree, leaving plenty of slack in the line, and position yourself nearby. The first squirrel down the tree will see the acorn, grab it and hurry back up the tree to its nest, which is always located at the very top of the tree. Once at its nest the squirrel breaks open the acorn and lets the shell and fishing weight drop to the ground — carrying the pilot line with it. After that it is a simple matter to retrieve the weight and lift your support ropes per the usual method. Note: This method works better in the spring (April in particular) when the critters are hungry than in the fall when they tend to drag your contraption into the undergrowth and bury it. — *73, Steve Sant Andrea, AG1YK, 225 Main St, Newington, CT 06111,* **ag1yk@arrl.org**

EASY ANTENNA MOUNTS FOR A HONDA RIDGELINE

◊ As a recent returnee to Amateur Radio, I wanted to use my 2006 Honda Ridgeline as my mobile ham station. I wanted to mount some antennas in a more "permanent" fashion than using a magnetic mount antenna. Unfortunately, this model of the Ridgeline does not have a roof rack and is a leased vehicle, so I was limited in my mounting options (for example, I could not cause visible damage to the vehicle by drilling holes).

The Ridgeline has six tie-down points in the bed of the truck that look like cleats on a boat. The tie-down points measure 1.75 inches long by 3.5 inches with a 1 inch square opening in the center (see Figure 3). Using the two tie-down points located at the top of the front of the bed on each side of the truck as the base for an antenna mount makes it easy to route the coax in through the center sliding window at the back of the cab.

I decided to develop an antenna mount that would clamp onto a tie-down point. To make my antenna mounts, I used 0.25 inch thick, 2 inch wide, flat aluminum stock. The local hardware store conveniently sells 3 foot lengths of this stock supplying material for several mounts.

The simplest type of mount is made by cutting a 3 inch (or longer) piece from the stock (we'll call this the upper plate). Measure 0.5 inch in from each of the long

Figure 3 –– Honda ridgeline tie-down point.

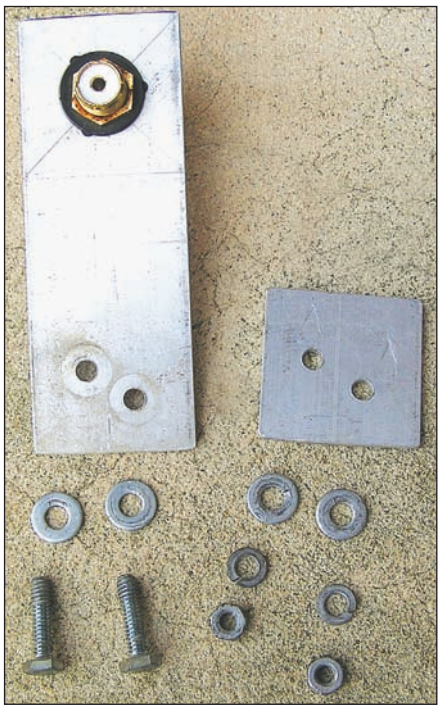


Figure 4 –– Close-up of antenna mount hardware (disassembled).

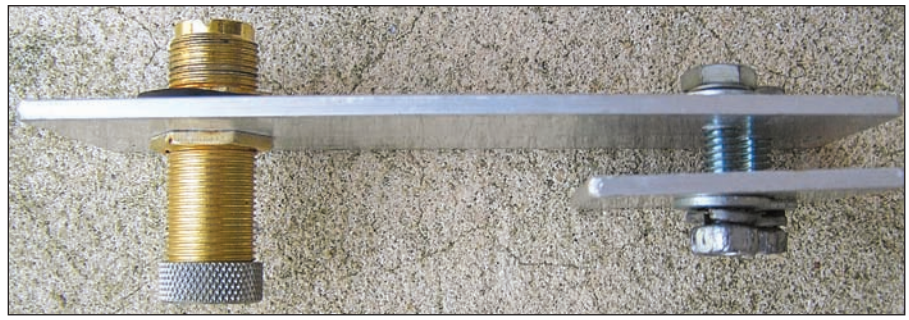


Figure 5 — Side view of assembled antenna mount.

sides of the upper plate and scribe a line. Now measure and mark lines across the width of the upper plate 1 inch in from one end of the upper plate and another line at 2 inches in from the same end of the upper plate. You should now have a 1 inch square box marked on the upper plate. This scribed box corresponds to the 1 inch opening in the tie-down. Drill two 0.25 inch holes at opposite corners of the 1 inch box marked on the upper plate.

Next, cut another 2 inch square piece from the stock (we'll call this the lower plate). Clamp the lower plate underneath the upper plate with one end of both the upper and lower plates and the sides of both the upper and lower plates aligned. Using the two holes you just drilled in the upper plate as a template, drill two more 0.25 inch holes through the lower plate. Figure 4 shows the upper and lower plates for the antenna mount (along with mounting hardware).

To install the antenna mount, hold the upper plate on top of the tie-down. Slide the lower plate underneath the tie-down. Insert one of the 0.25 inch bolts through the holes in both the upper and lower plates and screw a nut on the bolt that extends through the lower plate. Install the second bolt through the remaining hole in both plates and screw a nut on the bolt. As you can see from Figure 4, for extra security I also used a 0.25 inch flat washer between the bolt head and the upper plate and flat and lock washers between the lower plate and the nut. Depending upon how you drilled the holes in opposite corners of the upper plate, the lower plate may align only one way. Figure 5 shows a side view of the assembled antenna mount.

You should now have an inch or more of the upper plate extending past the end of the tie-down. If the antenna you want to use requires a counterpoise, then simply drill a hole of appropriate size for the antenna mount. For example, in the previous figures, you can see where I drilled a hole large enough for a double female SO-239 "bulkhead" connector. I verified the tie-downs are grounded to the Ridgeline chassis using a multimeter between the tie-down and the outside of the cigarette lighter/power receptacle in the back of the center console. Note that, depending on your specific antenna, the counterpoise might not give acceptable SWR readings.

Figure 6 shows the simple antenna mount installed on the tie-down.

Photos 3-6 by Randy Kulzer, N2CUG.

73, Randy Kulzer, N2CUG, 2235 Allenwood Rd, Wall, NJ 07719, **rkulzer@usa.net**

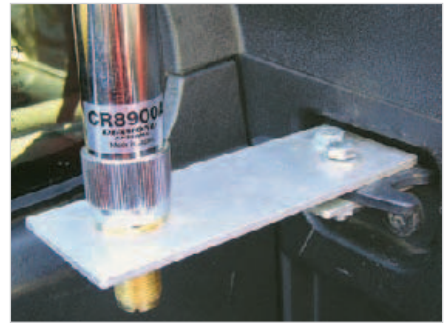


Figure 6 — Antenna mount installed on tie down.

HOT SUN — COLD SOLDER

◊ About 3 years ago I bought an ADI AR-447 70 cm transceiver, which worked great until just after the warranty expired. Does this sound familiar? I had the radio mounted in my car, which was always parked in the sun during the day. In El Paso, Texas that means that the interior of the car can reach temperatures above 250° F. With some of the silver-based and lead free solders used in manufacturing today this can be dangerous to your electronic equipment. When I got off work one day my ADI AR-447's display presented me with garbled characters. The radio worked fine. I just couldn't tell what frequency I was on.

I sent it off to be repaired and it came back with a letter stating that it was unfixable. I put it in my junk box thinking that I could use parts from it someday. It stayed there for 2 years.

While searching for parts for a project recently, I pulled the AR-447 out of the junk box and opened it up to see if there were any parts that I could use. I was looking at the parts when I noticed that much of the solder looked like crushed tin foil. Upon further study I discovered that most of the board had cold solder joints.

I got out the soldering iron and solder and resoldered every joint and connection I could find. I put the radio back together and it worked — and it is still working.

Over the years I've heard other hams complain of losing the use of equipment from the same cause, an unreadable dial. Many hams have had their radio's display fail and their radios have become unusable. Further research also indicated that in many cases the radio had been mounted in a vehicle that spends a fair amount of time sitting in the sun. If you have a radio that has display problems, check it out. It may just be cold solder joints. If your radio comes back to life after some serious resoldering and you plan to put it back in a vehicle, park in the shade and find a way to vent the vehicle to keep the temperatures down. *— 73, John P. Conlon, WB7NPF, 10033 Mercedes St, El Paso, TX 79924-3816,* **aconlon1@elp.rr.com**

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

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

This Month in Contesting

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

OFF-SEASON TRAINING

I like baseball. No, I take that back; I *love* baseball. To me, it is the perfect game, one that, like any other sport, requires a lot of training to get in good shape to participate at a world-class level. I'm now in my 40s, so I don't see myself playing first base for the Chicago Cubs anytime soon. Fortunately, my contesting skills have fared a little better over the years than my baseball skills.

As you're reading this, we are slowly closing the door on yet another contest season. There are only a handful of major HF contests left until fall; the CQ WPX SSB and CW contests (held in March and May, respectively) and the IARU HF World Championships (in July) are about it for the top-shelf competitions until September. That's when the new Contest Season will kick off with the 2009 CQ WW RTTY Contest. While warmer weather will certainly get a lot of us out of the house (maybe even to play baseball!), there are things you can do during the "off-season" to keep fit for next fall and be ready for the major events when the clock strikes 0000. Here are some practical suggestions on keeping in Contest Shape.

1) ***Use the Batting Cage.*** Practice making QSOs, especially CW. Aside from simply getting on the air and making QSOs, check out the *MorseRunner* CW contest trainer by Alex, VE3NEA. *Morse Runner* simulates a contest environment where you are calling CQ and running a contest pileup. There are numerous variables you can adjust, such as the number of stations that call you at once, noise and interference levels, and other factors that make it feel quite real indeed. It also gives you the added bonus of helping with your contest logging skills at the same time. *MorseRunner* can be found at **www.dxatlas.com/morserunner**.

2) ***Check Out The Hot Stove Report.*** Most major hamfests offer a contesting forum; these are excellent events to attend and listen to guest speakers talk about everything from operating techniques to sleeping patterns and eating habits. If you want to get even more involved, a few seminars are available. One of the biggest is Contest University, held each year just before the Dayton Hamvention®. Here you will learn from some of the top contesters on the planet. Subjects range from antenna design, contest strategies and tactics, mobile contesting, contest ethics and a slew of other information in a classroom setting with plenty of opportunities to ask questions. For more information on Contest University at this year's Dayton Hamvention, visit **www.contestuniversity.com**. A similar program is being offered this year at the International DX Convention in Visalia, California in April.

3) ***Play Winter Ball.*** A lot of younger ballplayers trying to get their skills up for next year's major-league season will play winter ball during the off-season in smaller leagues in other countries. Radiosport is no different; there may not be any major events for the next few months, but there are plenty of smaller contests (both national and international) you can get in on and hone those skills. These events are not just training grounds for the larger events; they're a lot of fun in their own right! The ARRL's Contest Corral provides a monthly list of great contests that provide a lot of fun while learning some valuable on-air skills. Be sure to check my monthly "Sean's Picks" area for a few that really stand out as worthy of your time. State QSO Parties, QRP events, single-band competitions…it's all there for your enjoyment and training.

4) ***Learn a New Pitch.*** Things may be slowing down on the HF bands, but May through August is Prime Time for the VHF bands. Summertime means Sporadic-E propagation, and that means tons of activity on 6 meters and 2 meters, too. The two biggest VHF+ contests to be found in summer are the ARRL June HF QSO Party (June 13-14) and the CQ WW VHF Contest (July 18-19). If you have an HF rig that has 6 meters built-in, or if you have one of those compact all-in-one rigs that go from 1.8 up to 432 MHz, it's easy to get involved! VHF antennas are small — a dipole for 6 meters is around 9 feet long, and small beams for 2 meters and 70 cm can be less than 6 feet long. The antennas are small enough that portable operation on a nearby hilltop is a breeze. Steve Kavanagh, VE3SMA, has written an introductory paper on VHF Contesting for the VHF newbie. You can find it at **http://cco.ve3xd.com/VHFContestPrimer.pdf**.

5) ***Break in Your Glove.*** Think for a minute. Are you aware of all the features your radio offers? It sounds silly, doesn't it? Still, if not, take some time and learn how to use your rig to the fullest extent possible. Knowledge of how all the filters, memories and other adjustments work and when to use them can save you hours of fatigue and do wonders for your final score. If you spent big money for a radio and you're not using it to the best of its ability, QSOs are being left out of your log.

These tips will help get you on the path to a larger score during the 2009-2010 contest season, and increase your enjoyment of Amateur Radio in general. Did I miss something? Drop me a line at **kx9x@arrl.org** and tell me what you do to keep in contest-ready shape.

Sean's Picks

- ***State QSO Parties this month*:** Florida, Georgia, Michigan, Missouri, Montana, Nebraska, Ontario.
- 2009 is the Year of the State QSO Party! Visit **www.arrl.org/ysqso** for details!
- **QRP ARCI Spring QSO Party (April 4-5):** One of the great QRP contests. ARCI Members give their ARCI number, non-members send their power. This is an excellent event for getting out into the field on a nice spring day.
- **2 Meter Spring Sprint (April 6):** This "shorty" on 2 meters is a great introduction to non-FM communication on 2 meters. It runs from 7 PM to 11 PM *local* time, no matter where you live.
- **Lighthouse Spring Lites QSO Party (April 9-19):** Sponsored by the Amateur Radio Lighthouse Society, this 10-day long event seeks to "shed light" on radio activities from lighthouses and lightships. How many different lighthouses around the world can you get into the log? Better yet, can you operate from one?
- **TARA Skirmish Digital Prefix Contest (April 18):** See how many different Amateur Radio prefixes you can log using the digital modes! Bonus multipliers are awarded based on how little power you run.

Operating Tip of the Month

"'CQ Concurso!' When working a DX contest, learn a few simple phrases in several languages. For example, speaking a little Polish or Italian when running Europe can put some badly needed QSOs into your log, especially on bands that seem dead. 'Grazie per il cotatto!'"

CONTEST CORRAL

in association with the *National Contest Journal*

APRIL 2009

Start and Finish	HF	VHF+	Contest Title	SSB	CW	Dig	Exchange	Sponsor's Web Site
Apr 4 0000Z - Apr 6 2359Z	1.8-28	50-432	Montana QSO Party	✘	✘	✘	RS(T), S/P/C or MT county	www.fvarc.org
Apr 4 0000Z - Apr 4 0359Z	7		LZ Open 40 Meter Contest		✘		6-digit serial and serial from previous QSO	www.lzopen.com
Apr 4 0000Z - Apr 5 2359Z		432, 5.7	GEU EME Contest	✘	✘		TMO/RS(T) and "R"	www.dubus.org
Apr 4 1200Z - Apr 5 2359Z	1.8-28		QRP ARCI Spring QSO Party		✘		RST, S/P/C, power or QRP ARCI number	www.qrparci.org
Apr 4 1500Z - Apr 5 1500Z	1.8-28		SP DX Contest	✘	✘		RS(T), serial or SP province	www.spdxcontest.info
Apr 4 1600Z - Apr 5 1600Z	3.5-28		EA RTTY Contest			✘	RST, serial or EA province	www.ure.es/contest
Apr 4 1800Z - Apr 5 2359Z	1.8-28		MO QSO Party	✘	✘		RS(T), serial, MO county or S/P/C	www.w0ma.org
Apr 4 1800Z - Apr 5 1800Z	1.8-28	50+	QCWA Spring QSO Party	✘	✘	✘	Call/year lic'd/name/QCWA chap or S/P/C	www.qcwa.org/qso-party.htm
Apr 6 7 PM - Apr 6 11 PM		144	VHF Spring Sprints	✘	✘		Grid Square (6-character preferred)	www.sysadnet.com/vhfsprintrules.htm
Apr 9 0001Z - Apr 19 2359Z	160-10		Lighthouse Spring Lites QSO Party	✘	✘	✘	ARLHS number or serial, name, S/P/C	arlhs.com
Apr 11 1600Z - Apr 11 1959Z	3.5-14		EU Spring Sprints		✘		both call signs, serial, name	www.eusprint.com
Apr 11 0000Z - Apr 12 2359Z	1.8-28		URE 60th Anniversary Contest	✘	✘	✘	RS(T) and EA province or serial	www.ure.es/contest
Apr 11 0700Z - Apr 12 1300Z	1.8-28		Japan International DX Contest		✘		RST, JA prefecture or CQ Zone	jidx.org
Apr 11 12 Noon - Apr 11 6 PM	14		PSK31 Flavors Contest			✘	S/P/C and name or 070 number	www.podxs070.com
Apr 11 1800Z - Apr 12 2359Z	1.8-28	50	GA QSO Party	✘	✘		RS(T), S/P/C or GA county	gqp.contesting.com
Apr 11 2100Z - Apr 12 2100Z	1.8-28		Yuri Gagarin DX Contest		✘		RST, ITU Zone	gc.qst.ru/en
Apr 13 1400Z - Apr 13 2000Z	1.8-28		Low Power Spring Sprint		✘		RST, grid square, category	alexanderkorda@hotmail.com
Apr 14 7 PM - Apr 14 11 PM		222	VHF Spring Sprints	✘	✘		Grid Square (6-character preferred)	www.sysadnet.com/vhfsprintrules.htm
Apr 18 1600Z - Apr 18 1959Z	3.5-14		EU Spring Sprints	✘			both call signs, serial, name	www.eusprint.com
Apr 18 0000Z - Apr 18 2359Z	1.8-28	50	TARA Skirmish Dig Pfx Contest			✘	Name, prefix	www.n2ty.org/seasons/tara_dpx_rules.html
Apr 18 0000Z - Apr 19 2359Z	1.8-28		Holyland DX Contest	✘	✘	✘	RS(T), serial or Israel district	www.iarc.org
Apr 18 0500Z - Apr 18 0859Z	3.5,7		ES Open HF Championship	✘	✘		RS(T), serial, dupes OK once/hour	www.erau.ee/index.php?newlang=eng
Apr 18 1600Z - Apr 19 0400Z	3.5-28		Michigan QSO Party	✘	✘		Serial and MI county or S/P/C	www.miqp.org
Apr 18 1700Z - Apr 19 1300Z	3.5-28		EA QRP Contest		✘		RST, category, M if EA QRP member	www.eaqrp.com
Apr 18 1800Z - Apr 19 1800Z	1.8-28	50,144	Ontario QSO Party	✘	✘		RS(T), S/P/C or Ontario QTH	cco.ve3xd.com/oqp
Apr 18 2100Z - Apr 19 1700Z	1.8-28		YU DX Contest		✘		ITU zone	www.yu1srs.org.yu/dl/yudx/yudxruleseng.html
Apr 22 7 PM - Apr 22 11 PM		432	VHF Spring Sprints	✘	✘		Grid Square (6-character preferred)	www.sysadnet.com/vhfsprintrules.htm
Apr 25 1200Z - Apr 26 1200Z	3.5-28		SP DX RTTY Contest			✘	RST, serial, SP province	www.pkrvg.org/zbior.html
Apr 25 1300Z - Apr 26 1259Z	1.8-28		Helvetia Contest	✘	✘	✘	RS(T), serial or Swiss canton	www.uska.ch/e_index.htm
Apr 25 1600Z - Apr 26 2159Z	7-28		Florida QSO Party	✘	✘		RS(T), FL county or S/P/C	www.floridaqsoparty.org
Apr 25 1700Z - Apr 26 1700Z	1.8-28	50,144	Nebraska QSO Party	✘	✘	✘	RS(T), NE county or S/P/C	www.hdxa.net

All dates refer to UTC and may be different than 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 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, additional contests and a downloadable PDF version online at www.arrl.org/contests

April 2009 QUALIFYING RUNS

www.arrl.org/w1aw.html

♦ W1AW Qualifying Runs are 9 AM EDT (1300Z) Thursday, April 2 (35-10 WPM) and 4 PM EDT (2000Z) Thursday, April 16. The West Coast Qualifying Run will be transmitted on 3590 kHz by station K6YR at 9 PM PDT Wednesday, April 8 (0400Z April 9) (10-40 WPM). Unless otherwise indicated, code speeds are from 10-35 WPM.

2008 ARRL International EME Competition Results

Competitive proving ground of skills and emerging technologies.

Jeremy Alexander, W7EME
jeremy@w7eme.org

Earth-Moon-Earth (EME) operators ran up their power bills for the 30th annual ARRL International EME Competition, held on September 20-21, October 18-19 and November 15-16. The 2008 event once again provided outstanding activity and produced some nice scores. Smaller stations are scoring higher, and higher total scores have been logged by most participants nearly every year.

For the accomplished microwave contester, 2304 MHz and Up competition occurred on the first weekend. Moon passes on the second and third weekends were reserved for 50 MHz through 1296 MHz. (Weekends are dedicated to different sets of bands to allow station and antenna reconfiguration.)

EME Categories

In this annual event, participants may choose from a variety of entry categories. Single-Operator stations are the event mainstay with a handful of Multi-Operator teams. Other categories include operating CW-only, Digital-only or Mixed Mode. Participants must also choose to compete using a single band or as an All-Band entry in either of the 50-1296 MHz or 2304 MHz and Up groups. The Assisted category allows the contestant to coordinate and advertise their operation during the contest by means of the Internet or otherwise.

The results of the competition show a total of 140 entrants and 7 check logs. Of the total, nearly 90% of the entries are Single-Operator with entries in almost all of the different categories. The total of 140 submitted logs with 8500 completed QSOs in 2008 is down from 2007's 183 entries and 10,100 QSOs. Single-Band, 222 MHz remains the only category for which an entry has never been received.

Category Winners

The overall highest score of the competition goes this year to the mighty Multi-Op, All-Band, Mixed-Mode efforts of HB9Q with 360 Qs and a score of 5,724,000 points. The competition's second highest score overall was made by Team K1JT. With a score of 5,696,000 for their 356 contacts completed, Team K1JT was operating as a "Neighborhood" Multi-Op, All-Band, Mixed-Mode entry, combining 144 MHz operation at K1JT with other bands through 10 GHz at K2UYH. Top scores in each category are shown in the table below.

Increase Your Aperture!

More about the EME Competition including complete scores, comments from the entrants and informative sidebars is available at **www.arrl.org/contests/results**.

Where the Action Is

The 2304 MHz band is showing more and more activity. This contest was a good example of the increasing population on 13 cm. 13 cm is likely the New Band of Choice for the more technically minded ham and a good place to find the modern analog operator on CW and SSB.

The 144 MHz band has always been host to the greatest activity. The use of digital mode JT65b from the WSJT suite of software (available for free at **www.k1jt.com**) was the choice of the 2 meter contester in 2008. The quantity of CW stations was down considerably from years past.

The 23 cm band was also a good place to hunt points for the contester. Many smaller stations are now enjoying 1296 MHz EME with quite a few of them active on the second and third weekends.

EME — Learn More

EME should be attempted by any amateurs wanting to try something new, exciting and rewarding! The Web site of Paul Kelley, N1BUG, at **www.n1bug.net/operate/emebasic.html**, is a great read for the beginner. To learn more about and download the popular WSJT software suite, see the Web site of Joe Taylor, K1JT: **www.physics.princeton.edu/pulsar/K1JT**.

EME contesting is in the reach of even the weekend VHFer. Try it — it's fun, it's technical and it's rewarding!

Top Scores and Category Winners

Category	*Winner*	*Score*
Single Operator, All Band, Analog	G3LTF	1,582,400
Single Operator, All Band, Mixed Mode	OH2DG	967,500
Single Operator, Multi-Band, 50-1296 MHz Analog	VK3UM	618,000
Single Operator, Multi-Band, 50-1296 MHz Digital	VK4CDI	28,500
Single Operator, Multi-Band, 50-1296 MHz Mixed-Mode	WA4NJP	459,200
Single Operator, 50 MHz, Digital	JR6EXN	1,600
Single Operator, 144 MHz, Analog	LA8YB	159,600
Single Operator, 144 MHz, Digital	HAØHO	251,600
Single Operator, 144 MHz, Mixed Mode	RA6DA	1,252,900
Single Operator, 144 MHz, Mixed Mode, Assisted	RU1AA	3,175,900
Single Operator, 432 MHz, Analog	I1NDP	198,000
Single Operator, 1296 MHz, Analog	DLØSHF (DL6LAU, op)	438,600
Single Operator, 1296 MHz, Mixed Mode	PA3FXB	107,500
Single Operator, 1296 MHz, Mixed Mode, Assisted	PY2BS	18,000
Single Operator, Multi-Band, 2.4 GHz and Up	RW1AW	256,500

Category	*Winner*	*Score*
Single Operator, 2.4 GHz	WD5AGO	39,600
Single Operator, 10 GHz	F5JWF	14,300
Single Operator, 24 GHz	DF1OI	900
Multi-operator, All-Band Mixed	HB9Q	5,724,000
Multi-operator, Multi-Band, 50-1296 MHz Analog	SP6JLW	713,900
Multi-operator, Multi-Band, 50-1296 MHz Mixed Mode	RK3WWF	934,800
Multi-operator, 144 MHz Mixed Assisted	K5QE	1,258,000
Multi-operator, 432 MHz Analog	OH2PO	213,000
Multi-operator, 1296 MHz Analog	LA2Z	41,400
Multi-operator, 1296 MHz Mixed Mode	VA7MM	160,000
Multi-operator, Multi-band, 2.4 GHz and Up	OK1KIR	36,000
Commercial Equipment Entrants		
Multi-operator, Multi-Band, 50-1296 MHz Mixed Mode	PI9CAM	1,833,500
Multi-operator, 144 MHz Mixed Mode	8J1AXA	57,800

The ARRL Contest Staff gratefully acknowledges the following amateurs who submitted their logs as checklogs: DL7APV, EA3MS, JM1WBB, PA3CWN, PJ4NX, RW3BP and UA4HAK.

Straight Key Night 2009

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

I discovered the joys of AM DXing when I was 3 years old. By the time I was 6, I had talked my older brother out of his shortwave receiver kit, wrapped wire around my bedroom walls and started listening to the world. It wasn't long before I wasn't content to just *listen*; "how can I *talk* to these places?" I trotted on down to the library, asked the librarian for books on ham radio, and soon 621.384 was a weekly haunt of mine. Clearly this ham radio business was something I wanted to do, but in 1975 one had to learn Morse code to get a license. I was scared off by the requirement, and convinced myself I would be happy to just listen in.

When I was 13, unable to contain my desire to transmit any longer, I hunkered down with a Novice license study guide borrowed from the University of Illinois club station, W9YH. A couple of students — Tom Ask, AC9L and Fred "Fubar" Kleber, K9VV, most notably — helped me tremendously. I faithfully copied "The Battle of Gettysburg, the most important battle of the Civil War" and passed my 5 WPM code test. My license came in the mail on May 20, 1982.

Now it was time for the rubber to meet the road; as a Novice in 1982, you were only permitted to use Morse code. I started tentatively, making one or two QSOs a week. That soon turned into 3 or 4 QSOs a day, all with my Radio Shack straight key. While CW started off as a curiosity and was an obstacle to me for several years, it quickly became my voice for talking to people hundreds and thousands of miles away. As part of the last generation of kids that grew up without a computer in the home, CW was pure magic, and I still feel that way today.

Nothing So Fantastic

This magic is what Straight Key Night is all about. Yes, we can communicate more efficiently with other modes, but there is nothing as pure, nothing so fantastic in its simplicity as Morse code. Clearly, others agree with those sentiments; participation in *SKN* has doubled in just ten years, from 108 entries in 1999 to 235 entries this year. Total QSOs are up as well, from 1249 to 1897 in that same decade. Even with the FCC dropping Morse code as a licensing requirement, participation in CW contests and operating events like *SKN* continues to rise. The reports of the death of CW, much like that of Mark Twain, are greatly exaggerated.

Eighteen-hundred ninety-seven contacts may not seem like many if you are a hardened, seasoned contester. Indeed, many a CW contester could make that many QSOs in a DX contest by themselves in a single weekend. Nevertheless, consider that SKN is not about the quantity of contacts, it is about the quality of the contacts completed and encouraging the art of the "rag chew," something many newcomers to the hobby may not have experienced.

Each year, participants are invited to "vote" for the most interesting QSO they either had or heard during SKN. This year we had six different calls tying for "Most Interesting QSO." Congratulations to Kelly, K7SU, John, N2BE, Ed, W7GVE, Bob, K2WI, the operators at K6KPH, and John, K4BAI, for being recognized in this category. Ninety-five operators received at least one vote for Most Interesting QSO.

Anyone who has operated a lot of CW knows that that an individual's "fist" can be as distinctive as his or her voice on phone transmissions. It takes a lot of practice and patience to send *good* CW with a hand key. In 2009, 10 different individuals were tied with nominations for "Best Fist." It is a pleasure to see Karl, N3IJR; Branan, W5ZR; Jim, K7HZ; Bob, W6BNB; Lee, WB6SSW; Ed, W7GVE; Bill, KØCDJ; Bill, K5ECI; Peter, K4BKD, and Jerry, WA6BXV, identified by their fellow participants for this honor. A total of 119 participants received at least one vote for Best Fist.

It is hard to capture the fun of SKN in a brief article. That is why it is one of the more popular items in the ARRL Contest Online Soapbox. Do not forget to tour the entries posted at **www.arrl.org/contests/soapbox**. You will find that SKN appeals to a wide range of interests and elicits the nostalgic ties to our heritage in this wonderful hobby. This once-a-year event always happens on January 1. So why not take some time between football, gatherings of family and friends, and the modern world next year and spend some time reconnecting… You will not be disappointed. QST

2009 SKN Participants

AA4LR, AA4ZS, AB3AP, AB7MP, AB8FJ, AB9NZ, ACØBU, AE3A, AE3J, AE4MZ, AE5B, AE6PX, AE6RF, AF4MY, AJ4BP, DL2KDW, HP1AC, HP1DCP, HP1IBF, JE4QGF, KØCDJ, KØCVN, KØLWV, KØODF, KØZK, K1LNL, K1NV, K1PDY, K1YA, K2CJ, K2HT, K2KEY, K2NPN, K2UY, K3BVQ, K3MD, K3NCO, K3PX, K3ROI, K3RSA, K3Y/7 (NG7Z, op), K4BAI, K4CNW, K4DXV, K4EOR, K4HGX, K4IV, K4JK, K4NVJ, K4TRH, K4ZMR, K5BZH, K5DCM, K5ICW, K5MV, K5RLA, K5SOH, K6FFY, K6KQV, K6PBQ, K6WSC, K7SU, K7TUC, K8UC, K9AYB, K9ING, K9KEU, K9PMV, K9VKY, K9WWT, K9YKL, K9ZTV, KAØI, KA2SJG, KA7T, KBØETU, KB1LZH, KB2KDV, KB5RXL, KB8M, KB8TXZ, KB9KEG, KCØEEP, KCØRSX, KC2ICA, KC2LMX, KC8WGA, KD5QHV, KD6WKY, KD8BXT, KE4RQ, KE7POV, KF4IZE, KF8ZN, KG2OR, KH6OU, KIØKM, KI5JF, KI6ZX, KK5FX, KL8DX, KN4SA, KO6YG, KT3A, KW3U, NØBGT, NØEAX, NØJL, NØSS, N2BE, N2KZ, N2UC, N3CJM, N3MVX, N3NZ, N4IQ, N4QX, N4XE, N5BF, N5BNU, N5DY, N5LH, N5LUL, N5NT, N5VWN, N6NAX, N7TOD, N8GM, N8GU, N8KC, N8QE, N8XMS, N9AKF, N9NM, ND6S, NF8M, NG2T, NJ3K, NMØL, NNØB NN7A, NP3CW, NQ4Q, OH3WD, ON6ZJ, VA3RKM, VE7BGP, VE7NI, VO1NA, WØAAA, WØESE, WØFBI/7, WØIS, WØKU, WØNOV, W1DUW, W1IVB, W1OH, W1PID, W1RO, W1TPB, W1TS, W1WIU, W2LG, W2LID, W2OBJ, W3CEI, W3EQ, W3GK, W4CYF, W4RK, W4STX, W4UR, W4VAB, W4YD, W4YE, W4YOK, W5AKU, W5ESE, W5IA, W5QLF, W5XW, W6LX, W6TUR, W6VNR, W7GVE, W7LNG, W8FDV, W8IQ, W9ILF, WAØVQY, WA1ABI, WA1CFX, WA2BSW, WA2JSG, WA2QQF, WA4ONV, WA5AU, WA5MUF, WA6BXV, WA7GSN, WA7OET, WA7YAZ, WA8OKR, WA8TOX, WA9CFK, WA9QWX, WA9ZBW, WA9ZJI, WBØB, WB2LEB, WB2LHP, WB2MIC, WB2Y, WB3CQD, WB5NMZ, WB6CGJ, WB6IYM, WB6SCA, WB6SSW, WB7O, WB8LZG, WB8SJE, WB9CIS, WB9DLC, WB9HFK, WB9MII, WD5FOI, WD8NHA, WD8RIF, WF5W, WI6I, WR9H, WW3QB, WW6D, K2WY, K6KPH, N3IJR, W5ZR, K7HZ, W6BNB, WB6SSW, K5ECI, K4BKD

Armed with a refurbished Atwater Kent speaker for ambience, Tom Hart, AD1B of Dedham, Massachusetts used his trusty J. H. Bunnell flameproof key with 20 W on 80 meters in the 2009 SKN.

AT THE FOUNDATION

A New Way to Fund an ARRL Foundation Scholarship!

Founded in 1973, the ARRL Foundation awards grants and scholarships annually with a combined total of nearly $60,000. These awards are carefully designed to promote Amateur Radio — either in the classroom for young amateurs seeking higher education or to Amateur Radio groups that license and promote Amateur Radio programs in their communities. Funding for these activities comes from generous individuals and clubs that share the Foundation's dedication to the Amateur Radio Service.

New scholarships are added each year and another new award will be made in 2009 from the Ray, NØRP and Katie, WØKTE Pautz Scholarship. This $1000 award will come from earnings on the scholarship fund established by the generosity of Ray and Katie. The Pautz's were motivated by the charitable giving provision of the recent Pension Protection Act, allowing them to make contributions of up to $100,000 from their IRA directly to the ARRL Foundation. Their gifts now endow the scholarship that bears their name.

The same Pension Protection Act charitable giving provision for donors aged 70½ or older is still in effect through December 31, 2009. It provides donors with an opportunity to support the ARRL Foundation by providing vital funding for scholarships or Amateur Radio grants — and perhaps reap some tax benefit as well.

The ARRL Foundation is funding the future of Amateur Radio. And you can be part of that process. The grant and scholarship awards are 100% funded by contributions, and there is no better organization to benefit from the generous spirit of Amateur Radio individuals or clubs.

For more information about how you can support the ARRL Foundation programs — and how they can benefit you — contact the ARRL Foundation at 225 Main St, Newington, CT 06111. We'd love to hear from you! QST

Mary M. Hobart, K1MMH ♦ Secretary, ARRL Foundation Inc ♦ mhobart@arrl.org

SPECIAL EVENTS

Contact these stations and help commemorate history. Many provide a special QSL card or certificate!

Mar 14, 1600Z-2000Z, New London, TX. Hospital Emergency Radio Operators, N5TMF. 72nd Anniversary of the opening of Trinity Mother Frances Hospital. 7.270. Certificate. Ed Sagen, New London, TMF Anniversary, 365 West Twin Creeks Trl, Troup, TX 75789. **sagene@tmfhs.org**

Mar 14-Mar 15, 1400Z-2300Z, Robbinsville, NJ. Delaware Valley Radio Association, W2R. Robbinsville, New Jersey, 150 Year Anniversary. 14.270 7.200. QSL. Michael Moreken, 55 Sharon Rd, Apt E-22, Robbinsville, NJ 08691. **www.qrz.com/ab2io**

Mar 22, 1400Z-2000Z, Pasadena, CA. Pasadena Radio Club, W6KA. The First Pasadena Marathon. 28.400 14.200 7.250 3.900. QSL. Peter Fogg, KA6RJF, 1302 N Mar Vista Ave, Pasadena, CA 91104. **www.qsl.net/w6ka**

Apr 4, 0000Z-2359Z, Tulsa, OK. Tulsa Health Department Amateur Radio Club, K5THD. Celebrating World Health Organizations World Health Day 2009. 14.288 7.273 SSTV 14.230 PSK 14.070. Certificate. Dave Cox, Tulsa Health Department, 5051 S 129 E Ave, Tulsa, OK 74134. **www.tulsa-health.org/k5thd**

Apr 4, 1200Z-2200Z, Folkston, GA. Camden County Amateur Radio Society, KB4CC. Annual Folkston Georgia Railwatch Day Commemorative Event Station. 21.350 14.280 14.050 7.045. QSL. CCARS — Railwatch SES, PO Box 1244, Kingsland, GA 31548. *Additional frequencies and info* **www.ccars.org/events9.htm**

Apr 4, 1600Z-2359Z, San Diego, CA. USS *Midway* (CV 41) Museum Radio Room, NI6IW. Commemorating the establishment of Navy grade of Chief Petty Officer in 1893, and the decommissioning of USS *Midway* in 1992. SSB 14.320 7.250 CW 14.060 7.055 PSK-31 7.070-7.080 RTTY 14.080 7.080 2m/70cm SOCAL rep WIN. QSL. USS *Midway* (CV 41) Museum Radio Room, 910 Harbor Dr, San Diego, CA 92101. **af6ha@yahoo.com**

Apr 4, 1700Z-2100Z, Saint Joseph, MO. Missouri Valley Amateur Radio Club, WØP. Start of the Pony Express. 28.400 14.250 7.250 3.900. Certificate. Brad Cawley, 6013 N 22nd Street Ter, Saint Joseph, MO 64505. **w0nh@w0nh.com** *or* **www.w0nh.com**

Apr 4-Apr 5, 0000Z-2100Z, Flourtown, PA. Mount Saint Joseph Academy Area Amateurs, W1L. 150th Anniversary of Mount Saint Joseph Academy and the 10th Anniversary of the Robotics Team — The Firebirds. 446.000 14.250 7.250 3.850 PSK SSTV on 20 m. Certificate. Chris Brady, N3CB, 5 Yale Rd, Plymouth Meeting, PA 19462. **www.msjacad.org**

Apr 4-Apr 12, 0000Z-2359Z, Marietta, OH. Marietta Amateur Radio Club, W8HH. Commemorating the First Permanent Settlement in the Northwest Territory, April 7, 1788. SSB 28.405 21.325 14.250 7.240 3.840 CW 40 up from band edge. Certificate. MARC, PO Box 393, Marietta, OH 45750. *No QSL required.* **mathenyr@marietta.edu**

Apr 10-Apr 11, 1330Z-2100Z, Indian Orchard, MA. Titanic Historical Society, W1MGY. 97th Anniversary of the Titanic voyage. 14.260 14.033 7.260 7.033. QSL. Titanic Historical Society QSL, PO Box 51053, 208 Main St, Indian Orchard, MA 01151-0053. **www.hcra.org/titanic.htm**

Apr 11-Apr 12, 1500Z-0300Z, Green River, WY. Sweetwater Amateur Radio Club, WY7U. Commemorating explorer John Wesley Powell and the Colorado River. 14.280 7.265 3.920. QSL. Sweetwater Amateur Radio Club, 1000 South Dakota, Green River, WY 82935. **karprod@wyoming.com** *or* **www.wy7u.org**

Apr 16-Apr 18, 0600Z-0600Z, Bellevue, NE. Bellevue Amateur Radio Club, WØWYV. 50th Anniversary of the club. 7.035 PSK 14.247 7.030 CW 3.850 50.125 147.390 Gen portion of bands. QSL. BARC, 7518 Chandler Hills Dr, Bellevue, NE 68147-2108. **bellevuearc.org**

Apr 17-Apr 19, 1300Z-1900Z, Venice, FL. Tamiami Amateur Radio Club, K4S. Venice Sharks Tooth Festival. 21.313 18.153 14.236. QSL. Jack Sproat, W4JS, 1419 E Manasota Beach Rd, Englewood, FL 34223-6341. **tamiamiarc.org**

Apr 18, 1100Z-2359Z, Middle Island, NY. Great South Bay Amateur Radio Club, W2GSB/BSA. Suffolk County Boy Scout Communication Camporee. 14.260 7.260 3.895 14.070 PSK. QSL. W2GSB/BSA, PO Box 1356, West Babylon, NY 11704. **www.gsbarc.org**

Apr 18, 1500Z-2000Z, Texas City, TX. Tidelands Amateur Radio Society, K5BS. 62nd Anniversary of the April 1947 Texas City Disaster. 14.250. QSL. Tidelands ARS, PO Box 73, Texas City, TX 77592. **www.tidelands.org**

Apr 18, 1500Z-2100Z, Westbury, NY. Great South Bay Amateur Radio Club, W2GSB. Radio Day Long Island Wireless Reliving Radio History. 14.275 7.275 3.850 28.230. QSL. W2GSB/Radio Day, PO Box 1356, West Babylon, NY 11704. **www.gsbarc.org**

Apr 18, 1700Z-2300Z, Porterville, CA. Tulare County ARES, W6J. 48th Annual Jackass Mail Run from Porterville to Springville. 146.880 21.310 14.290 7.190. Certificate. Hal Clover, Tulare County ARES, PO Box 121, Porterville, CA 93258. **www.tcares.us**

Apr 21-Apr 25, 1800Z-2300Z, Ft Davis, TX. Texas Star Party Amateur Radio Club, W5TSP. Texas Star Party. 18.150 14.250 14.230 7.250. QSL. W5TSP, PO Box 559, Greenwood, TX 76246. **www.texasstarparty.org**

Apr 24-Apr 25, 1200Z-0000Z, Springfield, IL. Sangamon Valley Radio Club, N9L. Boy Scouts of America Lincoln Trail Hike. SSB 14.225 7.225 CW 14.030 7.030. QSL. SVRC c/o American Red Cross, Illinois Capital Area Chapter, 1045 Outer Park Dr, Springfield, IL 62704-4408. **www.svrc.org**

Apr 24-Apr 26, 0700Z-2300Z, Barry, IL. Hannibal Amateur Radio Club, K9P. 2008 USPSA Handgun Nationals PASA-Park. 14.265 7.265. QSL. Hannibal Amateur Radio Club, PO Box 1522, Hannibal, MO 63401. **www.w0kem.com**

Apr 25, 1300Z-2100Z, St Petersburg, FL. Southwest Florida Mic And Key, W4W. Fort Desoto History Month. 14.225 7.175. QSL. WE4N, 23068 Hillsdale Ave, Port Charlotte, FL 33954. **home.comcast.net/~we4n**

Apr 25, 1500Z-2100Z, Carthage, TX. Panola County Amateur Radio Club, WA5PC. Transmitting from the only international boundary marker within USA. 14.260 7.260 3.925. Certificate. WA5PC, 380 CR1241, Gary, TX 75643. **www.wa5pc.org**

Apr 25, 1600Z-2300Z, Petaluma, CA. Sonoma County ACS and SMRS, K6P. Butter & Egg Day Parade, honoring Petaluma as egg capital of the world. 146.91 14.260 7.260 7.050. QSL. Matt Ilonummi, KE6LPO, PO Box 2922, Petaluma, CA 94953-2922. **repairguy.net/ACS/index.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/contests/spevform.html**. 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 publication date; a special event listing for **Jun** *QST* would have to be received by **Apr 1**. In addition to being listed in *QST*, your event will be listed on the *ARRLWeb* Special Event page. Note: All received events are acknowledged. If you do not receive an acknowledgment within a few days, please contact us.

Special Events listed in this issue include current events received through February 12. You can view all received Special Events at **www.arrl.org/contests/spev.html**. 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 December 1, 2008 to January 31, 2009.

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/awards/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

1667	KD4MZM
1668	WBØYEA
1669	W7JY
1670	K8IJ
1671	N2LID
1672	N1SV
1673	W2AC/WB2ABK
1674	WAØGUD
1675	W2UDT
K9QVB	225
K9AAA	275
K3FN	350
W8PAT	350
WA9PWP	450
N4JJ	525
KT1J	550
AF2K	575
W5OZI	1100

144 MHz
100

691	K4QXX
692	ZS2GK
693	W3TWX
W8PAT	300

222 MHz
50

W8PAT	80

432 MHz
50

W8PAT	70

1296 MHz
25

152	W4HY
W8PAT	30

Satellite
100

K8YSE	200

QST

Maty Weinberg, KB1EIB ♦ Special Events ♦ events@arrl.org

W3UR

HOW'S DX?

Midway Islands

Sand Island and Eastern Island are the two main islands that make up the Midway Islands. The islands are located about 2100 km (1300 miles) WNW of Honolulu at 28° 13' N and 177° 26' W. The islands are not incorporated in the state of Hawaii and measure 5 square km (2 sq mi).

Some History

On July 8, 1859 American Captain N. C. Brooks discovered the Middlebrook Islands, later called Brooks Islands. Brooks claimed the islands for the US under the Guano Islands Act of 1856. Captain William Reynolds took formal possession of the islands on August 28, 1867 and changed the name to the Midway Islands. The islands were then annexed in 1869 by then Secretary of State William Seward. A year later Congress appropriated $50,000 for the construction of a ship channel into the lagoon so it could be used as a safe harbor for ships crossing the Pacific. The Commercial Pacific Cable Company set up a cable station used to link San Francisco, Honolulu, Midway, Guam and the Philippines. During the 1930s and '40s Midway was used as a refueling spot by Pan American Airways flights. The Battle of Midway took place in June of 1942 and was a key turning point of WWII in the Pacific. Midway was also used as a support location during the Korean and Vietnam wars. In 1988 Midway became an "overlay refuge" to the Unites States Fish and Wildlife Service (FWS) while still under the US Navy. The Naval Air Facility closed in 1993.

DXCC History

The December 1938 issue of *QST* (page 27) reported the American Radio Relay League requested special prefixes to "be used in amateur calls in regions outside of the United States, to distinguish one region from another." The Federal Communications Commission agreed and assigned the prefix KD6 to the Midway Islands. One of the first calls issued was Hal Reid, KD6QHX, who was working for Pan American Airways. Midway was on the original DXCC list on November 15, 1945. Midway was key to the addition of KH7K — Kure Island. In the April 1960 issue of QST (page 80), a new rule was added to the DXCC criteria. The rule stated: **"***3. Where foreign territory divides a country, there will be a minimum distance of 75 miles of foreign land separating the two areas or places in question. In the case of island groups this distance requirement does not apply.***"** Kure Island was part of the Hawaiian Islands, separated from them by Midway Island. The discovery was noted and Kure Island was added to the DXCC list in May 1961, although the effective date was made retroactive to November 15, 1945.

Over the years multiple operations have taken place from Midway Island. Sometime after WW II the prefix for Midway changed to KM6, which lasted until 1981 when the prefix changed to AH4, KH4, NH4 and WH4. Probably the biggest DXpedition to Midway in recent years was that of K4M in 1997, which was the establishment of the Midway-Kure DX Foundation.

USFWS Reopens Midway for Amateur Radio Use

On January 26, 2009 the FWS announced in a press release the opening of the island to an Amateur Radio opportunity. The FWS had shut down Amateur Radio access to Kure Island back in 2002, although there were at least two small scale operations that took place by single operators who were on work assignments during the following 2 years. Bill, KH4/NH6D, was there in mid-February 2003 and Jeff, KA1GJ/KH4, was there in April 2004. Both count for DXCC.

NASA

Aerial view of Midway Atoll.

The FWS stated that "In January 2008, a regularly scheduled visitor program began offering limited opportunities for people to experience Midway's wildlife, history and culture, as well as for some specific nonwildlife-dependent recreational activities, such as Amateur Radio use." The FWS is allowing only a 2 week window for Amateur Radio operations from October 5-19, 2009. This announcement was made on the ARRL Web site (**http://tinyurl.com/bomyaw**) on January 27 and the maximum number of participants was picked by the National Wildlife Refuge [the branch of the FWS that administers Midway — *Ed.*] shortly afterward.

"Radio operation will be allowed only within a designated area on the north side of Sand Island and the use of portable generators will not be permitted," said Matt D. Brown, Midway Atoll Refuge Manager. "Although determined to be a wildlife-compatible activity, this opportunity is being conducted on a trial basis. The Refuge Manager retains the authority to discontinue this activity, at any time, based on wildlife protection and conservation goals." The selection was made on a "first come first serve" basis.

As of press time full details of the Amateur Radio DXpedition to Midway in October 2009 are not available. I am told that there will be two seasoned DXpeditioners from Europe and the rest are Americans. Watch your favorite DX bulletin and this column for future updates.

Time to Start Thinking about Dumping Your IRCs

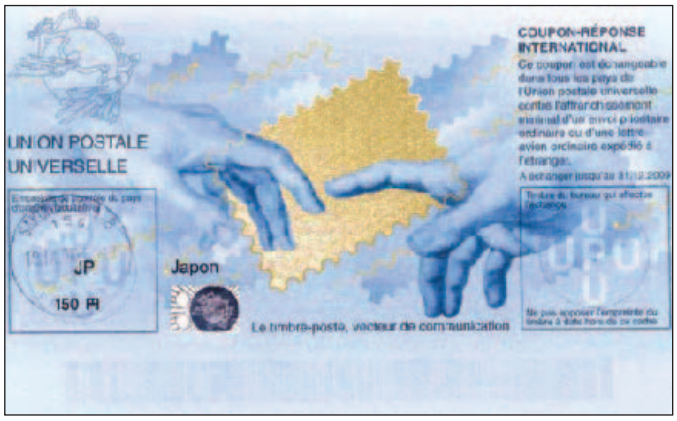
DXers and QSL Managers alike need to be aware that the "Beijing model No 2" International Reply Coupons (IRC) with the Michelangelo "two fingers about to touch, framed in a postage stamp" must be exchanged for postage by December 31, 2009. DXers need to use them up as soon as possible in order to allow QSL managers ample time to turn them in by the end of this year. I would suggest the DXers not use the Beijing model No 2 IRC after September and that QSL managers will want to turn them into their post offices by early December. As of press time the new IRCs are not available but probably will be this summer. Don't get caught (in this Ponzi scheme) with a bunch of worthless IRCs!

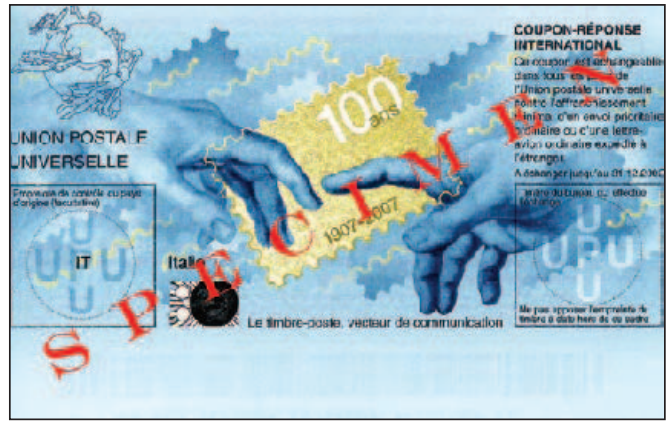
DX NEWS FROM AROUND THE GLOBE

4K — AZERBAIJAN

Axel, DL6KVA, will once again be

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





These are the current Beijing model No 2 International Reply Coupons (IRC) with the Michelangelo "two fingers about to touch, framed in a postage stamp." The one on the left is the original and the one of the right is the UPU's 100th anniversary issue. Both are good through December 31, 2009.

active as 4KØCW from Vlad's, 4K9W, QTH from March 19-25. Listen for him on CW on all bands. He'll be running 100 W and an 84 meter long wire. Axel plans to be on-the-air (QRV) in the Russian DX Contest as a single-op on CW.

5X — UGANDA

5X1NH will be back on the air March 11 "for a couple months volunteer work in Fort Portal," as Nick, G3RWF, goes back to Uganda. This is in the west near the Congo border. Nick says he will arrive in time for Commonwealth Contest/BERU (**http://uk.geocities.com/beru2004@btinternet.com**). From previous operations, Nick has 20,000 contacts (QSOs) in the log and may do some digital modes this time, though he says he's not very good at it. And he will try to make improvements to his low band antennas. QSL via G3RWF.

C6 — BAHAMAS

Joe, W8GEX, reports he's going back to the Caribbean, this time to the island of Eluethera in the Bahamas. The trip will take place April 17-24. The four person team will be AA4NN, N4AA, W8CAA and W8GEX. They will operate all bands CW, SSB and RTTY. The group will sign C6DX.

C9 — MOZAMBIQUE

The Texas DX Society is setting up an expedition to Mozambique for March 25-April 5. On the trip will be WF5W, KG5U, W5MJ, N4AL, K5WAF and W5PF. They plan to be on 160-10 meters CW, SSB and RTTY with three stations and two amplifiers. For skyhooks they'll have log periodics on 20-10 and verticals for lower bands. And they'll jump into the CQWW WPX Phone Contest. The call signs are still unknown but the QSL manager will be W5PF. The log will be put on LoTW afterward. See **www.tdxs.net/c91.html.**

C91FC will be in Mozambique April 9-13. The operators will be ON4AEO, ON4CJK, ON7BK, ZR6APT, ZS6ACT, ZS6AYC and ZS6GC. C91FC will be on all HF bands, SSB, RTTY and possibly CW. QSL via ON4JK direct or bureau. The Web site: **www.filipstattooshop.be/Mozambique/index.html**.

DU — PHILIPPINES

Max, MØGHQ, says his DU9 reciprocal license has arrived via registered post, so his March-April, 2009 Philippines trip is on. He expects to be QRV from Cebu, OC-129, Samal Island and his QTH in Mindanao for about a month. He will be running 100 W on 160-6 meters.

E5 — SOUTH COOK ISLANDS

Lance Collister, W7GJ, is putting together an expedition to E51, formerly ZK1, the South Cook Islands, with some concentration on 6 meters and EME. Lance says, "Mark your calendars for March 26 to April 4!" Lance has the call sign E51SIX. Also part of the operation will be Bob Sutton, ZL1RS, who will meet with Lance in Rarotonga. On 6 meters, look for them on 50.190. This will be grid BG08dr. They do not expect to have an Internet connection but hope to get to an Internet cafe, in town to give their exact QRV plans or if they are having gear or weather problems. Lance says to watch the ON4KST 6 meter and JT65 chat pages or watch 50.190 at their South Cooks moonrise. E51SIX will always transmit during the first sequence, using JT65A mode. See **www.bigskyspaces.com/w7gj/E51SIX.htm**. QSL direct to W7GJ with self-addressed stamped envelope from the USA or $1 USD from other countries to cover postage. His address is: E51SIX/W7GJ, Lance Collister, PO Box 73, Frenchtown, MT 59834-9973.

J3 — GRENADA

Look for Colin, G3VCQ, and Sharon, M3VCQ, to be QRV as J38CW and J38/M3VCQ from Grenada from March 12-26. This will be a holiday style operation with activity expected on 3.5 through 28 MHz on CW, SSB and possibly RTTY and PSK. Colin's main purpose is the Commonwealth Contest/BERU on March 14 and 15. Sharon will be on SSB only. QSL via G3VCQ.

TI — COSTA RICA

DK6AO, TI7WGI and DH8WR/EA2CRX are planning an IOTA DXpedition to San Jose Island (NA-191), Costa Rica from April 17-20. They are still looking for one to two CW ops. They have a Web page at **www.ti7.info**.

VK9L — LORD HOWE ISLAND

Bill, VK4FW, updates us on the March VK9LA — Lord Howe Island DXpedition team, which is ready to begin activity. Team members include IZ3ESV, K5YY, N2OO, N2OZ, SQ8X, SQ9DIE, SV2KBS, VK1TX, VK3HJ, VK3QB, VK4IO, VK4VCH, VK5CP, VK5PO, W5SL and VK4FW. Bill will depart for Lord Howe on March 22 and will instantly start unpacking. On the 23rd four more team members will arrive and the rest on the 24th. Plans are to amass seven complete HF stations in two locations, including a 6 meter station. VK9LA will be QRV on CW, SSB and RTTY. They will have monoband Yagis and verticals with the ability to have two stations on at the same time simultaneously. The team is still working on their list of suggested transmit frequencies to optimize activity. "With the rising fuel prices and the international economy crashing around us we have been able to secure a vessel to freight all of our equipment in," says Bill. They are still trying to get more support to cover this cost and ask for support at their Web site **www.odxg.org/vk9la.htm**. Plans are in the works for an online QSLing system for DXers who work the DXpedition, to request QSLs thereby cutting postage costs for those interested. QSLs are expected quickly from their printer, UX5UO. QSL via VK4FW who will be handing the QSLing chores.

YJ — VANUATU

Andrew Munson, VK4HAM, has announced plans to a DXpedition to Efate Island (NA-035), Vanuatu. He'll be operating as YJØAAC from March 25-April 1, 2009, including the CQWW WPX SSB Contest. Andrew will be QRV on 3.5 to 28 MHz. QSL via VK4HAM.

ZS — SOUTH AFRICA

Eight South African amateurs will be operating ZT2V in the CQ World Wide SSB WPX Contest, March 29-30. This will be one of the rare times the ZT prefix has been used and the first time South Africa's East Cape Province (ZS2) has had a team operation entry in a major contest. The multi-two operation will take place from the Port Elizabeth region at the QTH of ZS2DL, Donovan, who serves as team leader. Other experienced contest participants include Barry, ZS2EZ; Mitch, ZS2DK; Thiaan, ZS2Y, and Andre, ZS2ACP. Henning, ZS2HK, and Glen, ZS2GV, will be making their major contest debuts. One other operator, not yet selected, will round out the team. The two stations will consist of an FT-2000 and a Quadra amplifier into a SteppIR beam and an FT-1000MP MK-V and an Ameritron amplifier into a HyGain TH5. An antenna for 40 and 80 meters will also be used. While the group is hoping to score well, the primary goal is to put Port Elizabeth on the map and give the prefix hunters a rare one. The QSL route for ZT2V will be via Buzz, NI5DX. QST

W3ZZ

THE WORLD ABOVE 50 MHz

The FFMA and the Rarest 6 Meter Grids

The legendary Fred Fish, W5FF (SK), and his wife, Lee, K5FF, were for decades among the best known VHF operators in the world. Among his many achievements, including the second 6 meter DXCC (Lee's was the first), was one that has never been equaled by anyone else: working and confirming each of the 488 grids in the contiguous 48 United States. In July 2007 his fellow New Mexican, Bill VanAlstyne, W5WVO, suggested establishing the Fred Fish Memorial Award — FFMA (the first presented posthumously to Fred Fish as described in the February 2009 column). This would both honor Fred's singular achievement and provide a finite goal to encourage 6 meter grid chasing. The award would have to be something very difficult to achieve over a lifetime of operating, like the DXCC Honor Roll. Just as with DXCC entities, many grid squares in the US are quite rare, some workable only when activated by a portable expedition. Further background appears in an article by W5WVO in *CQVHF* (**www.cq-vhf.com/FredFishSpr08.html**).

The FFMA has progressed rapidly since that time under the leadership of Bill, Sean, KX9X; Kevin, W9GKA; Paul, K7CW, and the formation of an online Yahoo! Group. They wisely began with a survey to determine the most needed US grids and how close some of the leading 6 meter operators were to achieving FFMA #2. The response was very positive and a number of maps were created from these results showing where the most-needed grid squares were. In this respect the map resembles the most wanted squares information collected annually for Europe. This column is based on information provided by Bill, W5WVO, edited by Kevin, W9GKA.

The Leaders

So who's close? The FFMA Yahoo! Group maintains a Leader Board tracking progress of the top grid chasers up to 488. The current totals appear in Table 1. Note that a few 6 meter operators are very close! To view the complete leader spreadsheet, including which grids the leaders still need, join the FFMA Yahoo! Group at **groups.yahoo.com/group/FFMA**.

The Rarest Grids

Referring to Figure 1, the primary observation is that the vast majority of rare grids are in the West, where the population density is the lowest. The next observation is that there are quite a few rare grids along the US boundaries with Mexico and Canada, as well as along parts of the Pacific, Atlantic and Gulf seaboards. These red and orange grids are prime candidates for dedicated Grid DXpeditions.

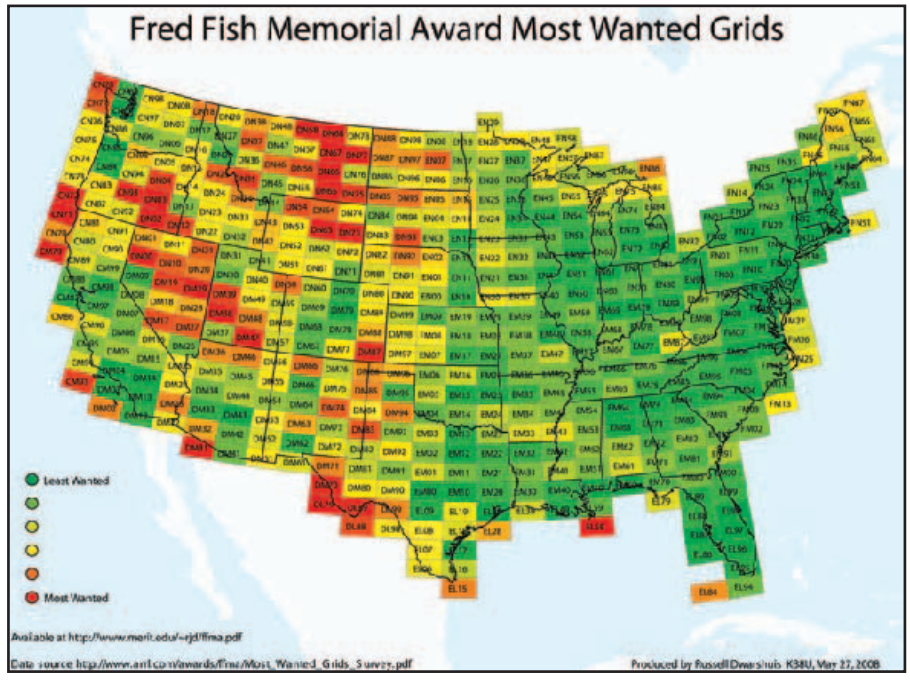


Figure 1 — The most wanted to most worked grids on 6 meters in the contiguous, continental 48 United States based on a survey conducted by W5WVO, KX9X, W9GKA and K7CW. This figure, created by Russ, KB8U, uses a continuous gradient of color to show the most wanted (red) to the most worked (green) grids.

The top 20 most wanted grid squares as judged by the survey of active 6 meter stations noted previously are found in Table 2. Each contains a note indicating your editor's best estimate of the reason(s) for their rarity. As might be guessed, low population and/or lack of resident 6 meter activity is a primary reason for each one. There are other reasons, as noted in the table, that add to the rarity of some.

This Month

*April 5	Excellent EME conditions
April 6	144 MHz Spring Sprint
April 14	222 MHz Spring Sprint
April 22	432 MHz Spring Sprint

*Moon data from W5LUU

Contests and Grid DXpeditions

Historically, and even to this day, rare grid squares have been activated on 6 meters mostly during the two major contests during the summer sporadic-E season, when there is the most activity on this band: the ARRL VHF QSO Party in June and the CQ World Wide VHF Contest in July. When seen from the point of view of the grid-chaser (as opposed to the contester), there are some problems with combining the two activities.

First, there has always been a divide between the contesting mindset and the grid-chasing mindset. For contesters, there is a well-defined goal, an "end," which leads to competition, excitement and intense effort. Grid-chasers, on the other hand, were (up until now) simply trying to work new grids. Since VUCC is an open-ended program, there was no competition because there was no finite, identifiable goal. Second, due to the contest's short duration (less than 2 full days), the contest period may exhibit no widespread

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Table 1

FFMA Leader Board

Call	State	Grid	US Grids	Status	Update	Call	State	Grid	US Grids	Status	Update
W5FF	NM	DM64	488	FFMA #1	19-Jun-95	W4UDH	MS	EM52	448	40	Aug-08
K5UR	AR	EM35	485	3	Jun-08	KB6NAN	CA	CM87	448	40	Sep-08
WD5K	TX	EM12	483	5	Sep-08	K7MCX	WA	CN87	446	42	Aug-08
W5OZI	TX	EM00	481	7	Jul-08	K7CW	WA	CN87	427	61	Sep-08
KMØA	MO	EM48	480	8	Jun-08	K7WIA	WA	CN87	426	62	Aug-08
W9RPM	WI	EN43	474	14	Nov-08	W5WVO	NM	DM65	421	67	Nov-08
NØLL	KS	EM09	472	16	Aug-08	WØJRP	MO	EM27	415	73	Aug-08
K1TOL	ME	FN44	467	21	May-08	W4DR	VA	FM17	414	74	Aug-08
WØFY	MO	EM48	463	25	Jun-08	W3EP	CT	FN31	401	87	Sep-08
AA7A	AZ	DM43	459	29	May-08						

The FFMA leader board updated as indicated. Status indicates how many grids are needed to achieve the FFMA.

band openings from a given grid square. Third, a key rule regarding counting grid squares differs significantly between contests and VUCC/FFMA. In both the ARRL and CQ contests, an entrant can claim presence in only one grid square at a time. In the VUCC/FFMA program, a station can be located precisely on the boundary of two contiguous grid squares or at the corner of four contiguous grid squares and claim to be operating from both or all of them simultaneously. This rule discrepancy complicates operating a grid DXpedition during a contest weekend. By contest rule, you can only give out one grid square as part of your contest exchange. Explaining that the QSO also counts for three other grids for VUCC and FFMA, but not for the contest, ends up confusing a lot of people and wasting precious contest time.

A good solution to this problem is to plan contest Grid DXpeditions to operate for several days both before and after the contest period, when all simultaneous grids can be given out on the air. This will give more people a chance to work the expedition and will publicize the fact that they are activating multiple grid squares simultaneously, even though only one grid counts during the contest period.

Boundary and Corner Grid DXpeditions, Past and Future

With the advent of the FFMA, talk began about activating rare grid squares, and a few hardy souls actually went into the field and did it during the summer and autumn of 2008! Though most of these initial Grid DXpeditions were short-term (1 or 2 days) single-grid mobile-portable operations, one was run as a full blown four-grid corner expedition. This expedition to the corner of grids FN45-44-35-34 (in extreme northeast Vermont) was mounted by Henry, KT1J; Bob, WE1P; Ed, WX2R, and Randy, KA1LEX, during the CQ WW VHF Contest in July using Bob's call. While they signed only FN45 during the contest, anyone who worked WE1P during the 2008 CQ WW VHF Contest can get credit for all four grid squares for VUCC/FFMA. In 2009 this group plans to activate six of the rarest grid squares in the northeastern US, all at least partially in Maine. Before, during and after the June ARRL VHF QSO Party, they will be at FN56/57/66/67. A month later — before, during and after the CQ WW VHF Contest — they will move 1° latitude to the south, activating FN55/56/65/66. As before, even when giving a single grid square for the contest, all four will appear — and count for VUCC/FFMA — on their QSL cards.

A two-grid-square border mobile/portable activation was put on the air by Jim, KS7S, one of the Super 7s Meteor Scatter Group, in November 2008. His gorgeous homebrew QSL shows the GPS reading of his location at exactly 39° 00' 00" N latitude. This GPS photo is a requirement of the VUCC/FFMA rules when claiming to operate from a 2-grid boundary or a 4-grid corner. Because early November normally has no sporadic E, all of Jim's Qs were made via meteor scatter (MS) using the WSJT digital mode FSK441. MS allows Qs to be made over a 300-1300 mile range any day of the year with even shorter paths possible on MS backscatter. The FFMA group strongly encourages all hams interested in FFMA to get set up for WSJT/MS. The Super 7s Meteor Scatter Group is planning more 6 meter western US grid square expeditions for later this year.

Table 2

Top 20 Rarest Grids

Based on the W5WVO+ survey with the characteristics of each grid noted.

Rank	Grid	State	Notes
1	DN67	MT	1, 5, (3)
2	CN71	CA	1, 2, 5
3	DN02	OR	1
4	DN66	MT	1, 5
5	DL79	TX	1, 3, 6, 7
6	DN63	WY	1
7	CM79	CA	1, 2, 3, 5, 7
8	DN03	OR	1
9	EL58	LA	1, 2, 4, 7
10	DN58	MT	1
11	CN72	OR	1, 2, 5
12	DM38	UT	1, 5
13	DM47	UT	1, 5, 6
14	DN65	MT	1, 5
15	DN68	MT	1, 5
16	DM29	NV	1, 5
17	DM31	AZ	1, 3, 6
18	DM70	TX	1
19	DN00	NV	1, 5, 6
20	DN77	MT	1, 5

[1]Sparsely populated and/or no 6 meter activity.
[2]Coastal/small land area.
[3]Difficult to reach by land.
[4]Sea access only.
[5]Mountainous.
[6]Very hot in summer.
[7]Other dangers (smuggling, drugs, weather).

COURTESY BILL VAN ALSTYNE, W5WVO

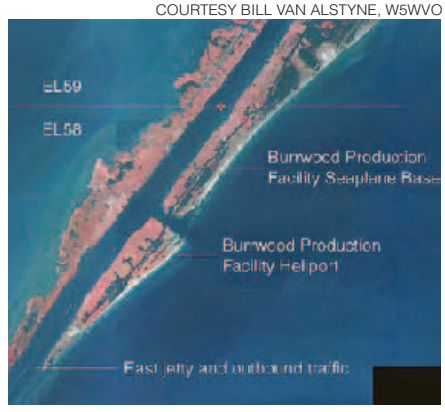


Figure 2 — EL58 at the southernmost tip of the Mississippi delta. Water access only. Fire up your boat or your seaplane!

The Big One: EL58

Wherever grid-chasers congregate, the subject of EL58 usually comes up sooner or later. This is the southernmost tip of the Mississippi River delta (Figure 2). No roads come within 20 miles of it; the only way in or out is by boat or pontoon-equipped aircraft. A few real old-timers worked this grid square back in the 1980s when it was last seriously activated from land and a few others have worked the occasional ham-equipped freighter plying its waters. For the most part, though, this remains a grid that most of the top FFMA grid hunters still need.

While activating EL58 might not look all that challenging, there are some serious obstacles. You have to consider permission; access; potential bad weather; logistics like power, fuel, food, water and waste; and emergency contingency planning. The point is, an expedition to EL58 differs little from a DXpedition to an isolated island in the middle of an ocean somewhere. Think Bouvet with heat instead of ice! It will require the same level of patience, attention to detail and yes, money. While it is probably too late for 2009, plans are already underway to activate EL58 in the summer of 2010.

Other Truly Rare Ones

CM79, The "Lost Coast" Area of Northern California

It isn't really lost, but it might as well be! No roads, no campgrounds, no trails in

or out. Mountainous wilderness populated by cougar and bear and about 1 square mile of land area. Effective operation from the beach to the east is impossible due to high cliffs. Many of us have spent hours and hours talking about CM79. Its been activated in the past, but never on 6 meters with adequate antennas and power and duration of stay. The geographic validity of at least one of the past claimed activations has even been called into question.

Feel like a real backpacker with nonpareil organizational skills? Or have an ocean-going motor yacht big enough to sit at anchor a mile or two offshore without giving everyone onboard the heaves? This grid square might have your name on it!

DL88, the Southernmost Point in Big Bend National Park, Texas

This probably should not be attempted any time soon — it is simply too dangerous. This very remote area along the Rio Grande's Big Bend is reportedly frequented both by illegal smugglers and by drug gangs. As there is a virtual civil war raging between rival drug cartels along the Mexican border, this is probably one we're going to have to wait for. When it does become safe enough to go there, a good deal of geographical research has already been done on DL88 and an ideal spot has been picked out that can be accessed by 4WD vehicle.

CN71, Del Norte County, Northwest California Coast

There are other rare ones in remote, difficult-to-access places like DL88, but amazingly, some of the most-needed grid squares are easy to get to and set up in. One of the most-needed grid squares in the US, for example, is CN71 on the northwest coast of California (Figure 3). This grid includes Crescent City, a pretty good-sized town with an active ham radio club. So what's the problem? Out of 135 licensed hams in this grid square (at this writing), no one is even equipped to work the 6 meter band. A considerable amount of detective work has led us to this determination, but we'd love to be wrong! If you are a ham in CN71, be aware that you could make yourself extremely popular if you were to get on 6 meters!

Conclusion

VUCC on 6 meters is not much of a challenge unless you are running 10 W to a loop antenna on your car. For the average fixed station running 100 W to a typical small 5 element Yagi 30 or 40 feet up, 6 meter VUCC can be worked in a weekend during one of the summer contests. The whole purpose of the FFMA award is to get more people active and excited about pursuing a sky-high goal on 6 meters. The FFMA is the first really challenging high-profile award devoted exclusively to 6 meter band operation. It has now been joined by the Lewis and Clark Awards program (see "World Above 50 MHz," *QST*, February 2009, pp 92-94).

To participate, just get on the air. The 2009 summer sporadic E season is almost upon us — roughly May 15 to August 15 in most parts of the US. The 6 meter band becomes incredibly fun during the E_s season. The fact is, though, that 6 meters is arguably the only amateur band that supports, at one time or another, virtually every radio propagation mode currently known. That's why it's called the Magic Band!

ON THE BANDS

6 meters. The minor E_s season that started with a bang in late November and was moribund otherwise, ended with some fireworks on January 25-27 perhaps generated by a minor storm (k=4) and a high solar wind. Among the more unusual reports on January 24 Mick, W1JJ (FN41) worked EB1EHO (100 W to 5 el) and EA7DUD both on JT6M. Tones especially from EB1EHO were readily audible, meaning that a CW QSO was possible. Mick thinks this may be the first instance of European E_s during the Northern Hemisphere winter. Al, K7ICW (DM62), summarizes some outstanding conditions with a wide variety of propagation. Rarely heard E_s backscatter was widely evident into AZ, NM and west TX with a QTF (position) of 140 degrees. Late in the opening an unidentified XE2 in DM30 exhibited signs of FAI propagation — multi-path flutter and distortion. EL87 was worked on double hop. Stations were worked from KY to northern CA, including an unusual number of stations through all Mexican districts. Ken, AC4TO (EM70) worked his first E_s/TEP link in 2 years into PY (GG grid field) as well as southern DX: XE, TI, YN, 9Y, HK, KP4, TI, YV, P4, C6. Others like Dave, N9HF (EL99); Sam, K5SW (EM25) and Dan, K3ZXL (EM87) enjoyed the southern DX; Dave worked a TEP PY and Sam a lot of backscatter as well. Using 10 W to a vertical, Winston, CO2WF (EL83) worked into TX, OK and AZ on the 25th and 38 grids in W3, 4, 5, 8, 9 on the 26th. Roger, K6LMN/m, activated the junction of EL15/EL16 in the boot of Texas with well over 100 contacts from the southeast to AZ. Steve, N4JQQ (EM55) enjoyed working Roger as well as a variety of northern XE stations. Jon, NØJK/m (EM28) worked to the east coast and XE with 10 W to a whip. Pete, N6ZE (DM04) enjoyed hours of E_s as far east as EL39 and as close as DM30. On the 26th Lenny, W2BVH (FN20) worked into C6, XE and the Gulf Coast. Finally from the Pacific Northwest Dave, N7DB, worked first into CO, WY and later into TX, NM on January 25-26. Chuck, N6KW (CN87) worked into TX and XE on the 26th.

US ARMY CORPS OF ENGINEERS

Figure 3 — Aerial view of CN71. This grid includes Crescent City, California but no active 6 meter hams.

Tropospheric Ducting. Winter is not a good time for tropo yet. Jon, NØJK (EM18) reports that most probably a wave cyclone associated with warm foggy weather produced an opening from KS into north TX on the 3rd. Ken, AC4TO, in the FL Panhandle found tropo across the Gulf into EL19 in TX on the 23rd.

EME. The V5/KT6Q DXpedition to Namibia (HB9CRQ, ZS6WB, ZS6OB, ZS6JR, N7BHC), January 8-18, was very successful. After significant problems that damaged their 6 meter EME and 2 meter tropo arrays, they set up at Diaz Point with 280 W to 4 × 2M9SSB M^2 Yagis on 144, 160 W to 8 × 12 el M2 Yagis on 432 and 90 W to a single 59 el Yagi on 23 cm. They worked 231 initials, 47 DXCC, 230 JT65 and 1 CW on 144; 18 initials, 13 DXCC, 16 JT65 and 5 CW on 432, and 18 initials, 12 DXCC, 17 JT and 1 CW on 1296. Congratulations all! On January 30 Lance, W7GJ, reports the first contact between the Congo and the US, working TN5SN who was running 1 kW to a 10JXX 7 el Yagi 17 meters high on JT65.

HERE AND THERE

35th Annual Eastern VHF/UHF Conference. This conference sponsored by the Northeast Weak Signal Group will be held at the Crowne Plaza Hotel in Enfield, Connecticut on April 17-19. Features include the band sessions, the usual excellent technical presentations and the Trivia Quiz. Further details are available at **www.newsvhf.com/vhfconf.html**.

Thirteenth Annual SVHFS Conference. The Southeastern VHF Society sponsors this meeting at the Doubletree Hotel Charlotte Airport in Charlotte, North Carolina on April 24-25. There will be a kick-off luncheon and the winners of the VHF Design Achievement Award will be announced. More information is available at **www.svhfs.org/conf_2009.htm**.

Spring Sprints. The first three parts of the VHF/UHF Spring Sprints again sponsored by W4SHG and K9JK, in cooperation with Ham Radio Outlet (**www.hamradio.com**) are on 144, 222 and 432 MHz all from 1900-2300 local time on April 6, 14 and 22 respectively. Complete details are at **www.sysadnet.com/vhfsprintrules.htm**.

KR1P SK. It is with great sadness that I report the passing of EME pioneer Chip Brown, KR1P (ex-W1ZIG). He and Ned Conklin, K1HMU (now KH6JJ) built a huge 16 Yagi array of 2 meter Yagis after the W2NLY design in the early 1960s.

New VUAC Chairman. The ARRL has announced that Kermit Carlson, W9XA, has been named the new Chairman of the League's VHF/UHF Advisory Committee, replacing Lauren Libby, WØLD. The primary function of the ad hoc VUAC is to consider VHF+ contest issues. QST

Introducing IARU President-Elect Tim Ellam, VE6SH/G4HUA

Every five years, the International Amateur Radio Union (IARU) engages in a consultative process to nominate a President and Vice President. The consultation is initiated by the ARRL as the IARU International Secretariat and is conducted with members of the IARU Administrative Council (AC) representing the three regional organizations. The result of the process is the nomination of a single candidate for each of the two positions. The IARU Member-Societies then decide whether to ratify the nominations.

The ratification process for the five-year terms beginning on May 9, 2009 was completed on February 10. The current IARU Vice President, Tim Ellam, VE6SH/G4HUA of Calgary, Alberta, Canada was confirmed as the next IARU President, succeeding Larry Price, W4RA, who did not seek another term. Replacing Ellam as Vice President will be Ole Garpestad, LA2RR, of Vestby, Norway. Garpestad previously served as President of IARU Region 1.

Born in England, Ellam immigrated to Canada when he was 12. First licensed in 1977 at 16 as VE6CJR, Ellam entered his first Field Day later that year; this was back when Canada was part of the ARRL. "Field Day got me interested in contesting," he said. "I joined the Canadian division of the ARRL and took my advanced exam in September 1978."

That fall, Ellam began college at the University of Calgary. In summer 1979, he and another ham friend decided to hitchhike across Europe and operate from a number of different countries there. "We went to Geneva specifically to operate 4U1ITU, the Amateur Radio station at the International Telecommunication Union (ITU) Headquarters. "This was before the Internet, so we just showed up and talked our way into using the station," Ellam said. "WARC-79 was held later that year. I was actually kind of surprised how amateurs were able to influence a body like the ITU to give us frequencies, like 12, 17 and 30 meters. That got me thinking, 'Wow, this is kind of neat, that amateurs can really influence something like this.' Other than reading the odd, cryptic thing in *QST* every once in a while, I never really had an idea what kind of international politics goes on in Amateur Radio — I was just your young, typical teenage guy, more interested in operating contests and running power. My senior paper at university was on reforming the ITU — all from that trip in 1979 to the ITU and Geneva."

On the National and World Stage

In 1988, the Winter Olympics came to Calgary, and Ellam, now graduated from law school, volunteered to help out with communications. "A lot of the volunteers were amateurs, so I got plugged back into the Amateur Radio scene in Calgary," he said. "I told CRRL [Canadian Radio Relay League] Director Ken Oelke, VE6AFO, and CRRL President Tom Atkins, VE3CDM, that I wanted to get more involved with CRRL activities. So I started to help out CRRL on some legal issues, just small things — licensing problems and such. Eventually, I became First Vice President and General Counsel for CRRL in 1990."

Soon after Ellam came on board the CRRL, Atkins — who became IARU Region 2 President in 1995 — tasked Ellam with helping to merge the CRRL and the Canadian Amateur Radio Federation (CARF) into one body. In 1993, they merged into the Radio Amateurs of Canada (RAC), with Ellam serving as the new group's first First Vice President. It was in this role that Ellam first met then-IARU Secretary and ARRL International Vice President Larry Price, W4RA. Price became IARU President in 1999.

In 2001, Ellam was elected Director of IARU Region 2's Area A, which covers Canada and Bermuda. He moved up to IARU Vice President in 2004. In this position, Ellam worked with the ITU's development sector. He also chaired the IARU's 2025 Committee, a group formed by the AC to take a look at the future structure of the IARU.

IARU President-Elect Tim Ellam, VE6SH/G4HUA

The Future of the IARU

Saying that he is excited about the challenges the IARU will face in the future, Ellam said that the IARU "[has] to focus on strengthening our representation at the Regional Telecom Organizations (RTO), such as CITEL in the Americas and CEPT in Europe. These groups have a lot of influence within the ITU, and a lot of the decision making process happens at the RTO level. With some RTOs, like CITEL and CEPT, we enjoy a good relationship, but with the more regional ones, like in the Arab states and Africa, are more of a challenge."

Ellam said he also thinks that the IARU needs to become relevant to what he called the "everyday" amateur: "If you ask the average amateur about IARU, they probably have no idea what we do. They don't understand what work, and good work, we do at the RTO and ITU levels on behalf of Amateur Radio. Larry, to his credit, has worked very hard these last 10 or 15 years to make the IARU much more relevant."

Ellam believes that in the future, Amateur Radio will "face demands on its spectrum. I think Amateur Radio will still exist in 2025, but probably in a different form than we know today. I see it growing, that we will continue to develop and keep pace with new technologies. Amateur Radio will still be attractive to a certain group of society, whether those people are interested in technology or otherwise. Today, I think it is ahead of the technology curve. We are continuing to develop things. I think Amateur Radio and emergency communications will continue to be neccessary in the future and that the commercial infrastructure is still very susceptible to natural and manmade disasters. There will always be a need for an independent, self-taught body that can step up to the plate in times of emergency."

In preparing for the World Radiocommunication Conference in 2011 (WRC-11), Ellam noted that the Amateur Radio Service has the potential to receive a new allocation — 500 kHz. "IARU representatives who attend ITU preparatory meetings are very focused on this. One of our prime objectives at WRC-11 is to obtain this new frequency allocation. But our main focus will be on protecting against any encroachment to our existing spectrum." QST

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

CONVENTION AND HAMFEST CALENDAR

Abbreviations
Spr = Sponsor
TI = Talk-in frequency
Adm = Admission

Alabama (Birmingham) — May 2-3
D F H S V
Saturday 9 AM-4 PM; Sunday 9 AM-2 PM. *Spr:* Birmingham ARC. Zamora Temple, 3521 Ratliff Rd (Irondale). *TI:* 146.88, D-Star 145.41. *Adm:* advance $7, door $8. Tables: $20. John Outland, K3FP, c/o BirmingHAMfest, Box 603, Birmingham, AL 35201; **hamfest@w4cue.com**; **www.w4cue.com**.

Alabama (Headland) — Apr 25 F T V
8 AM-1 PM. *Spr:* Wiregrass ARC. Headland Town Square, 10 Park St. *TI:* 145.43. *Adm:* Free. Tables: $5. James Nelson, KE4GWW, 415 Gwaltney Dr, Dothan, AL 36303; 334-685-1642; **ke4gww@arrl.net**; **www.wb4zpi.org**.

Alabama (Mobile) — Apr 11 D F R V
8 AM-2 PM. *Spr:* Mobile ARC. Boys and Girls Club Auditorium, 6585 Carol Plantation Rd. *TI:* 146.82 (203.5 Hz). *Adm:* $5. Tables: $10. Larry Early, WB4YOR, 8495 Desert Oak Ct, Mobile, AL 36695; 251-635-2327; fax 251-639-4769; **comdoc52@comcast.net**; **w4iax.com**.

Arizona (Phoenix) — Apr 11
6 AM-noon. *Spr:* Arizona ARC. DeVry University, 2149 W Dunlap Ave. *TI:* 147.06. *Adm:* $1. Tables: $10. Gary Hamman, K7GH, 5326 E Voltaire Ave, Scottsdale, AZ 85254; 602-996-8148; **k7gh@arrl.net**; **w7io.org**.

Arizona (Sierra Vista) — May 2 T V
7 AM. *Spr:* Cochise ARA. Green Acres, 2756 Moson Rd. "Larry Warren Memorial Hamfest," ARCA meeting. *TI:* 146.76 (162.2 Hz). *Adm:* Free. Tables: $10. Dale Chidester, NJ7C, 5053 S Apache Ave, Sierra Vista, AZ 85650; 520-803-8828 or 520-227-1823 (cell); **dalechid@cox.net**; **www.k7rdg.org**.

Arkansas (Fort Smith) — Apr 4 S V
8 AM-3 PM. *Spr:* Fort Smith Area ARC. Columbus Acres, 10203 Columbus Acres Rd. *TI:* 146.94, 146.64 (88.5 Hz), 444.5. *Adm:* advance $8, door $10. Tables: $10. Jimmie Lowrey, W5JNL, Box 32, Fort Smith, AR 72902; 479-649-7249; fax 586-314-0232; **info@hangingjudgehamfest.com**; **www.hangingjudgehamfest.com**.

Arkansas State Convention
April 25, Rogers S V
The Arkansas State Convention, sponsored by the Benton County Radio Operators Club, will be held at The First Church of the Nazarene, 4911 W Pleasant Grove Rd. Doors are open 8 AM-3 PM. Features include forums (ARRL, Weather, DX, ARES/RACES, and more); VE sessions; special guest from ARRL HQ Khrystyne Keane, K1SFA, ARRL News Editor. Talk-in on 145.29 (110.9 Hz). Admission is $4 in advance, $6 at the door. Tables are $5. Contact Jay Harrison, KCØCNB, 520 N 37th St, Rogers, AR 72756; 479-631-7727; **texgun19@cox.net**; **bentoncoradiooperators.org/**.

California (Sonoma) — Apr 25 D F R S V
Set up 7 AM; public 8 AM-noon. *Spr:* Valley of the Moon ARC. Sonoma Valley Veteran's Memorial Building, 126 First St W. *TI:* 145.35 (88.5 Hz). *Adm:* Free. Tables: $10. Darrel Jones, WD6BOR, 358 Patten St, Sonoma, CA 95476; 707-996-4494 (phone and fax); **wd6bor@vom.com**; **vomarc.org**.

International DX Convention
April 17-19, Visalia, CA D H Q R S V
The International DX Convention (60th Annual International DX Convention), sponsored by the Northern California DX Club, will be held at the Holiday Inn, 9000 W Airport Dr. Doors are open Friday 1 PM-Sunday 11 AM. Features include all HF, 160 meter, and DX-oriented forums and presentations; technical sessions; vendors; major equipment manufacturers; exhibitors; Contest Academy (new this year, Friday 1-5 PM); DXCC QSL card checking; VE sessions; hosted cocktail party (Friday and Saturday); Saturday barbeque lunch ($20); banquet and DX program with well-known speaker (Saturday eve, $37); Sunday Breakfast Buffet featuring a well-known speaker ($20); RV parking ($40 for the weekend; Brian Lancaster, 559-651-5000; **blancaster@altamonthotels.com**); handicapped accessible. Admission is $90 in advance (by Mar 20), $95 at the door or after Mar 20 (includes all meals). Contact John Eisenberg, K6YP, 25 Parsons Way, Los Altos, CA 94022; 650-941-7426 (phone and fax); **k6yp@arrl.net**; **www.dxconvention.org**.

March 13-14
Oklahoma State, Claremore*
March 14-15
Roanoke Division, Concord, NC*
March 21
Nebraska State, Lincoln*
West Texas Section, Midland*
Microhams Digital, Redmond, WA*
March 27-28
Maine State, Lewiston*
April 4
Delaware State, Georgetown*
April 4-5
Communications Academy, Seattle, WA*
May 15-17
ARRL National, Dayton, OH
May 22-24
Wyoming State, Casper
May 29-31
Rocky Mountain Division, Estes Park, CO
May 30
Atlantic Division, Rochester, NY
June 5-7
Northwestern Division, Seaside, OR
June 6
Georgia State, Marietta
*See March *QST* for details.

Connecticut (Ledyard/Gales Ferry) — Apr 18 R
10 AM-3 PM (or until last item is sold). *Spr:* RAS of Norwich. Gales Ferry Firehouse, 1772 Rte 12. RASON Auction. *TI:* 146.73, 449.725 (156.7 Hz). *Adm:* $2. Gary Divan, WT1SND, 102 Plain Hill Rd, Baltic, CT 06330; 860-884-4218; **wt1snd@portone.com**; **www.RASON.org**.

Florida (Coral Gables) — Apr 18. Bill Moore, WA4TEJ, 305-264-4465; **wa4tej@juno.com**; **www.FlamingoNet.8m.net**.

Florida (Fort Walton Beach) — Mar 21 F V
8 AM-3 PM. *Spr:* Playground ARC. Northwest Florida Fairgrounds, 1958 Lewis Turner Blvd. *TI:* 146.79. *Adm:* $5. Tables: $10. Steve McCarter, KB4OID, 203 Pilgrim Ave, Fort Walton Beach, FL 32547; 850-496-1819; **kb4oid@kb4oid.org**; **w4zbb.org**.

Florida (Fort Lauderdale/Oakland Park) — Apr 25 F V
7 AM-1 PM. *Spr:* Broward ARC. Collins Center, 3900 NE 3rd Ave. "Cy Harris Memorial Free Flea." *TI:* 146.79 (110.9 Hz). *Adm:* Free. Tables: Free. Al Flapan, KN4FA, 4460 NW 72nd Ave, Lauderhill, FL 33319; 954-748-7218; **kn4fa@arrl.net**; **www.eagle3.net/barc**.

Florida (New Port Richey) — Mar 21 T V
8 AM. *Spr:* Gulf Coast ARC. Ridgewood High School, 7650 Orchid Lake Rd. *TI:* 146.67. *Adm:* $6. Tables available. Jerry Patterson, K4JHK, 3108 Ohara Dr, New Port Richey, FL 34655; 727-946-5186; **k4jhk@verizon.net**; **www.gulfcoastarc.org**.

Florida (Tampa) — Apr 18 F T V
8 AM-1 PM. *Spr:* Tampa ARC. TARC Clubhouse, 7801 N 22nd St. TARCFest XXI. *TI:* 147.105 (146.2 Hz). *Adm:* $2. Tables: $3. William Bode, N4WEB, 14302 Capitol Dr, Tampa, FL 33613; 813-382-9262; fax 813-878-4020; **n4web@arrl.net**; **www.hamclub.org**.

Georgia (Sugar Valley) — Apr 25 D F R T V
8 AM-2 PM. *Spr:* Cherokee Capital ARS. Sugar Valley Community Center, 3295 Sugar Valley Rd NW. *TI:* 443.675, 146.805. *Adm:* $5. Tables: $10. Felton Floyd, AF4DN, 1054 Mountain Loop Rd NW, Sugar Valley, GA 30746; 770-324-9859; **af4dn@iwispr.net**; **www.k4woc.com**.

Idaho State Convention
April 24-26, Boise D F R S V
The Idaho State Convention, sponsored by the Voice of Idaho ARC, will be held at the Holiday Inn-Boise Airport, 3300 Vista Ave. Doors are open Friday noon, Saturday 8 AM, Sunday 9 AM. Features include indoor and outdoor swapmeet; ham radio vendors; numerous seminars; Special Event Station; VE sessions (Saturday 9 AM-noon, all classes of Amateur Radio licenses); Friday eve seminar with ARRL Pacific Division Director Bob Vallio, W6RGG (DXpedition to the Scarborough Reef); banquet with special guest speaker Riley Hollingsworth, K4ZDH. Talk-in on 147.24 (100 Hz). Admission is $10. Tables are $10. Contact Doug Rich, W7DVR, 2025 N Regal Dr, Boise, ID 83704; 208-376-7651; fax 208-955-6464; **doug@the-one.com**; **www.voiceofidaho.org**.

Illinois (Arthur) — Apr 26 F V
8 AM-noon. *Spr:* Moultrie ARK. Arthur Firehouse, Rte 133. 46th Annual Hamfest. *TI:* 146.655 (162.2 Hz), 444.925 (103.5 Hz). *Adm:* $7. Tables: $15. Ralph Zancha, WC9V, Box 55, Lovington, IL 61937; 217-254-7574; **rzancha@one-eleven.net**; **www.qsl.net/mark/**.

Illinois (Galva) — Apr 19 F H R
8 AM-noon. *Spr:* Area AR Operators. Galva High School Gym, 1000 N Center Ave. *TI:* 145.49 (225.7 Hz). *Adm:* advance $5 (3 stubs), door $5 (1 stub). Tables: $10. Tom Davis, N9OSP, 802 Rose St, Kewanee, IL 61443; 309-853-1903; **tdn9osp@kewanee.com**; **www.qsl.net/aa9ro/index.html**.

Illinois (Godfrey) — Apr 25 D F H V
7 AM-noon. *Spr:* Lewis and Clark RC. Lewis and Clark Community College (River Bend Arena), Rte 67. *TI:* 145.23 (79.7 Hz). *Adm:* advance $2, door $3. Tables: $10. Jim McDermott, KC9JZW, 220 Patterson Pl, Alton, IL 62002; 618-462-7184

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

(phone and fax); **kc9jzw@arrl.net**; **www.k9ham.org**.

Illinois (Sandwich) — May 3 F T
8 AM-1 PM. *Spr:* Kishwaukee ARC. Sandwich Fairgrounds, intersection of Rte 34 and Gletty Rd. DeKalb Hamfest. *Tl:* 146.73 (100 Hz), 146.52. *Adm:* advance $5, door $6. Tables: $10. Bob Yurs, W9ICU, 1107 Commercial St, Sycamore, IL 60178; 815-895-3219; fax 815-895-7584; **w9icu@arrl.net**; **www.w9icu.com**.

Indiana (Peru) — Apr 19 V
7 AM-2 PM. *Sprs:* Cass County ARC, Grant County ARC, Miami County ARC, Blackford ARC, and Kokomo ARC. Miami County 4-H Fairgrounds, County RD 200 N. *Tl:* 147.345. *Adm:* $5. Tables: $4. Robbie Robinson, W9RSR, 2202 W Leffel Ln, Peru, IN 46970; 765-985-2811; **w9rsr@comcast.net**; **www.nci-hamfest.com**.

Iowa (Des Moines) — Apr 25 D F H V
8 AM-1 PM. *Spr:* Des Moines RA Assn. Iowa State Fairgrounds, Walnut Center Bldg, E 30th St and E University Ave. *Tl:* 146.94 (114.8 Hz). *Adm:* $6. Tables: $20. Ron Hobbs, NØXWI, Box 88, Des Moines, IA 50301; 515-255-4020; **rwhobbs@aol.com**; **www.dmraa.com**.

Iowa (Oskaloosa) — Mar 21. Vernon Stanley, NØSJF, 641-622-2154; **vstanley@iowatelecom.net**.

Kentucky (Ashland) — Apr 25 T V
8 AM-3 PM. *Spr:* River Cities ARA. National City Bank Parking Lot, 1000 Carter Ave. *Tl:* 146.94. *Adm:* Free. Tables: Free. Matt Tinker, AA4XA, 1032 Aberdeen Pl, Russell, KY 41169; 606-834-9177; fax 606-834-9517; **aa4xa@arrl.net**; **www.rcara.org**.

Kentucky (Louisa) — May 2 F V
8 AM. *Spr:* Big Sandy ARC. Senior Citizen Center, 101 W Pike St. ARES and QCWA meeting. *Tl:* 147.39 (127.3 Hz). *Adm:* $4. Tables: $5. Fred Jones, WA4SWF, 511 N Lackey Ave, Louisa, KY 41230; 606-483-1109; **wa4swf@arrl.net**; **www.bsarc.org**.

Louisiana (Benton) — May 2 F R
10 AM-3 PM. *Spr:* ARC of Shreveport. Cypress Black Bayou Recreation Park, 135 Cypress Park Dr. 8th Annual Swapmeet and Cookout, D-STAR demonstration. *Tl:* 146.67. *Adm:* $1. Tables: Free. Kelly Spencer, KD5SPO, 930 N Lake St, Waskom, TX 75692; 903-687-2899; **kelly.spencer@comcast.net**; **www.qsl.net/nwlarn/arcos.htm**.

Louisiana State Convention
April 25, Monroe D S V
The Louisiana State Convention, sponsored by the Twin City Ham Club, will be held at the Barak Shrine Temple, 6620 Frontage Rd. Doors are open 8 AM-2 PM. Features include dealers, forums, VE sessions, friendship. Talk-in on 146.85. Admission is $5. Tables are $10. Contact David Gore, W5DSG, 111 Baywood Dr, W Monroe, LA 71291; 318-235-6845; **tchc@tchams.org**; **www.tchams.org**.

Louisiana (Ruston) — May 9 F R T V
8 AM-2 PM. *Spr:* Piney Hills ARA. Cook Parish Park, 2800 Kavanaugh (N Cooktown Rd). *Tl:* 147.12 (94.8 Hz). *Adm:* $2. Tables: $5. James Christian, W5JC, 555 Pisgah Church Rd, Bernice, LA 71222; 318-285-7417 or 318-990-0888 (cell); fax 318-255-1755; **w5jc@bellsouth.net**; **www.phara.us**.

Maine (South Portland) — Apr 18 D F S V
8 AM-noon. *Spr:* Portland Amateur Wireless Assn. Stewart Morrill American Legion Post #35, 413 Broadway. Consignment Table. *Tl:* 147.36 (100 Hz). *Adm:* $5. Tables: $10. Bryce Rumery, K1GAX, 75 Ocean House Rd, Cape Elizabeth, ME 04107; 207-799-1116; **k1gax@juno.com**; **www.pawa-maine.org**.

Massachusetts (Cambridge) — Apr 19. Nick Altenbernd, KA1MQX, 617-253-3776 (9 AM-5 PM); **w1gsl@mit.edu**; **www.swapfest.us**.

Michigan (Cadillac) — May 2 D F H S V
Set up Friday 6-8:30 PM, Saturday 6 AM; public 8 AM-1 PM. *Spr:* Wexaukee ARC. Cadillac Jr High School, 500 Chestnut St. 47th Annual Swap and Shop, U P Net meeting. *Tl:* 146.98. *Adm:* $5. Tables: $10. Alton McConnell, NU8L, 4189 48th Rd W, Cadillac, MI 49601; 231-862-3774; fax 231-775-8731; **nu8l@yahoo.com**; **www.wexaukeearc.org**.

Michigan (Highland) — Apr 18 D F H R
8 AM-1 PM. *Spr:* Milford ARC. Milford High School, 2380 Milford Rd. Swap and Shop. *Tl:* 145.49 (67 Hz), 146.52. *Adm:* advance $5, door $6. Tables: $1.50 per foot. Rose Moore, KC8NQJ, 1383 Sylvan Dr, Hartland, MI 48353; 810-632-5174; **www.qsl.net/w8ydk**.

Missouri (Kansas City) — Apr 18 D F H R S V
Set up 6 AM; public 8 AM-2 PM. *Spr:* Ararat Shrine ARC. Ararat Shrine Temple, 5100 Ararat Dr. Emergency vehicles on display. *Tl:* 145.13. *Adm:* advance 3 for $7, door $4 each. Tables: $17. Dave Hinkley, KAØSOG, 1221 SE 11th St, Lee's Summit, MO 64081; 816-525-4826; **ka0sog@arrl.net**; **www.hambash.com**.

Missouri (Mount Vernon) — Apr 4 F V
Set up Friday 3:30-8 PM; public Saturday 8 AM-4 PM. *Spr:* Ozarks ARS. Mount Vernon Middle School Auditorium, Hwy 39 at Landrum St. *Tl:* 146.97. *Adm:* $5. Tables: $5. Bob Myer, KAØRM, 704 Windsor Ave, Aurora, MO 65605; 417-678-4796; **bhmyer@centurytel.net**; **w0oar.com**.

Midwest Division Convention
April 17-18, South Sioux City, NE
D F H Q R S V
The Midwest Division Convention (Hamboree 2009 – 33rd Annual Hamboree), sponsored by the 3900 Club, will be held at the Marina Inn, 4th and "B" Sts. Doors are open Friday 2-7 PM, Saturday 8 AM-4 PM. Features include an in-house sales arena for all vendors and clubs, VE sessions, full slate of seminars and forums, 3900 Club luncheon meeting (Saturday), DXCC card checking, left foot keying contest, banquet, "Ladies Day" activities, handicapped accessible, refreshments, special motel rates. Talk-in on 146.91. Admission is $6 (good both days). Advance registration is required for meals and vendor booths. Tables are $10 and up. Make checks payable to "Hamboree 2009" and send to Tom Brosamle, WBØYNX, Box 2332, Sioux City, IA 51106; 712-252-4107 (10 AM to 5:30 PM, Monday through Saturday); **wb0ynx@arrl.net**; **www.3900club.com**.

EMCOMMWEST Convention
May 1-3, Reno, NV D F H S V
The EMCOMMWEST Convention, sponsored by Emcommwest, Inc, will be held at the Circus Circus Hotel Resort, 500 N Sierra St. Doors are open Friday noon-5 PM, Saturday 8 AM-5 PM, Sunday 8 AM-1 PM. Features include swapmeet; ARRL forum; vendors; speakers and presentations; Emergency Communications forums; special guest from ARRL HQ, Steve Ewald, WV1X, Field Organization Supervisor; VE sessions; barbeque (Friday, 5:30 PM, at the Salvation Army), banquet (Saturday eve, $39; guest speaker Riley Hollingsworth, K4ZDH); handicapped accessible. Talk-in on 147.15 (123 Hz), 147.21 (100 Hz). Admission is $10 in advance, $15 at the door. Tables (see web site). Contact Don Carlson, KQ6FM, c/o EMCOMMWEST, Box 51408, Sparks, NV 89435; 775-354-2636; **kq6fm@arrl.net**; **www.emcommwest.org**.

New Hampshire (Deerfield) — May 1-2. Mike Raisbeck, K1TWF, 978-250-1235; **k1twf@arrl.org**.

New Jersey (Roxbury/Succasunna) — Apr 4 D F Q T V
Sellers 6 AM, buyers 8 AM-1 PM. *Spr:* Splitrock ARA. Roxbury Senior Center (Horseshoe Lake Park), 72 Eyland Ave. *Tl:* 146.985 (131.8 Hz). *Adm:* $5. Tables: $20. Dan Gruber, N2AB, c/o Splitrock ARA, Box 610, Rockaway, NJ 07866; 866-457-6687 (phone and fax); **hamfest@splitrockara.org**; **www.splitrockara.org**.

New Jersey (Toms River) — Apr 5 D F T V
Sellers 6 AM, buyers 8 AM. *Spr:* Jersey Shore ARS. Riverwood Recreation Center, Riverwood Dr and Whitesville Rd. *Tl:* 146.91 (127.3 Hz). *Adm:* $5. Tables: $15. Darleen McGlaughlin, KC2HCW, c/o JSARS, Box 295, Toms River, NJ 08754; 732-237-9448; **jsars910@gmail.com**; **www.jsars.org**.

New Jersey (Wall Township) — Apr 18 F T V
6 AM-1 PM. *Spr:* Ocean-Monmouth ARC. Infoage Learning Center, Project Diana Site, Marconi Rd. *Tl:* 145.11 (127.3 Hz). *Adm:* $5 (per car load). Tables: $10. Jeff Harshman, N2LXM, 5 The Arborway, Ocean, NJ 07712; 732-996-0637; **n2lxm@juno.com**; **www.omarc.org**.

New Mexico (Las Cruces) — Apr 26 V
7 AM. *Spr:* Mesilla Valley RC. MVRC Clubhouse, 6609 Jefferson. "Bean Feed." *Tl:* 146.64 (100 Hz). *Adm:* Free. Tables: Free. Kevin McNelis, K5KMC, 1613 Imperial Ridge, Las Cruces, NM 88011; 575-571-7326; **kmcnelis@nmsu.edu**; **www.zianet.com/mvrc**.

New York (Lagrangeville) — Apr 26 F H R T V
8 AM-2 PM. *Spr:* Mt. Beacon ARC. Tymor Park, 249 Duncan Rd. *Tl:* 146.97 (100 Hz). *Adm:* $6. Tables available. Jim Capicotto, K2JIM, 813 Heard Ave, Maybrook, NY 12543; 845-427-2702; **k2jim@frontiernet.net**; **www.wr2abb.org**.

New York (Lindenhurst) — May 9 D F V
Set up 7 AM; public 9 AM-1 PM. *Spr:* Great South Bay ARC. Fireman's Memorial Park, Hartford St. *Tl:* 146.685 (110.9 Hz). *Adm:* $6. Tables available. John Melfi, W2HCB, Box 1356, W Babylon, NY 11704-0356; 631-669-6321 (phone and fax); **w2hcb@arrl.net**; **www.gsbarc.org**.

New York (Newark) — Apr 18 D F V
Set up 7 AM; public 8 AM. *Spr:* Drumlins ARC. Marbletown Fire Department, 6416 Silver Hill Rd. *Tl:* 146.745. *Adm:* $5. Tables: $5. David Taylor, KB2KBY, 228 W Jackson St, Palmyra, NY 14522; 315-597-4293; **kb2kby@rochester.rr.com**; **www.drumlinsarc.org**.

New York (Owego) — May 9 F T
Set up 6 AM; public 8 AM. *Spr:* Binghamton ARA. Marvin Park, W Main St (Rte 17C). *Tl:* 147.39 (91.5 Hz). *Adm:* $5. Tables: $10. Allen Lutins, KC2KLC, 607-729-4817; **allen@lutins.org**; **w2ow.org**.

New York (Rensselaer) — May 9 D F H
Set up 6 AM; public 8 AM-1 PM. *Spr:* East Greenbush ARA. East Greenbush Fire Company, 68 Phillips Rd. 6th Annual Hamfest. *Tl:* 147.27 (94.8 Hz). *Adm:* $6. Tables: $6. Thomas Scorsone, KC2FCP, 1310 10th Ave, Watervliet, NY 12189; 518-272-1494; **kc2fcp@nycap.rr.com**; **www.w2egb.org**.

Southeastern VHF Conference
April 24-25, Charlotte, NC F H R S V
The Southeastern VHF Conference (13th Annual Conference), sponsored by the Southeastern VHF Society, will be held at the DoubleTree Hotel-Charlotte Airport, 2600 Yorkmont Rd. Doors are open 8 AM-6 PM both days. Features include printed conference proceedings, SVHFS Design Contest, technical programs and presentations, kick-off lunch with special guest speaker (Friday noon, $20), Worked All of 'EM Award and VUCC card checking, Hospitality Suite, test bench area, noise figure and antenna gain measurements, flea market, manufacturer exhibits, annual SVHFS auction, K4UHF Award presentation, VE sessions, Saturday eve ban-

quet with keynote speaker ($40), handicapped accessible. Talk-in on 146.94. Admission is $40 in advance, $45 at the door. Flea market tables are $5 each. Contact Dexter McIntyre, W4DEX, 16164 Pless Mill Rd, Stanfield, NC 28163; 704-485-4925; **w4dex@arrl.net**; **www.w4dex.com/svhfs_2009.htm**.

North Carolina (Hampstead) — Apr 18
F R T V
8 AM-1 PM. *Spr:* Azalea Coast ARC. Holy Trinity Episcopal Church, 107 Deerfield Rd. *TI:* 146.73 (88.5 Hz). *Adm:* Free. Tables: $5. Captain Michael Hamby, KG4SRW, 561 Garden Terrace Dr, Unit 207, Wilmington, NC 28405; 910-256-8328; **sailormike@att.net**; **www.ac4rc.org**.

North Carolina (Morganton) — Apr 18
F Q R V
8 AM-2 PM. *Spr:* McDowell ARA. Burke County Fairgrounds, 145 Bost Rd (Hwy 181 N). 12th Annual Catawba Valley Hamfest. *TI:* 147.15. *Adm:* advance $4, door $5. Tables: $10. Michael Fox, KF4MWX, 4895 Karen Ct, Morganton, NC 28655; 828-437-2787; fax 828-652-3102; **kf4mwx@gmail.com**; **cvhamfest.org**.

North Carolina State Convention

April 11, Raleigh D F H Q S V

The North Carolina State Convention (37th Annual RARSFest), sponsored by the Raleigh ARS, will be held at the North Carolina State Fairgrounds Exposition Center, 1025 Blue Ridge Blvd. Doors are open 8 AM-3:30 PM. Features include huge electronics flea market; computers; new equipment dealers; vendors; forums and meetings; special guest from ARRL HQ Regulatory Information Manager Dan Henderson, N1ND; VE sessions (9 AM sharp, walk-ins accepted, $14 fee; Joe White, WA4GIR, 919-387-9152, **wa4gir@arrl.net**); QSL card checking; contests; Special Event Station that you can operate; hands-on construction projects; Youth Lounge; RV parking with full hookup ($25 per night; 919-612-6767); handicapped accessible. Talk in on 146.64. Admission is $6 in advance (by Apr 4), $7 at the door; age 16 and under admitted free when accompanied by paying adult. Tables with 2 chairs are $17 each in advance (by Apr 4), $18 each after Apr 4. Contact Chuck Littlewood, K4HF, 2005 Quail Ridge Rd, Raleigh, NC 27609; 919-872-6555 (phone and fax); **k4hf@arrl.net**; or Steve Ferrarini, KJ4BX, 919-247-8690, **steve.kj4bx@gmail.com**; **www.rars.org/hamfest**.

North Carolina (Reidsville) — May 9 F T
8 AM-noon. *Spr:* Rockingham County ARC. Calvary Baptist Church Parking Lot, 7860 NC Hwy 87. 5th Annual Swapfest. *TI:* 146.85 (103.5 Hz). *Adm:* advance $3, door $5. Tables: $5. George Brewer, WN4LTY, 5190 NC Hwy 700, Eden, NC 27288; 336-635-1261 (phone and fax); **wn4lty@rcarc.com**; **www.rcarc.com**.

North Dakota (West Fargo) — Apr 18
D F H S V
8 AM-2:30 PM. *Spr:* Red River Radio Amateurs. Red River Valley Fairgrounds, 400 15th St W. *TI:* 145.35, 444.875 (both 123 Hz). *Adm:* $7. Tables available. Kent Olson, KAØLDG, 7702 Forest River Rd, Fargo, ND 58104; 701-298-0956 (phone and fax); **qtipf16@q.com**; **www.rrra.org**.

Ohio (Athens) — Apr 26 D F R T V
8 AM-1 PM. *Spr:* Athens County ARA. Athens Community Center, 701 E State St. 30th Annual Hamfest. *TI:* 145.15. *Adm:* $5. Tables available. Drew McDaniel, W8MHV, 61 Briarwood Dr, Athens, OH 45701; 740-592-2106; fax 740-593-9184; **mcdanied@ohiou.edu**; **www.ac-ara.org**.

Ohio (Cuyahoga Falls) — Apr 19 F
8 AM-1:30 PM. *Spr:* Cuyahoga Falls ARC. Emidio & Sons Party Center, 48 E Bath Rd. 55th Annual Hamfest, Electronics, and Computer Show. *TI:* 147.27. *Adm:* advance $5, door $6. Tables: $15. Ted Sarah, W8TTS, 239 Bermont Ave, Munroe Falls, OH 44262; 330-688-2013; **www.cfarc.org/hamfest2009.html**.

Ohio (Jackson) — Apr 11 D F H R T V
9 AM-1 PM. *Spr:* Jackson County ARC. Jackson County YMCA, 594 E Main St. *TI:* 146.79 (167.9 Hz). *Adm:* $5. Tables: $5. Jim Dennett, K8ZUA, 4597 Riegel Ridge Rd, Jackson, OH 45640; 740-286-5454; **k8zua@jacksoncountyarc.org**; **www.jacksoncountyarc.org**.

Pennsylvania (Boston/McKeesport) — Apr 26 F R V
8 AM-2 PM. *Spr:* Two Rivers ARC. The Spectrum of Boston, 6100 Smithfield St. *TI:* 146.73. *Adm:* $5. Tables: $10. Bill Hetrick, N3LQC, 696 King St, McKeesport, PA 15132; 412-751-1937; **hamfest@tworiversarc.com**; **www.tworiversarc.com**.

Pennsylvania (Dover) — Apr 18 F V
8 AM-2 PM. *Spr:* York Hamfest Foundation. Brookside Park, 4054 Fox Run Rd. 53rd Annual Hamfest. *TI:* 147.33 (123 Hz). *Adm:* $5. Tables: $15. Ray Shaub, W3AXC, 2331 Locust Rd, Dover, PA 17315; 717-292-3529; **w3axc@arrl.net**; **www.yorkhamfest.org**.

Pennsylvania (Wrightstown) — May 3 F V
7 AM. *Spr:* Warminster ARC. Middletown Grange Fairgrounds, 576 Penns Park Rd. *TI:* 147.09, 443.95 (both 131.8 Hz), 146.52. *Adm:* $5. Tables: $15. Stuart Leabman, KB3JRB, 2061 Durham Rd, New Hope, PA 18938; 215-794-1360; **hamfest@k3dn.org**; **www.k3dn.org/hamfest.htm**.

South Carolina Section Convention

May 2, Spartanburg D F H R S T V

The South Carolina Section Convention ("Upstate Hamfest"), sponsored by the Blue Ridge ARS, will be held at the Piedmont Interstate Fairgrounds, 575 Fairgrounds Rd. Doors are open for setup Friday 6-9 PM, Saturday 6-8 AM; public 8 AM-3 PM. Features include flea market, tailgating ($5 per space, plus admission), vendors ($31 for 1st table, $11 for each additional), presentations and forums, VE sessions (off-site at Spartanburg American Red Cross building; register 10:30 AM, testing 11 AM), overnight camping available ($20), handicapped accessible, refreshments. Talk-in on 146.61, 146.82. Admission is $6 in advance, $7 at the door (under 12 free). Tables are $11 (electricity $10 per drop for inside tables only). Contact Rusty Kirkpatrick, AJ4RK, 351 Old Georgia Rd, Moore, SC 29369; 864-576-9643 or 864-978-7519 (cell); **aj4rk@bellsouth.net**; **www.upstatehamfest.org**.

Tennessee Section Convention

April 18, Bartlett D V

The Tennessee Section Convention ("FreeFest"), sponsored by the Mid South ARA, will be held at the Bartlett Station Municipal Center, 5868 Stage Rd. Doors are open 9 AM-3 PM. Features include vendors; VE sessions; special guest from ARRL HQ Dan Henderson, N1ND, Regulatory Information Manager. Talk-in on 147.03 (107.2 Hz). Admission and tables are free. Contact Bill Hudock, KB4SQV, 163 Ericson Rd, Cordova, TN 38018; 901-753-8020 (phone and fax); **kb4sqv@bellsouth.net**; **sites.google.com/a/maraonline.org/mara-online/**.

Tennessee (Clarksville) — May 2 F R T
8 AM-2 PM. *Spr:* Clarksville Amateur Transmitting Society. Family Life Center, Hilldale Baptist Church, 205 Old Farmers Rd. Eyeball QSOs. *TI:* 147.39. *Adm:* Free. Tables: Free. John Freed, KX6F, 216 Maplewood Dr, Clarksville, TN 37042; 931-216-2503; fax 931-645-7608; **jdfreed@bellsouth.net**; **www.KF4L.org**.

Tennessee (Mountain City) — May 9 F V
7:30 AM. *Spr:* Johnson County ARC. Tennessee Army National Guard Bldg, 1923 S Shady St (Hwy 421). Wheel Chair Race. *TI:* 145.47, 146.61 (both 103.5 Hz). *Adm:* $3. Tables: $5. Frank Liberstein, W4FRL, 153 Quail Run Rd, Trade, TN 37691; 423-727-0333; **qquailrun@embarqmail.com**.

Texas (Amarillo) — May 9 F R
9 AM-2 PM. *Spr:* Panhandle ARC. Thompson Park, US Hwy 287 N. 9th Annual Swapfest/Picnic. *TI:* 146.94 (88.5 Hz). *Adm:* Free. Tables: Free. Henry Janhsen, N5HPJ, 8801 Red Wing Rd, Amarillo, TX 79119; 806-353-3747; **henry.janhsen@sbcglobal.net**; **www.orgsites.com/tx/w5wx/**.

Texas (Belton) — Apr 18 F V
7 AM-2 PM. *Spr:* Temple ARC. Bell County Expo Center, 301 W Loop 121. "HamEXPO." *TI:* 146.82 (123 Hz). *Adm:* $5. Tables available. Mike LeFan, WA5EQQ, 1802 S 13th St, Temple, TX 76504; 254-773-3590; fax 254-231-4128; **expo@tarc.org**; **www.beltonhamexpo.org**.

Utah State Convention

April 25, South Ogden D F S V

The Utah State Convention, sponsored by the Weber County ARES and the Weber County Sheriff's Communication Team, will be held at the Browning National Guard Armory, 625 E 5300 S. Doors are open 9 AM-4 PM. Features include swapmeet, vendors, emergency response and public safety displays, forums (Weather Spotter, D-STAR, HF, DX), NIMS 100/200 class with certificate, VE sessions (1-3 PM), State Emergency Plan, dinner with speaker from ARRL (5 PM). Talk-in on 146.82 (123 Hz). Admission is $5. Tables are $6 (full), $3 (half). Contact Jeff Kinney, KD7VUT, 360 E Elberta Dr, N Ogden, UT 84414; 801-782-7781; **nokinney@comcast.net;** or Ray White, K7RFW, 801-546-2549; **crwhite@airmail.net**; **ecommutah.com**.

Virginia (Chesapeake) — Mar 22 F T V
9 AM-3 PM. *Spr:* Chesapeake AR Service. Moose Lodge #898, 1400 N George Washington Hwy. *TI:* 146.82 (162.2 Hz). *Adm:* advance $5, door $6. Tables: 1 free. Paul Buckwalter, K4PRB, 4 Timberland Ct, Portsmouth, VA 23703; 757-484-6047; **w4car@yahoo.com**; **www.w4car.org**.

Wisconsin (Cedarburg) — May 2 F S
Set up 6 AM; public 8 AM-1 PM. *Spr:* Ozaukee RC. Circle B Recreation Center, 6261 State Hwy 60 (intersection of State Hwy 60 and Cty Hwy I). *TI:* 146.97 (127.3 Hz). *Adm:* advance $4, door $5. Tables: $10. Tom Nawrot, AA9XK, 10335 N Grasslyn Rd, Mequon, WI 53092; 262-242-1029 or 800-698-6087; **tnawrot@wi.rr.com**; **www.ozaukeeradioclub.org**.

Wisconsin (Stoughton) — Apr 18 D F V
8 AM-1 PM. *Spr:* Madison Area Repeater Assn. Mandt Community Center, 400 Mandt Parkway. Madison Hamfest and Computer Fair. *TI:* 147.15 (123 Hz). *Adm:* advance $4, door $5. Tables: $18. John Steffl, WZ9I, 720 Yorktown Rd, De Forest, WI 53532; 608-245-8890; **wz9i@arrl.net**; **www.qsl.net/mara/**.

Wisconsin (Superior) — May 2 D F V
9 AM-2 PM. *Spr:* Arrowhead RAC. Head of the Lakes Fairgrounds, 4700 S Tower Ave (Hwy 35). *TI:* 146.94 (103.5 Hz). *Adm:* $6. Tables: $10. Robert Schulz, KCØNFB, 115 Eden Ln, Duluth, MN 55805; 218-724-6957; **arac_hamfest@charter.net**; **www.thearac.org**.

WB8IMY

ECLECTIC TECHNOLOGY

Chinese Ham Satellite on the Horizon

According to Michael Chen, BD5RV, there is a new Chinese Amateur Radio satellite scheduled for launch this year, possibly as early as this summer.

This will be a low-Earth-orbiting bird at an altitude of about 500 km. Dubbed XW-1, it will travel in a sun-synchronous orbit inclined 98 degrees to the equator.

What makes XW-1 particularly interesting is its transponder configuration. The satellite will have a linear transponder for SSB and CW, receiving on 2 meters and retransmitting on 70 cm. It will also have an FM transponder (same downlink/uplink bands) *and* a digital store-and-forward capability. My guess is that the three transponder functions will operate on a rotating schedule.

This could be a unique, exciting satellite. Watch ARRL news on the Web for more information as it becomes available.

Quantum Communication Strangeness

One of the most important challenges in designing communication networks of any kind is compensating for the effects of noise. As hams, we know that by decreasing noise levels in communication channels we can increase channel capacity, which is defined as the number of bits (or *qubits*, in quantum channels) that one channel can transmit. For a channel with zero capacity, no bits are transmitted.

Amateurs who are well versed in digital communication know the name Claude Shannon very well. Among other things, he created the famous formula that governs data transmission techniques in classical communication channels. This formula guides the design of modern communication schemes used in cell phones, the Internet and, yes, Amateur Radio. In this classical formula, capacity is additive. That is, when two channels are used simultaneously to transmit data, the capacities of the channels are added to obtain the total capacity — assuming that both channels are "open" and able to carry data, of course. So far so good.

Two physicists recently discovered a strange characteristic of quantum communication that turns this classical idea on its head. They found that if two quantum channels each have a transmission capacity of zero they will have a nonzero capacity *when used together*. This spooky effect, which has no classical counterpart, reveals a new complexity in the fundamental nature of quantum communication.

The coauthors of the study, Graeme Smith of the IBM Watson Research Center in Yorktown Heights, New York, and Jon Yard of Los Alamos National Laboratory in Los Alamos, New Mexico, published their research in a recent issue of *Science*.

They demonstrated that pairs of zero-capacity channels — channels that are essentially closed — can have a positive capacity when used together for quantum communication. As the physicists explain, that would be like two severed and useless telephone cables being able to miraculously transmit data when used together. Their finding shows two things: (1) quantum channel capacity is not additive in the classical sense, and (2) the quantum capacity of a single channel does not completely specify its capability for transmitting quantum information.

The scientists account for this weird "superactivation" property, as they call it, by explaining that quantum channels have two different kinds of capacity. "Private capacity" is the rate at which a channel can send secure classical data. "Assisted capacity" is the transmission rate in which multiple symmetric channels can assist a given channel in sending quantum data.

If you have a mild headache at this point in the discussion, you're not alone. Suffice to say that this discovery has large implications for the future of digital communications. Quantum networking, like the "quantum computer," has been a technological Holy Grail for years. We may have just taken another step along the path to reaching it.

A Chinese *Long March* rocket being readied for flight. A similar booster may carry a new Amateur Radio satellite to orbit this year.

Tree Power!

Roger Wagner, K6LMN, sent a tip about yet another strange way to generate power. In prior Eclectic columns we've discussed power generation from kites and raindrops, so why not…trees?

Researchers at MIT have discovered that your average mature tree exhibits a substantial pH difference between its interior and the surrounding soil. According to Professor Andreas Mershin, the pH differential generates a small voltage potential. "You get about 59 mV for every step in pH mismatch." This voltage is constant regardless of weather or season.

The MIT group believes that by tapping several trees they can generate enough "tree power" to trickle-charge a small battery. This in, turn, could be used to power a wireless mesh data network. Imagine forests acting as power sources for wireless networks, in addition to scrubbing carbon dioxide out the air and generating oxygen — not to mention providing homes and food for animals. Sounds like a decent trade!

Roger also adds the following…

"On another related subject, my water heater recently blew out and flooded my house. The inlet/outlet pipes were also quite corroded after about 6 years of operation. Suspecting galvanic corrosion, I measured the voltages across the hot and cold copper water lines and got 8 mV. With my VOM microammeter across the two lines, I read a current of about 9 µA. Are home heating pipes yet another source of 'free' power?" QST

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

K2TQN

VINTAGE RADIO

Jack Barnsley, 9BP, Prince Rupert, British Columbia

When Don Mix sailed from Wiscasset, Maine, on June 23, 1923, his expectations were high for almost daily radio contact with US hams. After all, he had brand new state-of-the-art equipment, designed and manufactured by a group of hams of a (then) large company called Chicago Radio Labs (later called Zenith). Even though the company was new, they already had a very good reputation and Mr West, the company engineer, supervised the station's installation on the *Bowdoin*. What could possibly go wrong?

The first few days at sea little contact was made by radio. At sea, his small antenna attached between the two masts wasn't the best for the low wavelengths he was using. Two days later while in the harbor at Monhegan, Maine, he sent his first message to 1ZE (Irving Vermilya, known as Amateur Number One, who was then living in New Bedford, Massachusetts). Everything was looking good.

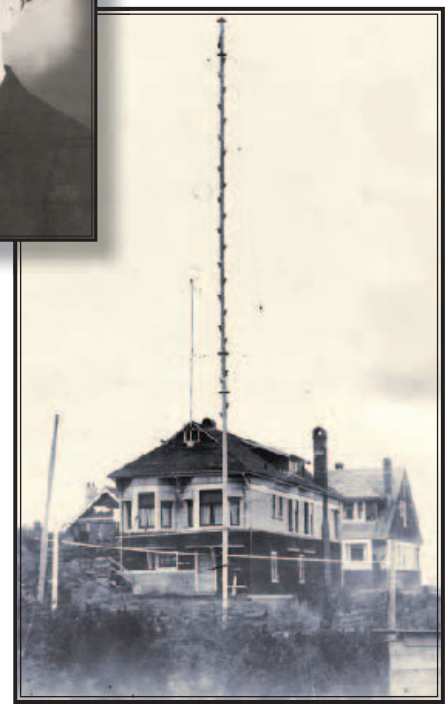
His good luck continued. On July 3 contact was made with 1UJ (Allan Lawson in Waterbury, Connecticut) who telephoned the messages to Mix's home in Bristol, Connecticut and answered back to the *Bowdoin* in 10 minutes. The following day Mix was only able to send half of a coded message to 1ZE, due to "atmospherics." On July 5, while under way off the coast of Newfoundland he was able to complete the coded message to 1ZE. Several times through the rest of July Mix complains of QRN (static) making communications impossible. He said, "Radio conditions have been as poor as I have ever seen so far. Fading and QRN have been unmerciful and infinite credit should be given to the fellows who stood by hour after hour copying that dry coded stuff, through that awful hash. 1ZE, 1ANA, 2CQZ and 1UJ are sure bricks."

On July 24, from Jack Lanes Bay, Newfoundland, he was able to send: one press message, one to President Harding and one message for Fairby (news photographer), all off to 1ANA (Roland Bourne of Chatham, Massachusetts). For the month of July 1ANA was the main contact with the *Bowdoin*. But this was not to last. As luck would have it, 1ANA was transferred by his employer and his station was dismantled.

On August 4, Mix comments on conditions, "Sig-

Jack Barnsley, Canadian 9BP.

Barnsley's Station 9BP; on his desk from the left, telephone, Adams-Morgan Paragon type RA-10 receiver, Paragon type DA-2 detector-amplifier, antenna switch with hand key in front, transmitter, ear phones, open high voltage power supply with antenna tuner just above. His transmitter was the same as 6ZAC's in the May, 1922, issue of *Radio* magazine. Two 50 W tubes were used in a full-wave rectification circuit with 1500 V on the plates.



Antenna is an inverted L type consisting of a cage 75 feet long and 63 feet high for the top part, with a lead-in 45 feet long. A counterpoise of 12 wires 85 feet long and fanned somewhat is located directly beneath the antenna.

John Dilks, K2TQN ♦ 125 Wharf Rd, Egg Harbor Township, NJ 08234-8501 ♦ k2tqn@arrl.org

nals weak — due no doubt to continuous daylight."

The rest of the month it wasn't looking good for reliable communications. Mix only comments on weak signals and said nothing regarding any contacts until August 28, when he reported, "Working 1ANA for a few minutes in the AM."

August 29 he mentions hearing 6s in the early AM. Then on September 1, he says, "QRN for the last three nights has been extremely bad."

Enter 9BP

On September 8, Mix said he "Hooked up with 7DC (Everett Sutton, Port Angeles, Washington) early this AM. He couldn't enjoy account QRN and QSS [fading]. Raised Canadian 9BP who took three msgs to Hartford, Freeport and Chicago. Gave us account of Japanese earthquake."

Jack Barnsley, Canadian 9BP, sent a letter to ARRL about this first QSO. In it he said:

Sept. 7th, 11:45 p.m. PST I put on the phones and the first station I heard was WNP [Wireless North Pole — the call sign used by the Bowdoin] trying to work 7DC. He said "Tell the gang to listen for me every night QRA [my location] lat 78.30." Figuring that 7DC was working him satisfactorily I camped on his wave waiting for him to come back. Which he didn't do. So at midnight I gave him a short call with "fm 9BP QSA [Your signal is strong] OM QTC [Have you anything for me]? K." Imagine my delight when in about half a minute WNP comes back with "Hello old top QRK [Your signal is good] u vy QSA hr." My answer was to tell him how glad I was to work him, advising I had received his latitude okay and asking for his longitude and to GA [go ahead] with messages. He came back: "Long abt 72.30" and then gave me three messages. I told him I would QSR [forward the message] and to listen for me again soon as I would be on every night possible. He came back with "Yes pse QSR and also mail msgs nw 3:19 AM EST will be on every nite fm midnite on will hv PX [press/news] tonite midnite wl u be on then? QSA vy OM all over forecastle hw?" I then told him that I would try to be on for his press and asked him if he had worked many stations since his arrival there. He replied: "Fine OM arrived hr August 17 u are first station I hv wkd since we came north of Disco Island exchanged sigs with 1ANA and 7DC tts all u cant imagine hw gld I am to raise u OM will look fr u tmw OM wl guess nm nw 73's." Then I told him that 9BP's power was 100 W with little over 3 A. He comes back: "R R fine OM thanks vy OM yes hv hrd a lot abt Can. 9BP thru QST two fifties hr ant current 5.5 amps will hv new antenna up in week or so pse tell 7IT his sigs FB hr wl gess nil." Then asked him if they had heard about the catastrophe in Japan. He said "No hvnt hrd a tng OM long wv tuner NG fr PX." Replying to my question as to how the weather was with them he said "We hv abt foot snow hr ice beginning to form in harbor temp 22." Later I sent him selected news from the papers telling him about the awful earthquake in Japan, etc.

Adams-Morgan Co advertisement featuring Station 9BP and letter from Barnsley telling how much he likes the Paragon receiving setup.

Jack Barnsley would become the critical link between the *Bowdoin* and US hams and the ARRL. Every night he was there, relaying messages with great skill. Without him and his excellent station the outcome of the radio experiment from the Arctic would have been much different.

Station 9BP is about 2000 miles to the southwest of the *Bowdoin* in Prince Rupert, British Columbia. To better fix 9BP's location in your mind, Prince Rupert is the western terminus of the Canadian National Railway and is situated along the coast 500 miles north of Vancouver, British Columbia.

Jack Barnsley had been more or less connected with radio for several years. He was first bitten by the bug in 1910 and laughingly related how his first set consisted of a bit of haywire, a homemade coil and detector, and a telephone receiver borrowed from one of Mr Bell's telephones. It was in 1914 that he started out as a commercial operator and worked on all of the coastal steamers operated by the Union Steamship Co, of British Columbia, Ltd. He then made several trips across the Pacific, joined the Royal Air Force during WWI and finally returned to Prince Rupert where he became agent for the Union Steamship Co.

In recognition of his splendid accomplishment of being the only amateur station to successfully communicate with WNP after a long period of silence, he was presented by the Chicago Radio Laboratory with a complete Zenith receiving set, which he highly prized.

Jack Barnsley's Obituary

He was born in Birmingham, England and immigrated to British Columbia in the 1880s. He ran a sporting goods store in Victoria and was later the secretary-manager of the Boscowitz Steamship Company. When that company was bought out by the Union Steamship Company in 1910, he was appointed agent at Prince Rupert, effectively the Union Steamship northern manager. He became assistant manager of the firm in 1917 and manager from 1920 to 1924. John Barnsley died in Vancouver on August 19, 1924 at the age of 67.

Don Mix and the *Bowdoin* returned to Wiscasset, Maine, on September 20, 1924, 32 days after 9BP became a Silent Key.

For more information and photos, please visit **www.k2tqn.com**. QST

75, 50 AND 25 YEARS AGO

April 1934

- The cover photo shows a ham grimacing as his carefully hand-wound coil pops off the coil form and unwinds.
- The editorial announces that the Federal Radio Commission has begun policing the amateur bands because of the growing number of violations of the rules and regulations.
- Managing Editor Clark Rodimon describes his new design, "A Single-Tube Short-Wave Converter."
- In Part II of "The Operation of R.F. Power Amplifiers," H. A. Robinson, W3LW, discusses excitation and the output circuit.
- In "Adding to the Single-Tube Transmitter," George Grammer tells us how to add a power amplifier and an antenna coupling unit.
- James Millen, W1HRX, and Dana Bacon, W1BZR, present "A Simple Cathode-Ray Oscilloscope" that can be used to check your 'phone signal.
- "Amateurs of Assistance in Emergencies" reports on hams' communication support in California (floods), Canada (an isolated man who needed emergency surgery and a passenger train trapped by snowdrifts), and the Northwest (two Idaho communities that had been isolated by snowstorms, and a raging coastal storm in Oregon and Washington).

April 1959

- The cover looks up at an unidentified ham with a massive stack of single-band beams above him.
- The editorial discusses "RACES Expansion."
- Dave Atkins, W6VX, provides information on "A Selective 21-Mc. Converter."
- Lew McCoy, W1ICP, again helps our new Novices, with "The Audiofil," which will help receivers with poor selectivity.
- Herman Lukoff, W3HTF, tells about his "C.W. Monitor for the Mobile," which will also help in the home station.
- "Coaxial Cable Attenuation," by Michael Ferber, W1GKX, helps the reader understand what goes on in his coax feed lines.
- Warren Bruene, WØTTK, provides "An Inside Picture of Directional Wattmeters."
- "Turnstile for Two," by Laird Campbell, W1CUT, describes his horizontally polarized, omnidirectional mobile antenna.
- Stu Rockafellow, W8NJH, tells about "Converting the Viking Ranger for 50-Mc. Operation."
- Phil Reich, W2HUG, describes a valuable modification to an ever-popular Heathkit rig, in "Diode Time-Sequence Keying for the DX-100."
- In "The Groundpole Antenna," R. W. Johnson, W6MUR, tells about the unorthodox antenna systems he has been experimenting with.

April 1984

- The cover photo shows a 2 meter amplifier, described in this issue, that will provide 700 W out with 20 W drive.
- The editorial discusses an idea from The New Zealand Association of Radio Transmitters — "World Radio Amateurs Day" — to be held on April 18, the Diamond Jubilee of IARU.
- In "A High-Power 2-Meter Amplifier Using the New 3CX600A7," David Meacham, W6EMD, tells the reader how to put 700 W of muscle into his 144-Mc DX efforts.
- D. S. Robertson, VK5RN, helps us with OSCAR 10 work with his simple but effective antenna design, "The 'Quadraquad' — Circular Polarization the Easy Way."
- "Receiver Preamps and How to Use Them," by Doug DeMaw, W1FB, will help the reader who has been straining for those weak HF signals.
- W1FB also gives us "Getting to Know Capacitors."
- Fred Williams, of TRW Electronics, provides information about building "A Digital Frequency Synthesizer."
- T. K. Davies, VE7DHD, reports on his latest homebrew project, "A Computerized Frequency Counter."
- James Rautio, AJ3K, presents Part 2 of "The Effect of Real Ground on Antennas."
- Richard Farman, K2QR; Donald Reschke, WA2SZY, and William Farman, WB9QBU, describe to the reader, in "Artificial Radio Aurora: The Sequel," how they deduced that "radio contacts should be possible via the RF energy produced from the massive competition among hams to make contact with the space shuttle *Columbia*."
- Bradley Wells, KR7L, encourages us to try "QRP: More than a State of Mind."

Al Brogdon, W1AB ♦ Contributing Editor

Field Organization Reports

January 2009

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/FandES/field/pshr/**.

665
AC8AR

620
W7TVA

530
KT2D

399
W4CAC

314
W2MTA

310
KI4GWC

300
WA2WMJ

285
KØBLR

255
KI4GEM

248
KC8NTE

246
K4DND

236
WB8RCR

235
K3CSX

231
NC4VA

205
KI4KWR

195
K7EAJ

190
KI4HGO

183
KB3KKY

174
K5SFM

172
KØIBS

170
W5DY
N7CM

167
AC8AL

166
W7JSW

165
KT5SR
KE5HYW

164
K7BC

160
N1UMJ
KGØGG
W4DNA

155
K2HJ
W2DWR

152
WB2KNS

151
K8MFK

150
WØLAW
W2SFD

140
K7BFL
N2GJ
WB5ZED
K2YDD
KK3F

138
KK6NU

137
W2KFV
K2BRG

135
KA8ZGY
NY3H
W3YVQ
WA2YBM

133
N2RDB

131
KØLQB

130
WB2FTX
WD9FLJ
K9LGU
W4ZJY
W4FAL

125
W7EKB
NN7H
N4LFJ

120
N7BEC
KA4FZI
K6JT
N2GS
AG9G
K2UL
KW1U
N1LKJ
W1GMF
K1LCQ
W8UL
N8IO
W4NBF
K4IWW

119
W5PY
117
N4EJF

115
KK7DEB
N4ABM

114
W7ELI

110
W7QM
W7GB
N7XG
N7YSS
KB2BAA
KB2RTZ
K2VX
KK5GY
K4GK
WA4UJC
N1IQI
W6DOB
WB4GHU
KI4ZJI
W2EAG
WB9JSR

108
N5NVP

107
N2VGA

105
KE4CB
KK1X

103
WD8USA

102
N3RB
W3CB

101
K2GW
N4HUB
W2LIE

100
W7GHT
K4SCL
N5OUJ
N1JX
NN7D
WB6OTS
N8NMA
WB6UZX
N7IE
NS7K
W3TWV
NX1O
K1HEJ
KB1NMO
KB2KLH
K2TV
WB2WAK
AA3SB
NIØI
WB8SIQ
N8OD
N9MN

NR2F
K5MC
KI4YV
W4TTO
KM1N

99
K8AE

98
KC5OZT
KB1KRS
NØMEA
WA1JVV

97
N2DW
KB9KEG

96
KS3Z

95
KF7GC
WG8Z
KI4PRX
K5KV

94
N2VC
KJ4NO

93
K6RAU

92
AD4BL
W2DSX

90
WA2CUW
KA8WNO
WD8DHC
N4MEH
W5CU
KA1RMV
KA1GWE
K4BG
WB4BIK
K3IN
N3ZOC
N8DD
WD8Q
K1JPG
NU8K
W1SGC
W8IM

89
W8CPG
KA2EJD

88
WB8OIF
KB5KKT
WB2HPI

87
W5ESE
N1CKM

86
KK7TN

85
KB8NDS
WC5M
K8AMR

83
W6SX

82
N7EIE
KI4JQB
KBØDTI

80
K7MQF
KE7DVV
KA3NZR
KB3MXM
W1PLW
K8KV
W3GQJ
KD8FNN
AB8SY

79
W5GKH
WA2NDA

KC4PZA

77
KE5DKV

76
KB5PGY
KI4QAU
NA7G
K8VFZ
KD8ADD
WDØGUF

75
AL7N

74
K4DLF

73
N7JCO

72
W4TY
N2VQA

71
AD5CQ
W5XX

70
N2SW
NM1K
KA5EXI
WØADZ
NØDUW
NØDUX
NUØF
KAØFUI
KBØJKO
NØMHJ
KØOR
KØRXC
NØUKO
WAØVKC
KD7ZUP

The following stations qualified for PSHR in previous months but were not recognized in this column: (Dec 2008) W2MTA 294, KB3KKY 111, K2TV 100, N4MEH 90, KO4OL 86, KM5VM 73. (Nov) W2MTA 303. (Oct) W2MTA 284. (Sept) W2MTA 305. (Jun) W2MTA 312.

Section Traffic Manager Reports

The following Section Traffic Managers reported: AK, AL, AR, AZ, CO, EB, EMA, ENY, EPA, EWA, GA, ID, IL, IN, KS, MDC, MI, MN, MS, NC, NFL, NH, NLI, NNJ, NTX, NV, OH, OK, OR, SC, SD, SFL, SNJ, STX, SJV, TN, UT, VA, WCF, WI, WMA, WV, WY.

Section Emergency Coordinator Reports

The following ARRL Section Emergency Coordinators reported: AZ, EMA, EWA, GA, IN, KS, LA, MDC, MI, MT, NC, NLI, NM, NTX, NV, OH, OK, SD, SFL, SNJ, SV, VA, WPA, WTX, WV. (Dec 2008) WWA.

Brass Pounders League

The BPL is open to all amateurs in the US, Canada and US possessions who report to their SMs a total of 500 or more points or a sum of 100 or more origination and delivery points for any calendar month. Messages must be handled on amateur radio frequencies within 48 hours of receipt in standard ARRL radiogram format. Call signs of qualifiers and their monthly BPL total points follow.

KK3F 1793, N1IQI 1674, W1GMF 1607, W4ZJY 1331, K7BDU 1367, KA9EKG 1318, WB5NKD 963, WB9NKC 926, KW1U 908, W8UL 837, N1UMJ 816, WB5ZED 705, NU8K 547, NR2F 516, WB9JSR 507. BPL by originations plus deliveries: KK5GY 185, NM1K 122.

SILENT KEYS

It is with deep regret that we record the passing of these amateurs:

KB1BFY **Hinkson**, Arthur W., Southbury, CT
♦NN1C **Woodbridge**, Deborah W., Cody, WY
♦W1EA **Galin**, Julius L., West Hartford, CT
K1HYL **Quist**, Oliver P., Keene, NH
W1KZS **Curry**, Ernest E., Port Orange, FL
W1LEW **Woodaman**, Lewis E., Center Harbor, NH
KR1P **Brown**, Wilfred E. III, Okeechobee, FL
N1SW **Piche**, Ernest E. Jr, Warwick, RI
WA1UQK **King**, Isabelle G., North Adams, MA
W2AZ **Robinson**, Harry W., Vineland, NJ
W2GGH **Stephan**, Henry C., Bradenton, FL
W2GUS **Bendler**, August, Homosassa, FL
W2HYQ **Brayden**, James M., Cooperstown, NY
K2IH **Falcioni**, Guy L., South Plainfield, NJ
♦W2JLO **Lawton**, Burtis E., Vero Beach, FL
W2JLW **Riley**, Leonard J., Somerset, NJ
W2KFC **Miles**, Leon T., Vienna, VA
W2LR **Sobus**, Richard J., Melbourne, FL
N2LTI **Gauvin**, Hervey P., Penfield, NY
WB2MVK **Mateo**, Louis R., Far Rockaway, NY
W2PUX **Brohman**, Joseph J., Buffalo, NY
W2SLW **Rich**, Edward, Trenton, FL
K2SQI **Hassett**, David I., Henrietta, NY
NY2X **Huffer**, Charles A., Springdale, AR
W3CD **Okas**, Robert P., Menlo Park, CA
♦N3DQX **McKinney**, Ronald W., Yantis, TX
K3EAT **Eicher**, Calvin E., Mount Pleasant, PA
N3FAL **Trutt**, William H., Thomasville, PA
W3HYL **Riddell**, Eugene C., Essington, PA
K3KAW **Burne**, Richard N., Clarks Summit, PA
♦W3KVI **Pindroh**, Sylvester A., Valencia, PA
W3LEO **Boberschmidt**, Leo, Kensington, MD
KM3N **Dabagian**, B. Romona, Clearwater, FL
W3QWU **Seibel**, Hazen "Si" J., Pittsburgh, PA
W3SR **Thyberg**, Robert C., Annapolis, MD
W3USP **Zanin**, Bruno P., Greenbelt, MD
W3WBY **Shisler**, James H., Floral City, FL
W3WTQ **Packham**, David A., Baltimore, MD
K4AQW **Sanial**, James A., Homosassa, FL
AD4AZ **Faust**, William, Savannah, GA
K4CAF **Fuseler**, Cheryl A., Hollywood, SC
W4EMB **Goldblatt**, Marshall B., Miami, FL
♦WD4IME **Cross**, Kenneth M., Meadowview, VA
AD4JC **Dalton**, Robert E., Camden, TN
W4KB **Freret**, L. Dell, Lucedale, MS
K4KVP **Bell**, Benjamin Paul, Waupaca, WI
WA4LZD **Godwin**, Ermon H. Jr, Dunn, NC
KA4MXM **Ivey**, Richard, Macon, GA
W4NCN **Kirkland**, Donald G., Tavares, FL
KB4NTE **Goodloe**, Virginia S., Kent, WA
KE4OSU **Frasso**, John J., Tampa, FL
N4QYU **Masterson**, Spero, Louisville, KY
K4SCI **Sims**, Eric, Birmingham, AL
KS4TK **Smith**, Edward C. Jr, Norfolk, VA
N4TNZ **Montgomery**, Florence M., Atlanta, GA
WA4UKU **Burchfield**, Walter R. Jr, Garfield, NJ
AE4VT **Jordan**, Garland, Louisville, KY
KI4WXQ **Ingram**, Robert L., Lexington, NC
KG4X **Corbett**, Hugh David, Winfield, AL
WB4YEL **Whaley**, Vernon G., Cleveland, TN
W4ZGA **Faniola**, John J., Bristol, TN
KD5BZ **Fernandes**, Richard L., Coahoma, MS
WB5CEW **Puckett**, Lawrence E., Utica, MS
K5DXV **Clute**, Millard G. Sr, Jewett, TX
W5EWN **Zingery**, Gordon W. Sr, Houston, TX
W5FOA **McClellan**, Alan B., Fort Worth, TX
KC5HRN **Tatsch**, Hubert, Boerne, TX
W5KJI **Sitton**, Robert J. Jr, Bedford, TX
KD5PSX **Ragland**, Lynn, Malvern, AR
♦KE5TF **Walworth**, Linda G., Spring, TX
WB5TKE **Treadaway**, Bill M., Lamesa, TX
♦W5UBU **Anderson**, William O., Deming, NM
KB5UF **Barnes**, Philip G., Kerrville, TX
KE5UKE **Threadgall**, Paul S., Onalaska, TX
KB5WEJ **Thompson**, Edward R., New Caney, TX
NC5Y **Tew**, George T., Jackson, MS
KD6AAT **Winkler**, Harold, Danville, CA
W6BEV **Suhrbier**, Beverly J., Hot Springs, AR
KZ6DK **Kustiner**, Daniel J., North Zulch, TX
♦K6DMF **Reed**, Preston A., Auburn, CA
K6DUJ **Wright**, John C., San Diego, CA
W6DY **Parker**, Joe K. Jr, Stockton, CA
W6EEN **Doughty**, Donald L., Bermuda Dunes, CA
W6FZO **Strieter**, Edgar H., Lafayette, CA
W6GVM **Malek**, Emil F., Sacramento, CA
KJ6J **Connell**, John H., Newport Beach, CA
KH6JVD **Newcomer**, George F., McMinnville, OR
AE6KR **Hood**, Michael D., Blythe, CA
K6OJR **May**, Richard M., Concord, CA
♦W6PK **Krogman**, Harry M., Sebastopol, CA
KB6PS **Cohen**, Robert, Pleasant Hill, CA
W6TWL **Haist**, Charles T., Walnut Creek, CA
KK6XJ **Palmer**, John H., Cedar Ridge, CA
KB6YX **Becker**, Wilhelm, Rancho Cordova, CA
WB7EJQ **Johnson**, Brian J., Sheridan, WY
KT7E **Uthus**, Ken, Sun City West, AZ
W7FG **Gompf**, Gary N., Bartlesville, OK
AA7FK **Jensen**, Robert O., Portland, OR
W7FNA **Ellis**, Robert W., Burien, WA
KE7JDG **Keel**, William R., Fort Wayne, IN
KA7SLR **Marshall**, Richard S., Seattle, WA
KD7UTC **McClune**, Sherrilyn J., Tumwater, WA
N7VBJ **Nadeau**, Paul M., Milton, WA
N7ZLI **Satalich**, Bergetta C., Amity, OR
W8DL **Lemley**, Donald G., South Charleston, WV
WB8GAO **Nalezyty**, Walter A. Jr, Reed City, MI
N8GOX **Jordan**, Darrell E., Mount Vernon, OH
K8IYZ **Pohl**, Glenn A., Homosassa Springs, FL
AE8L **Hunnel**, Walter S., Lawrence, KS
W8PHW **Vance**, Owen D., Dayton, OH
KB8VSR **Worth**, Jeremy S., McCutchenville, OH
WA8WAK **Howald**, Christian G., Chester, VT
N9CLG **Pliner**, Ed J., Pittsville, WI
W9FZW **Jones**, John C., Camden, TN
N9IL **Harper**, William C., Quincy, IL
W9KYC **Buser**, Robert E., Mount Morris, IL
KB9OBO **Erskine**, Daniel C., Elkhorn, WI
N9VBF **Bunting**, Donald J., Highland, IN
WDØANN **Ellington**, Elsie Jean, Garden City, KS
NØBB **Gentle**, Joseph J., Cedar Rapids, IA
WØBU **Frantz**, Ivan D. Jr, Saint Paul, MN
ABØBZ **Landberg**, Gale R., Mound, MN
WBØCXY **Redhage**, James H., Bowling Green, MO
WØIKR **Graham**, Norman L., Mount Vernon, IA
KØIOU **Fisher**, Marvin L., Mexico, MO
WØJEM **Miller**, John E., Hugo, MN
NØKXL **Layman**, Ray L., Berryton, KS
♦AAØLD **Wolfe**, James D., Edgemont, SD
KIØNC **Parsons**, Harold M., Saint Paul, MN
NØNNI **Harrington**, Robert N. Jr, Claremont, NH
WØRBO **Campbell**, Marc T. Jr, San Diego, CA
KAØTYP **Johnston**, Ilene M., Saint Cloud, FL
VA3ZJ **Donohue**, Wilbert, Elliot Lake, ON, Canada
♦G3JAG **Crux**, John A., Manchester, Great Britain
DF8PG **Nussbickel**, Ottwin, Worrstadt, Germany

♦ 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

USA AND IARU-R2 ARDF CHAMPIONSHIPS JUNE 5-7 NEAR BOSTON

◊Registration is now open for the next USA ARDF Championships, June 5-7, 2009. Radio-orienteers of all skill levels will gather for a practice day, followed by two days of intense competition, first on 2 meters and then on 80 meters. This year's USA Championships are being combined with the championships of International Amateur Radio Union Region 2 (North and South America).

Visitors from any country are welcome. The events are open to all persons, with or without a ham license.

Site of the contests will be the Blue Hills Reservation, a 7000 acre open space about 10 miles south of downtown Boston, Massachusetts. To encourage first-timers and foreign visitors, the competition fee will be waived for persons who have never participated in the USA ARDF Championships and for persons coming from outside North America.

The championships Web site, with registration form, is **www.bostonardf.org**. More information about ARDF in the USA is at **www.homingin.com**. — *Joe Moell, KØOV, USA ARDF Coordinator*

WEB PAGE AVAILABLE FOR SECOND ARRL HOMEBREW CHALLENGE Q&A

◊The second ARRL Homebrew Challenge was announced on page 75 of the February 2009 issue. This challenge is to build a 5 W to 50 W linear amplifier, perhaps to follow the 5 W CW/SSB transceiver from the first Homebrew Challenge — for under $125.

While the basic rules and evaluation criteria were provided in the original announcement, there are always questions on interpretation. We have thus again provided a Web resource to provide the questions and answers to all interested participants.

The Web site can be found at **www.arrl.org/qst/hbc**. Answers provided should be considered a part of the rules and are binding on all entrants. — *Joel R. Hallas, W1ZR, Technical Editor, QST*

STAMP SITE

◊Don Hillger, WDØGCK, has been putting Amateur Radio-related stamps online at **www.cira.colostate.edu/cira/RAMM/hillger/amateur-radio.htm**.

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/qst/glossary.html**.

A 20 Meter Moxon Antenna

Balun — *Bal*anced to *un*balanced transition. Generally used to convert signals from a balanced feed line to coax by eliminating any common mode currents that would flow on the outside of the coax. Versions are made from either transformers or chokes.

Counterpoise — Artificial ground system raised above earth ground and typically used as one side of the connection to a vertical monopole antenna.

E-skip — Slang for ionospheric propagation via the E layer. Sporadic-E or E_S propagation occurs when highly ionized regions in the E-layer form or move to be halfway between terrestrial stations. E_S occurs on 10 meters through low UHF bands.

SWR — Standing wave ratio. Measure of the ratio between maximum and minimum voltage on a transmission line over distance along the line.

S-unit — Unit of measure on S-meter. Each S-unit is intended to represent a factor of 2 in input voltage at the receiver antenna terminals.

VHF/UHF Century Club — An award abbreviated VUCC, presented to amateurs who make confirmed contact with at least 100 grid squares on the VHF and UHF bands. For details, see **www.arrl.org/awards/vucc/**.

Yagi — Multielement directive antenna array in which one or more elements are driven by connection to a transmission line and the others are parasitically coupled. Yagis are generally characterized by high gain for their size accompanied by narrow operating frequency range.

2008 ARRL International EME Competition Results

Apogee — Orbit's point of maximum altitude.

[1]*The ARRL Handbook for Radio Communications,* 2009 Edition. Available from your ARRL dealer or the ARRL Bookstore, ARRL order no. 0261 (Hardcover 0292). Telephone 860-594-0355, or toll-free in the US 888-277-5289; **www.arrl.org/shop/**; **pubsales@arrl.org**.

Path loss — Amount by which a received signal is weaker than the transmitted signal over a given communications path, usually expressed in decibels.

Perigee — Orbit's point of minimum altitude.

$500 Audio from a $5 Boom Arm Mic

Electret — Kind of microphone element consisting of a small acoustic driven capacitor mic integrated into a high gain preamplifier.

Pop screen — Acoustical membrane at front of microphone designed to keep high frequency breath and wind sounds from reaching a microphone element.

RFI — Radio frequency interference. Harmful or annoying interference reaching the receiver of an Amateur Radio station or other type of sensitive equipment.

RG-174 — Miniature 50 Ω coaxial cable with width about ⅛ inch.

Trimline — Trade name of compact Western Electric subscriber telephone set popular as a bedside or wall phone from the 1950s.

Bringing an Early Solid State Transceiver into the 21st Century

Direct digital synthesis (DDS) — Method of digitally generating a waveform of a specific frequency through direct calculation of the amplitude of the sinusoid as a function of time. See **sss-mag.com/dds.html** for more information.

DSP noise reduction — Digital signal processing mechanism that reduces non-coherent noise in favor of content that it can ascertain are signals.

Notch filter — Circuitry that is intended to remove a signal of a specific (usually adjustable) frequency without removing desired signal content on either side. This can be implemented as a DSP process, or using sharp analog components.

Permeability tuned oscillator (PTO) — Variable frequency tuning element with frequency determined by an L-C circuit in which the inductance, rather than the usual capacitance, is changed to make a change in frequency. This is usually done through moving a metal slug into the inductor through a finely threaded lead screw.

PIN attenuator — Device that can reduce the level of a signal, usually in small steps, through the application of voltage to PIN diodes that are used to switch in various values of resistance.

Speech processor — Circuitry that automatically adjusts the gain of a transmitter speech amplifier to maintain a more constant modulation level thereby increasing the average transmitted power.

Switching mode power supply — Power supply design type that uses the input power to operate an oscillator, usually operating in the tens of kHz, to allow use of smaller and lighter transformers.

Voltage variable capacitor (varicap) — Reverse biased diode that uses the junction capacitance as a variable capacitor controlled by the magnitude of the applied bias voltage.

Hairpin Tuners for Matching Balanced Antenna Systems

Balanced feeders — Transmission line in which the two conductors are balanced with respect to ground. This is in contrast to coaxial cable in which the outer conductor or shield is at ground potential.

Butterfly capacitor — Variable capacitor in which there are dual stators, one on each side of the center. The rotor has a shape similar to a butterfly with wings extended.

Johnson Matchbox — Trade name for a 1950s era wide range antenna tuner designed for balanced loads.

Open wire ladder line — Type of balanced feeder or transmission line composed of two equal sized conductors held at a defined distance apart by occasional bar shaped insulators.

Split stator capacitor — Multisection variable capacitor in which the non-movable (stator) plates are in sections so that multiple capacitors are provided.

Transmatch — Adjustable impedance matching device used to transform the impedance of an antenna system to that desired by a radio system. Sometimes called an *antenna tuner*.

TV twin lead — Type of transmission line used for almost all TV receive antennas before the advent of coaxial cable. Twinlead was a balanced line with two conductors separated by a plastic web of about ½ inch width. Some amateurs used this line for antenna connections.

Window line — Similar to open wire line, except the material holding the conductors apart is similar to that of TV twinlead, except windows are cut between the two pieces to reduce dielectric loss.

Where is Bob?

Automatic position reporting system (APRS) System that accepts global positioning system (GPS) position data from a GPS satellite receiver and processer, formats it into an AX-25 packet for transmission via Amateur Radio, usually on 144.39 MHz. Position data is available via radio or over the Internet. See **www.arrl.org/tis/info/HTML/aprs/pos-reporting.html** for more information.

Digipeater — Radio repeater station that receives and transmits data packets on the same frequency. It receives each packet, stores it and then retransmits it to the next station in the digital packet network.

Terminal node controller (TNC) —Dedicated hardware device under firmware control that translates packet digital communication to and from a computer type terminal.

XML — EXtensible markup language, a structured data format designed to facilitate the transport and storage of data. QST

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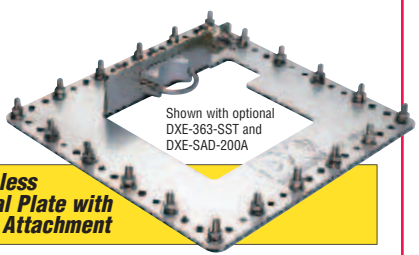

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- Patented high current coax connection to radials

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- High strength Type 6063-T832 drawn aluminum tubing
- Sections with 0.058 inch wall thickness are perfect for telescoping antenna elements
- Most sizes are pre-slit on one end for element clamps
- Available in 3 and 6 foot lengths

Aluminum Tubing, 0.058" Wall, 3 Foot Length

Part Number	Diameter/End Type	Price	Cost/Foot
DXE-AT1240	0.375", no slit	$2.70	$0.90
DXE-AT1241	0.500", one end slit	$3.30	$1.10
DXE-AT1242	0.625", one end slit	$3.60	$1.20
DXE-AT1243	0.750", one end slit	$3.90	$1.30
DXE-AT1244	0.875", one end slit	$4.20	$1.40
DXE-AT1245	1.000", one end slit	$4.50	$1.50
DXE-AT1246	1.125", one end slit	$4.95	$1.65
DXE-AT1247	1.250", one end slit	$5.55	$1.85
DXE-AT1248	1.375", one end slit	$6.15	$2.05
DXE-AT1249	1.500", one end slit	$6.75	$2.25
DXE-AT1250	1.625", one end slit	$7.65	$2.55
DXE-AT1251	1.750", one end slit	$8.40	$2.80
DXE-AT1252	1.875", one end slit	$9.15	$3.05
DXE-AT1253	2.000", one end slit	$9.90	$3.30
DXE-AT1254	2.125", one end slit	$11.40	$3.80

Aluminum Tubing, 0.058" Wall, 6 Foot Length

Part Number	Diameter/End Type	Price	Cost/Foot
DXE-AT1189	0.375", no slit	$5.40	$0.90
DXE-AT1205	0.500", one end slit	$6.60	$1.10
DXE-AT1206	0.625", one end slit	$7.20	$1.20
DXE-AT1207	0.750", one end slit	$7.80	$1.30
DXE-AT1208	0.875", one end slit	$8.40	$1.40
DXE-AT1209	1.000", one end slit	$9.00	$1.50
DXE-AT1210	1.125", one end slit	$9.90	$1.65
DXE-AT1211	1.250", one end slit	$11.10	$1.85
DXE-AT1212	1.375", one end slit	$12.30	$2.05
DXE-AT1213	1.500", one end slit	$13.50	$2.25
DXE-AT1214	1.625", one end slit	$15.30	$2.55
DXE-AT1215	1.750", one end slit	$16.80	$2.80
DXE-AT1216	1.875", one end slit	$18.30	$3.05
DXE-AT1217	2.000", one end slit	$19.80	$3.30
DXE-AT1218	2.125", one end slit	$22.80	$3.80

Aluminum Tubing, 2.000" Diameter, 0.125" Heavy Wall

Part Number	Length/End Type	Price	Cost/Foot
DXE-AT1255	3', no slit	$14.85	$4.95
DXE-AT1204	6', no slit	$29.70	$4.95

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DXE-ECL-020	1/2" and smaller tubing	$1.90
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DXE-ECL-060	3/4" and 7/8" tubing	$1.90
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DXE-ECL-16SS	1 3/8" and 1 1/2" tubing	$1.90
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DXE-ECL-28SS	2 1/8" and 2 1/4" tubing	$1.90
DXE-ECL-32SS	2 3/8" and 2 1/2" tubing	$1.90
DXE-ECL-36SS	2 5/8" and 2 3/4" tubing	$1.90
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- Use with DXE Insulated Base Assemblies

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Standard Base

- Tilt Base optional
- Two DXE-CAVS-1P mounting clamps required to attach base to mounting post

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Combine two identical receiving antennas to create a directional pattern—enables you to adjust the antenna pattern as if you were moving your antennas

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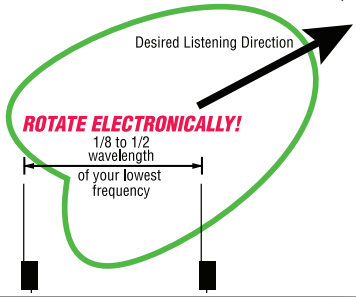
- Works on all modes, 300 kHz to 30 MHz
- Provides power for external active antennas
- Input for mute on transmit

DXE-NCC-1	Receive Antenna Variable Phasing Controller	**$495.00**
DXE-AAPS-1P	Active Antenna Phasing System with Controller	**$995.00**



Complete Receive Four-Square Package with DXE-ARAV2-4P Active Antenna Kit

- 4 Active Vertical Antennas
- RFS-2 Four Square Switch
- CC-8 Controller
- 1,000 ft. of direct-bury F6, 75 Ω CATV Coax
- 25 Snap-N-Seal Coax Connectors
- Snap-N-Seal Connector Crimp Tool
- Coax Prep Tool

DXE-RFS-TS2P	Complete Receive Four-Square Package	**$1,525.00**

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DXE-F6-1000	75 Ω, F6 style direct bury flooded cable, 1,000 ft.	**$149.95**
DXE-F6-CTL	75 Ω F6 cable by the foot	**$0.19/ft.**
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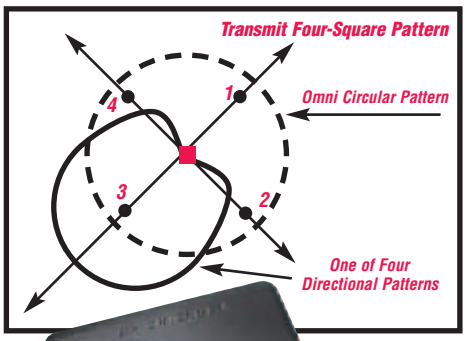

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- Classic Hybrid design—easy to install
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- Hot switching lock-out—disables amplifier while switching
- Drop-in replacement for Comtek—easy upgrade
- Proven DX Engineering RF relays—high performance
- RF Shielded weatherproof housing—unique protection

DXE-TFS4-160	160 Meter Four-Square Controller with Control Console	**$499.00**
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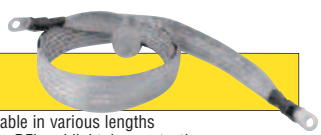

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- Ideal for vehicle noise reduction with mobile systems, ground radial plate or balun to antenna
- Preassembled with lugs for both #10 and 1/4" bolt sizes
- Call to order custom cable/connector assemblies

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- 8-position switch, controller included
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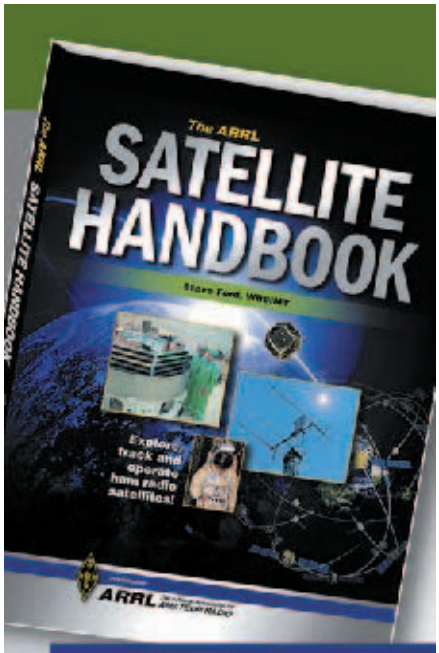

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• AA Battery Case • Memories: 107

IC-T90A 6M/2M/440 Triband FM HT

• TX: 50-54, 144-148, 420-450 MHz • RX: 0.495-999 MHz (cell blkd) • Power: 0.5-5W • Memories: 555

IC-718 All Band HF Transceiver

• TX: HF • RX: 0.03-30 MHz • Power: 5-100W
• Memories: 101 • DSP built-in
• SSB, CW, RTTY and AM (40W)

IC-756PROIII HF/6M Base

• TX: HF/6M • RX: 0.03-60 MHz • Power: 5-100W
• Memories: 101 • 5 inch color screen • 32-bit floating DSP
• Real time spectrum scope • Automatic antenna tuner
• Improved 3rd order intercept point

PW-1 HF/6M 1KW Linear Amplifier

• TX: 160-15M/6M • Power: 1000W (180-264 VAC), 500W (90-132 VAC) • Automatic band change & antenna tuner • Easily connects to any current Icom HF transceiver • Two input & Four output connectors

IC-V8000 2M FM Mobile

• TX: 144-148 MHz • RX: 136-174 MHz
• Power: 75/25/10/5W • Memories: 207

IC-208H 2M/440 FM Mobile

• TX: 144-148, 430-450 MHz
• RX: 118-173, 230-549, 810-999 MHz (cell blk)
• Power: 55/15/5W (2M), 50/15/5W (440 MHz)
• Memories: 512

IC-7000 Multiband Multimode Mobile

• TX: HF/6M/2M/440 MHz • RX: 0.03-199, 400-470 MHz
• Power: 100W (HF/6M), 50W (2M), 35W (440 MHz)
• Memories: 503 • 41 band-widths with sharp or soft filter shape • RMK-7000 included!

IC-7800 Multimode HF/6M Base

• TX: HF/6M • RX: 0.03-60 MHz • Power: 5-200W
• Memories: 101 • 7" color screen • Four 32-bit floating DSPs
• Two identical receivers • Three roofing filters
• External VGA connector • Automatic antenna tuner

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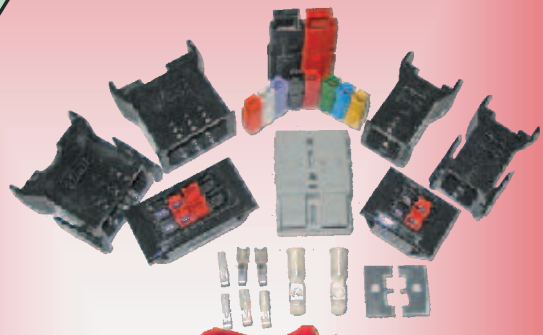

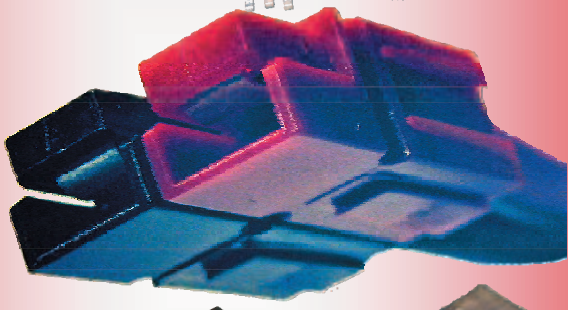

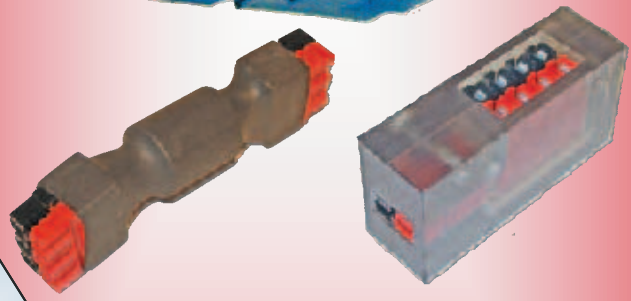

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VX-170 2M FM HT

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- Power: 5/2/0.5W • Memories: 200
- Extra large LCD display & speaker

VX-8R Quad-band HT

- TX: 50-54, 144-148, 222-225, 430-450 MHz
- RX: 0.5-999 MHz (cell blkd) • Memories: 1200+
- Power: 5/2.5/1/0.05W (1.5W on 220)
- Optional GPS Antenna Unit FGPS-2 provides you with real time APRS® data. You may display your exact current position (latitude and longitude), heading direction, moving speed, altitude, and more.

FT-8800R 2M/440 FM Mobile

- TX: 144-148, 430-450 MHz
- RX: 108-520, 700-999 MHz (cell blkd)
- Power: 50/20/10/5W (2M), 35/20/10/5W (440 MHz)
- Memories: 1000 • Crossband repeat
- YSK-8900 included!

FT-8900R Quad-Band FM Mobile

- Same as FT-8800R but TX: 28-29.7, 50-54, 144-148, 430-450 MHz and RX: 28-29.7, 50-54, 108-180, 320-480, 700-985 MHz (cell blkd • YSK-8900 included!

FT-857D 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-2800M 2M FM Mobile

- TX: 144-148 • RX: 137-174
- Power: 65/25/10/5W • Memories: 221

FT-897D 100W HF/VHF/UHF Portable

- TX: HF/VHF/UHF • RX: 0.1-56, 76-108, 118-164, 420-470 MHz • Power: 5-100W (HF/6M), 5-50W (2M), 5-20W (440 MHz) • Memories: 200

FT-7800R 2M/440 FM Mobile

- TX: 144-148, 430-450 MHz
- RX: 108-520, 700-999 MHz (cell blkd)
- Power: 50/20/10/5W (2M), 40/20/10/5W (440 MHz)
- Memories: 1055 • YSK-7800 included!

FT-2000 100W HF/6M Base

- TX: HF/6M • RX: 0.03-60 MHz • Power: 10-100W
- Memories: 99 • Auto Antenna Tuner • 32-bit Floating Point DSP • Dual In-Band Receive • Internal Power Supply

FT-2000D 200W HF/6M Base

- FT-2000 except RF output is 200W and supplied power supply is external

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TM-271A 2M FM Mobile

- TX: 144-148 MHz • RX: 136-174 MHz
- Power: 60/25W • Memories: 200

TM-V71A Dualband FM Mobile

- TX: 144-148, 430-450 MHz
- RX: 118-524, 800-1300 MHz (cell blkd)
- Power: 50/10/5W • Dual receive (V+V) (U+U)
- Cross-band repeat • EchoLink® ready
- $30 off DFK-3D detachable front panel kit when purchased on the same invoice! ©

TM-D710A

Dualband FM Mobile w/TNC

- TX: 144-148, 430-450 MHz
- RX: 118-524, 800-1300 MHz (cell blkd)
- Power: 50/10/5W • Dual receive (V+V) (U+U)
- Built-in TNC for APRS (needs GPS)
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- Import extra POI's with no extra costs
- Kenwood ready APRS cable included

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TH-K2AT

TH-F6A

TH-K2AT 2M FM HT

- TX: 144-148 • RX: 136-174
- Power: 5/1.5/0.5W • Memories: 100

TH-F6A Triband FM HT

- TX: 144-148, 222-225, 438-450 MHz
- RX: 0.1-1300 MHz (cell blkd) • Power: 5/0.5/0.05W
- Memories: 435 • Dual band RX

TS-480HX

200W HF/6M Mobile/Base

- TX: HF/6M • RX: 0.5-60 MHz
- Power: 10-200W (with two optional 22A PS's)
- Memories: 99 • IF/stage DSP on main band, AF/stage DSP on sub-band

TS-480SAT

100W version with built-in auto antenna tuner.

TS-2000 100W HF/VHF/UHF Base

- 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 high-tech "silver box" look & no front panel controls. Includes PC control software.

TS-2000X

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HF, 6M,2M, 440

RMK 7000

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IC-92AD
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D-STAR ★ Compatible

IC-91AD
D-Star compatible.

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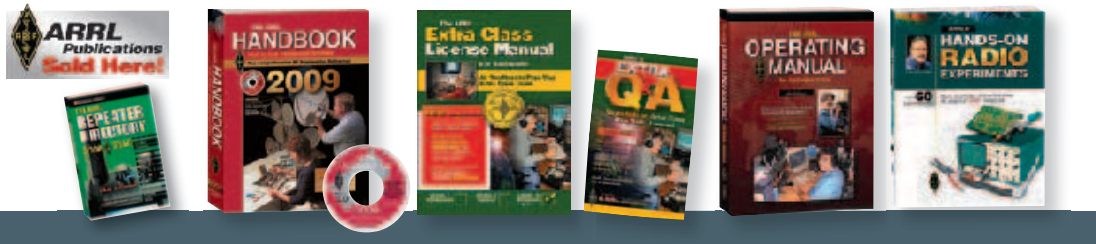

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VL-1000
High performance linear amplifier covers 160 to 15 and the 6 meter amateur bands

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FT-8800R
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FT-1802M
144-148MHz
50 watt mobile

VR-5000
2000 Memories 100 kHz to 2600 MHz (2.6 GHz) less cellular

FT-817ND
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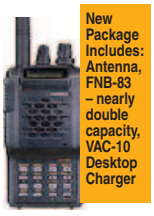

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FT-897D
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Always looking to make our products better and more useful, LDG's popular AT-7000 tuner has been upgraded to the IT-100. Still matched in size to the IC-7000 and IC-706, the IT-100 now sports 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***

Z-11Pro

The original portable Z-11 was one of LDG's most popular tuners, accompanying adventurous hams to their backyards, or to the ends of the earth. Now meet the Z-11Pro, everything you always wanted in a small, portable tuner. Designed from the ground up for battery operation. Only 5" x 7.7" x 1.5", and weighing only 1.5 pounds, it handles 0.1 to 125 watts, making it ideal for both QRP and standard 100 watt transceivers from 160 - 6 meters. With an optional LDG balun, it will also match longwires or antennas fed with ladder-line. All cables included. ***Suggested Price $179***

NEW! Z-817

The ultimate autotuner for QRP radios including the Yaesu FT-817(D). Tuning is simple; one button push on the tuner is all that is needed - the Z-817 takes care of the rest. It will switch to PKT mode, transmit a carrier, tune the tuner, then restore the radio to the previous mode! 2000 memories cover 160 through 6 meters. The Z-817 will also function as a general purpose antenna tuner with other QRP radios. Just transmit a carrier and press the tune button on the tuner. Powered by four AA internal Alkaline batteries (not included), so there are no additional cables required. A coax jumper cable is also induced for fast hook up. ***Suggested Price $129.99.***

AT-100Pro

This desktop tuner covers all frequencies from 1.8 – 54 MHz (including 6 meters), and will automatically match your antenna in no time. It features a two-position antenna switch, allowing you to switch instantly between two antennas. The AT-100Pro requires just 1 watt for operation, but will handle up to 125 watts. All cables included. ***Suggested Price $219***

See AT-1000Pro Review in Nov. '08 CQ

AT-1000Pro

Building on the success of the AT-1000, LDG Electronics has refined and expanded its 1KW tuner. 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. All cables included. ***Suggested Price $599***

NEW! KT-100

LDG's first dedicated autotuner for Kenwood Amateur transceivers. Easy to use - just right for an AT-300 compatible Kenwood transceiver. The KT-100 actually allows you to use the Tune button on the radio. The LEDs on the front panel indicate tuning status, and will show a match in seconds, or even less of you've tuned on or near that frequency before. Has 2,000 memories for instant recall of the tuning parameters for your favorite bands and frequencies. If you have an AT-300 compatible Kenwood radio, you can simply plug the KT-100 into your transceiver with the provided cable; the interface powers the tuner, and the Tune button on the radio begins a tuning cycle. The supplied interface cable makes the KT-100 a dedicated tuner for most modern Kenwood transceivers. ***Suggested Price $199.99***

NEW! Z-100Plus

LDG's popular Z-100 economy tuner is now the Z-100Plus. Still 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***

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. All cables included. ***Suggested Price $249***

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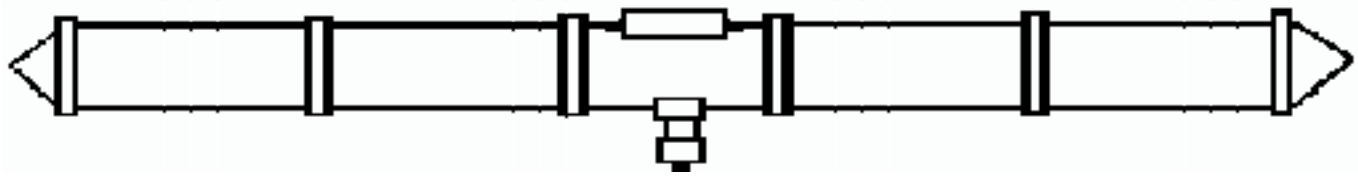

Barker & Williamson BWD90 (BWD1.8-30)

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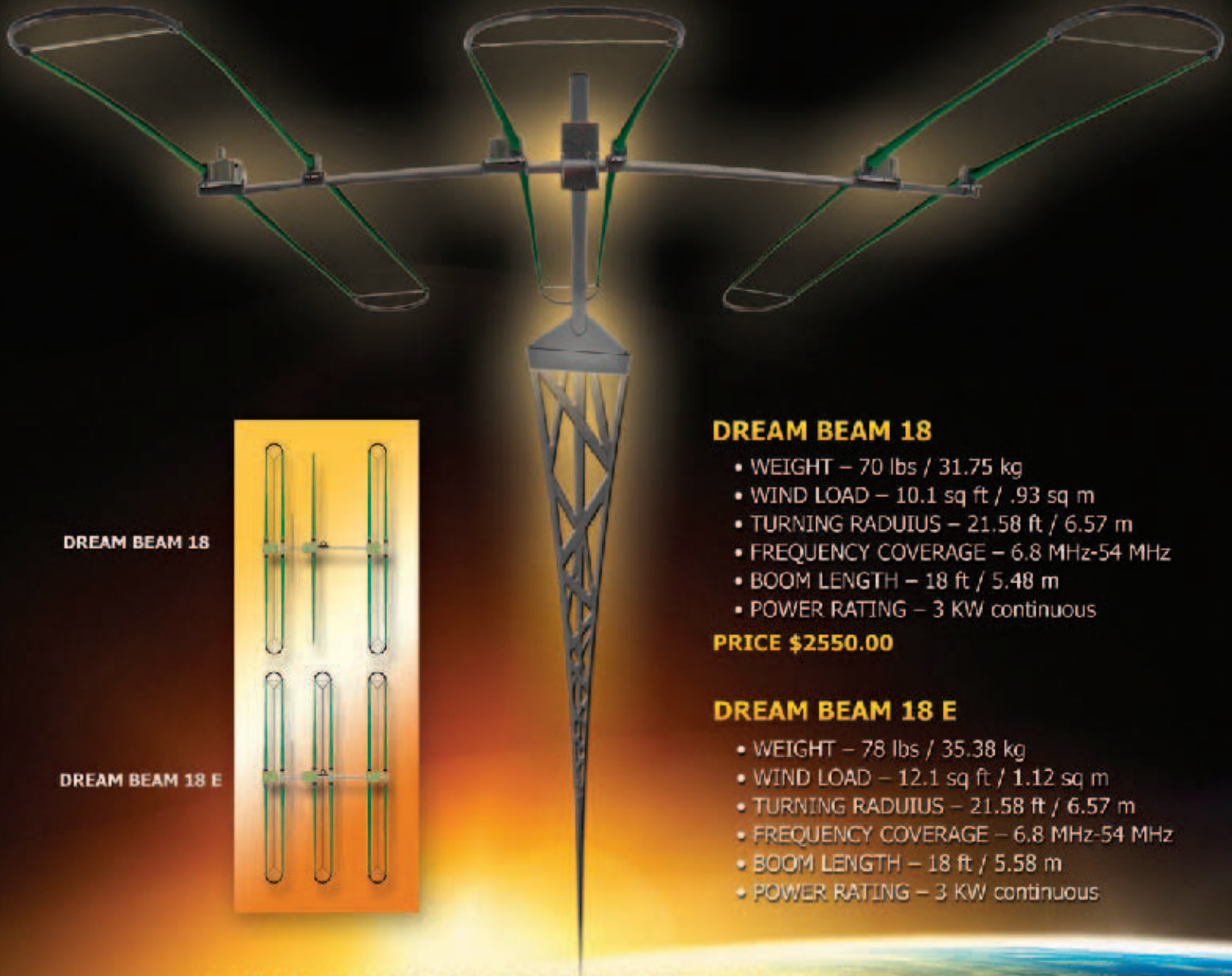

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DREAM BEAM 18 E

DREAM BEAM 18

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- TURNING RADUIUS – 21.58 ft / 6.57 m
- FREQUENCY COVERAGE – 6.8 MHz-54 MHz
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- POWER RATING – 3 KW continuous

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Picture is an artistic rendition to show the entire antenna.

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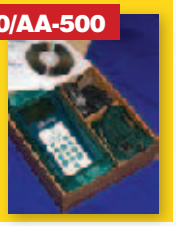

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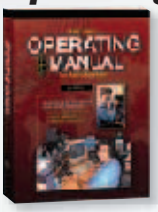

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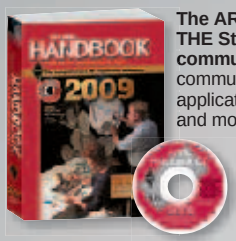

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Your participation in ARRL enables us to represent and serve you as we have since 1914. The traditions of ARRL and Amateur Radio are rich indeed.... and your continuing support keeps those cherished traditions alive—and helps us open the doors to new opportunities.

Become part of the Diamond Club and invest in our flexibility to apply your contribution where it is needed most—in the ARRL Lab, at W1AW, to protect our frequencies or to provide services and programs to support Amateur Radio.

It's a question of the personal responsibility we have for each other and for the continuing health and strength of ARRL. I am confident that you will do your part and be as generous as you are able.

Thank you! I look forward to welcoming you into the Diamond Club by mail, by phone or on the web at: **www.arrl.org/diamondclub**.

73,

Mary

For more information, contact:

Mary M. Hobart, K1MMH
Chief Development Officer
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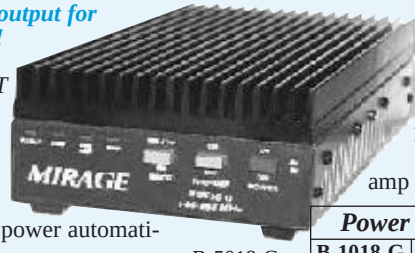

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B-1018-G	25	50	140	150	160	160	--	--	--	--
B-2518-G	5	7	40	60	80	100	125	160	160	160
B-5018-G	--	2	15	25	40	50	70	100	130	160
Watts In	.25	.5	3	5	8	10	15	25	35	50

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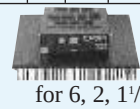

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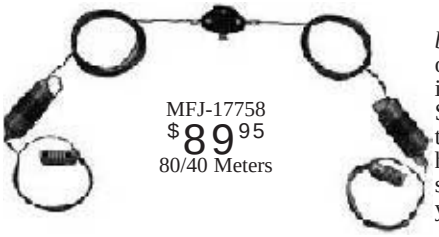

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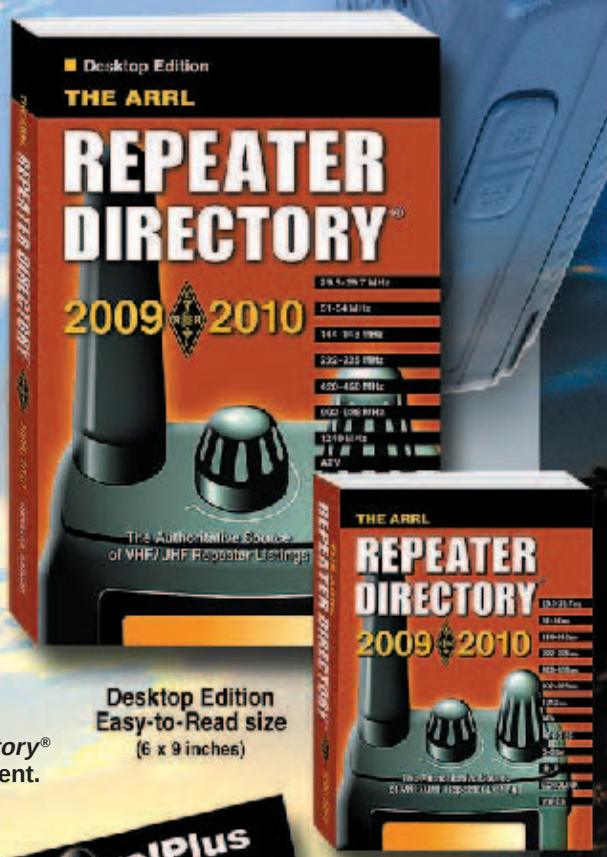

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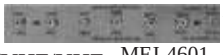
$69.95

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
New!

4 Balanced Line, 2 Coax

4 pairs of high-voltage *ceramic* feed-thru insulators for balanced lines and 2 coax connectors.

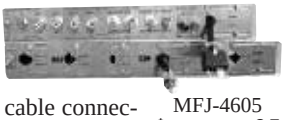
New!
MFJ-4600
$79.95

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
New!

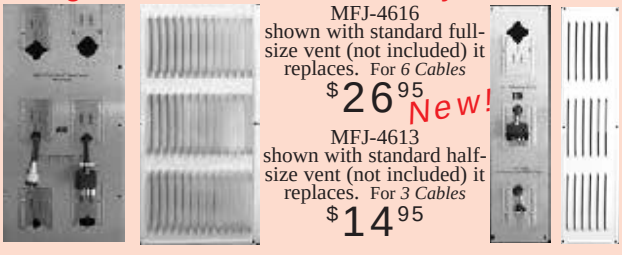
All-Purpose FeedThru/CableThru™



***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
New!

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.

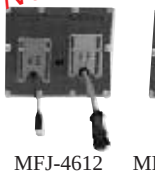
AdaptiveCable™ *Wall Plates*

New!

MFJ-4614
For 4 Cables
$34.95

Bring nearly any cable -- rotator, antenna switch, coax, DC/ AC power, etc. -- through walls *without removing connectors* (up to 1¼x1⅝ inches). Sliding plates and rubber grommets adjust hole size to weather-seal virtually any size cable.

Includes *stainless steel* plates for each side of wall, sliding plates, rubber grommets, weather stripping and screws.



MFJ-4612
For 2 Cables
$24.95

MFJ-4611
For 1 Cable
$14.95

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http://www.mfjenterprises.com for more info, catalog, manuals, dealers

1.8-170 MHz *plus* 415-470 MHz
MFJ HF/VHF/UHF Antenna Analyzer

All-in-one handheld antenna test lab lets you quickly check and tune HF, VHF, UHF antennas anywhere. Covers 1.8-170 MHz and 415-470 MHz

Measures: SWR…Return Loss…Reflection Coefficient…Antenna Resistance(R), Reactance(X), Impedance(Z) and Phase Angle(degrees) . . . Coax cable loss(dB) . . . Coax cable length . . . Distance to short or open in coax … Inductance . . . Capacitance . . . Resonant Frequency . . . Bandwidth . . . Q . . . Velocity Factor . . . Attenuation . . . Has: LCD readout . . . frequency counter . . . side-by-side meters . . . Ni-MH/Ni-Cad charger circuit . . . battery saver . . . low battery warning . . . smooth reduction drive tuning . . . One year No Matter What™ warranty . . .

You can instantly get a complete picture, check and tune any antenna from 1.8 to 170 MHz and 415 to 470 MHz -- an MFJ-269 exclusive -- with this rugged easy-to-use hand-held antenna test lab! You can measure virtually every antenna parameter.

You won't believe its capability and versatility. This rugged handheld unit literally replaces a workbench full of expensive delicate test equipment.

MFJ-269 $389.95

SWR Analyzer

You can read SWR, return loss, reflection coefficient and match efficiency at any frequency simultaneously at a single glance.

Complex Impedance Analyzer

Read Complex Impedance (1.8 to 170 MHz)as series equivalent resistance and reactance (Rs+jXs) or as magnitude (Z) and phase (degrees). Also reads parallel equivalent resistance and reactance (Rp+jXp) -- *an MFJ-269 exclusive!*

Coax Analyzer

You can determine velocity factor, coax loss in dB, length of coax and *distance to short or open in feet (it's like a built-in TDR).*

CoaxCalculator™ lets you calculate coax line length in feet given electrical degrees and vice versa for any frequency and any velocity factor -- *an MFJ-269 exclusive!*

Use any Characteristic Impedance

You can measure SWR and loss of coax with *any* characteristic impedance (1.8 to 170 MHz) from 10 to over 600 Ohms, including 50, 51, 52, 53, 73, 75, 93, 95, 300, 450 Ohms -- *an MFJ-269 exclusive!*

Inductance/Capacitance Meter

Measures inductance in uH and capacitance in pF at RF frequencies, 1.8-170 MHz.

Frequency Counter/Signal Source

You can also use it as a handy frequency counter up to 170 MHz and as a signal source for testing and alignment.

Digital and Analog displays

A high contrast LCD gives precision readings and two side-by-side analog meters make antenna adjustments smooth and easy.

415 to 470 MHz

Range features

Just plug in your UHF antenna coax, set frequency and read SWR, return loss and reflection coefficient simultaneously. You can read coax cable loss in dB and match efficiency.

You can adjust UHF dipoles, verticals, yagis, quads and others and determine their SWR, resonant frequency and bandwidth.

You can test and tune stubs and coax lines. You can manually determine velocity factor and impedances of transmission lines.

You can adjust/test RF matching networks and RF amplifiers without applying power.

Has easy-to-read LCD *logarithmic* SWR bargraph and SWR meter for quick tuning.

Much Better Accuracy

New 12-bit A/D converter gives much better accuracy and resolution than common 8-bit A/D converters -- *an MFJ-269 exclusive!*

Super Easy-to-Use

Select a band and mode. Set frequency. Your measurements are instantly displayed! Smooth reduction drive tuning makes setting

MFJ SWR Analyzer Accessories

MFJ-39C, $24.95.
Tote your MFJ-269 anywhere with this *genuine* MFJ custom carrying case. Has back pocket with security cover for carrying dip coils, adaptors and accessories. Made of special foam-filled fabric, the MFJ-39C cushions blows, deflects scrapes, and protects knobs, meters and displays from harm. Wear it around your waist, over your shoulder, or clip it onto the tower while you work -- the fully-adjustable webbed-fabric carrying strap has snap hooks on both ends. Has clear protective window for frequency display and cutouts for knobs and connectors.

MFJ-66, $24.95.
Plug these MFJ dip meter coupling coils into your MFJ *SWR Analyzer™* and turn it into a sensitive and accurate *band switched* dip meter. Set of two coils cover 1.8-170 MHz depending on your MFJ-269 *SWR Analyzer™*.

MFJ-99C, $40.90.
SWR** Analyzer Power Pack.* 10 Pack MFJ *SuperCell™* Ni-MH batteries, and power supply for SWR analyzers. ***Save $5!

MFJ-98, $60.85.
MFJ-269** Accessory Pack.* MFJ-39C *custom* Carrying Pouch, MFJ-66 dip coils, power supply for MFJ-269. ***Save $5!

MFJ-98B, $88.90.
MFJ-269** Deluxe Accessory Pack.* Complete accessory pack! MFJ-39C Pouch, 10 Ni-MH batteries, dip coils, power supply. ***Save $7!

MFJ-269*PRO™ Analyzer*

MFJ-269*PRO* $419.95 ***NEW!***

Like MFJ-269, but has extended coverage in UHF range ***(430 to 520 MHz)*** and ruggedized cabinet that protects LCD display, knobs, meters and connectors from damage.

MFJ-259B HF/VHF Antenna *SWRAnalyzer™*

The world's most popular antenna analyzer gives you a complete picture of your antenna performance 1.8 to 170 MHz.

It's Super easy-to-use -- makes tuning your antenna quick and easy.

Read antenna SWR, complex impedance, return loss, reflection coefficient. Determine velocity factor, coax cable loss in dB, length of coax and distance to a short or open in feet. Read inductance in uH and capacitance in pF at RF frequencies.

MFJ-259B $289.95

Large easy-to-read two line LCD screen and side-by-side meters clearly display your information. Built-in frequency counter, Ni-Cad charger circuit, battery saver, low battery warning and smooth reduction drive tuning.

Free MFJ Catalog

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MFJ *IntelliTuner*™ Automatic Tuners

More hams use MFJ tuners than all other tuners in the world!

World's most advanced Automatic Antenna Tuners feature world renowned MFJ AdaptiveSearch™ and AutomaticRecall™ algorithms -- world's fastest ultra-wide range tuning. Nine World Class models! Choose your features: Digital/Analog/Audio SWR-Wattmeter, Antenna Switch, Balun, Radio Interface, Digital frequency readout, Remoteable, Coax/Balanced Lines/Wire Tuning, Field Upgradeable . . .

MFJ-993B 300 Watt *IntelliTuner*™

The World's Best Selling Automatic Antenna Tuner!

The MFJ-993B *IntelliTuner*™ lets you tune any antenna -- balanced or unbalanced -- *automatically* and *ultra fast*.

It's a comprehensive automatic *antenna tuning center* complete with SWR/Wattmeter, antenna switch for two antennas and 4:1 current balun for balanced lines.

MFJ's exclusive *IntelliTuner*™, *Adaptive Search*™ and *Instant Recall*™ algorithms give you *ultra fast* automatic tuning with over 20,000 *VirtualAntenna*™ Memories.

Select 300 Watt SSB/CW power level and match 6-1600 Ohm antennas ***Or . . .*** select **150 Watt** SSB/CW power level and match *extra wide-range* 6-3200 Ohms!

You get a highly efficient L-network, 1.8-30 MHz coverage, Cross-Needle *and* digital meters, audio SWR meter, *backlit* LCD, remote control port, radio interface, heavy-duty 16 amp/1000V relays.

MFJ-993B $259.95

The MFJ-993B automatically tunes for minimum SWR and remembers your frequency and tuner settings. The next time you operate on that frequency and antenna, these tuner settings are instantly restored and *you're ready to operate in milliseconds!* 10W x2¾ Hx9D". Use 12-15 VDC/1 amp or 110 VAC with **MFJ-1316, $21.95**. Radio interface cables, remote control available. See ***www.mfjenterprises.com***

for 600 Watt amps

AL-811/ALS-600/ALS-500

For 600 Watt amps like Ameritron AL-811/ALS-600/ALS-500M. Matches 12-800 Ohms. 10,000 *Virtual Antenna*™ memories. Cross-Needle SWR/Wattmeter. 10Wx2¾Hx9D inches.

MFJ-994B $359.95

No Matter What™ Warranty

Every MFJ tuner is protected by MFJ's famous one year *No Matter What*™ limited warranty. We will repair or replace your MFJ tuner (at our option) for a full year.

1500 Watt *Legal Limit*

for Ameritron AL-1500/1200/82 amps

Roam the entire HF spectrum 1.8-30 MHz *hands-free* with full *1500 Watt* legal limit on SSB/CW and near-perfect SWR! Lighted LCD/Cross-Needle Meter.

MFJ-998 $699.95

300 Watt...*Extra* Wide Range

SWR/Wattmeter, 10000 VA Memories

Extra *wide matching range at less cost.* Exclusive dual power level: 300 Watts/6-1600 Ohms; 150W/6-3200 Ohms. Cross-Needle SWR/Wattmeter.

MFJ-991B $219.95

200 Watt ...Compact

Digital Meter, Ant Switch, Wide Range

World's fastest compact auto tuner uses MFJ *Adaptive Search*™ and *InstantRecall*™ algorithms. 132,072 tuning solutions instantly match virtually any antenna with near perfect SWR.

MFJ-929 $219.95

200 Watt ...Econo

Small, Ant Switch, 20K VA Memories

High-speed, wide matching range and compactness at low cost! Leave in-line and forget it -- your antenna is *always* automatically tuned! 2-position antenna switch.

MFJ-928 $199.95

200 Watt *MightyMite*™

Matches IC-706, FT-857D, TS-50S

No *extra space needed!* Just set your IC-706/7000, FT-857D, TS-50S on top of this matching low-profile automatic tuner -- it's all you need for a completely automated station using *any* antenna! Just tune and talk!

MFJ-925 $179.95

G5RV Antenna

MFJ-1778 $44.95

Covers all bands, 160-10 Meters with antenna tuner. 102 ft. long. Can use as inverted vee or sloper. Use on 160 Meters as Marconi.1500 Watts. Super-strong fiberglass center/feedpoint insulators. *Glazed ceramic* end insulators. All hand-soldered connections. Add coax, some rope and you're *on the air!*

MFJ-1778M, $39.95. G5RV Junior. Half-size, 52 ft. 40-10M with tuner, 1500 Watts.

200W...Weather-sealed

for Remote/Outdoor/Marine

MFJ-926 $399.95

Fully *weather-sealed for remote Outdoor/Marine use*! Tough, durable, built-to-last the elements for years.

200 Watt...Remote

Coax/Wire Ant, No pwr cable needed

MFJ-927 $259.95

Weather protected fully automatic *remote* auto tuner for wire ***and*** *coax* antennas -- an MFJ exclusive. Powers through coax -- No separate power cable needed.

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MFJ TUNERS

Ham Radio's *Most Popular* 300 Watt Antenna Tuner

More hams use MFJ-949s than any other antenna tuner in the world!

Why? Because the world's leading tuner has earned a world-wide reputation for being able to match just about anything.

Full 1.8-30 MHz Operation

Tune your antenna for minimum SWR! Works 1.8-30 MHz on dipoles, verticals, inverted vees, random wires, beams, mobile whips, shortwave receiving antennas . . . Use coax, random wire, balanced lines. Has heavy duty 4:1 balun for balanced lines.

Custom inductor switch

Custom designed inductor switch, 1000 volt tuning capacitors, *Teflon*® insulating washers and proper L/C ratio gives you *arc-free* no worries operation up to 300 Watts PEP transceiver input power.

MFJ-949E $179.95

The MFJ-949E inductor switch was *custom* designed to withstand the extremely high RF voltages and currents that are developed in your tuner.

8-Position Antenna switch

Antenna switch lets you select two coax fed antennas, random wire/balanced line or dummy load through your MFJ-949E or direct to your transceiver.

Lighted Cross-Needle Meter

Full size 3-inch lighted Cross-Needle Meter. Lets you easily read SWR, *peak* or average forward and reflected power simultaneously. Has 300 Watt or 30 Watt ranges.

QRM-Free PreTune™

MFJ's *QRM-Free PreTune™* lets you pre-tune your MFJ-949E *off-the-air* into its built-in dummy load! Makes tuning your actual antenna faster and easier.

Plus Much More!

Full size built-in non-inductive 50 Ohm dummy load, scratch-proof Lexan multi-colored front panel, $10^{5}/_{8}$x$3^{1}/_{2}$x7 inches. Superior cabinet construction and more!

MFJ-948, $159.95. Econo version MFJ-949E. Has all features except for dummy load.

***No Matter What™* Warranty**

Every MFJ tuner is protected by MFJ's famous one year *No Matter What™* limited warranty. We will repair or replace your MFJ tuner (at our option) for a full year.

More hams use MFJ tuners than all other tuners in the world!

MFJ-989D ***Legal Limit*** Tuner

MFJ-989D $389.95

New, improved MFJ-989D *legal limit* antenna tuner gives you better efficiency, lower losses and a new *true* peak reading meter. Easily handles *full* 1500 Watts SSB/CW, 1.8-30 MHz, including MARS/WARC bands. Six position antenna switch, dummy load. *New* 500 pF air variable capacitors. *New* improved *AirCore™* Roller Inductor. *New* high voltage current balun. *New* crank knob. $12^{7}/_{8}$Wx6Hx$11^{5}/_{8}$D".

MFJ-986 Two knob ***Differential-T™***

MFJ-986 $349.95

Two knob tuning (differential capacitor and *AirCore™* roller inductor) makes tuning foolproof and easier than ever. Gives minimum SWR at only one setting. Handles 3 KW PEP SSB amplifier input power (1.5 KW output). Gear-driven turns counter, lighted peak/average Cross-Needle SWR/Wattmeter, antenna switch, balun. 1.8 to 30 MHz. $10^{3}/_{4}$Wx$4^{1}/_{2}$Hx15 in.

MFJ-962D ***compact*** kW Tuner

MFJ-962D $299.95

A few more dollars steps you up to a KW tuner for an amp later. Handles 1.5 KW PEP SSB amplifier input power (800W output). Ideal for Ameritron's AL-811H! *AirCore™* roller inductor, gear-driven turns counter, pk/avg lighted Cross-Needle SWR/Wattmeter, antenna switch, balun, Lexan front, 1.8-30MHz. $10^{3}/_{4}$x$4^{1}/_{2}$ x$10^{7}/_{8}$ in.

MFJ-969 300W ***Roller Inductor*** Tuner

MFJ-969 $219.95

Superb *AirCore™* Roller Inductor tuning. Covers *6 Meters* thru 160 Meters! 300 Watts PEP SSB. *Active* true peak reading lighted Cross-Needle SWR Wattmeter, *QRM-Free PreTune™*, antenna switch, dummy load, 4:1 balun, Lexan front panel. $10^{1}/_{2}$Wx$3^{1}/_{2}$Hx$9^{1}/_{2}$D inches.

MFJ-941E ***super value*** Tuner

MFJ-941E $139.95

The *most for your money!* Handles 300 Watts PEP, covers 1.8-30 MHz, *lighted* Cross-Needle SWR/Wattmeter, 8 position antenna switch, 4:1 balun, 1000 volt capacitors, Lexan front panel. Sleek $10^{1}/_{2}$Wx$2^{1}/_{2}$Hx7D in.

MFJ-945E HF/6M ***mobile*** Tuner

MFJ-945E $129.95

Extends your mobile antenna bandwidth so you don't have to stop, go outside and adjust your antenna. Tiny 8x2x6 in. *Lighted* Cross-Needle SWR/Wattmeter. Lamp and bypass switches. Covers 1.8-30 MHz *and* 6 Meters. 300 Watts PEP. **MFJ-20, $6.95,** mobile mount.

MFJ-971 ***portable/QRP*** Tuner

MFJ-971 $119.95

Tunes coax, balanced lines, random wire 1.8-30 MHz. Cross-Needle Meter. SWR, 30/300 or 6 Watt QRP ranges. Matches popular MFJ transceivers. Tiny 6x$6^{1}/_{2}$x$2^{1}/_{2}$ in.

MFJ-901B ***smallest*** Versa Tuner

MFJ-901B $99.95

MFJ's smallest (5x2x6 in.) and most affordable wide range 200 Watt PEP Versa tuner. Covers 1.8 to 30 MHz. Great for matching solid state rigs to linear amps.

MFJ-902 ***Tiny Travel*** Tuner

MFJ-902 $99.95

Tiny $4^{1}/_{2}$x$2^{1}/_{4}$x3 inches, full 150 Watts, 80-10 Meters, has tuner bypass switch, for coax/random wire.

MFJ-904H, $149.95. Same but adds Cross-needle SWR/Wattmeter and 4:1 balun for balanced lines. $7^{1}/_{4}$x$2^{1}/_{4}$x$2^{3}/_{4}$ inches.

MFJ-16010 ***random wire*** Tuner

MFJ-16010 $69.95

Operate all bands anywhere with MFJ's reversible L-network. Turns random wire into powerful transmitting antenna. 1.8-30 MHz. 200 Watts PEP. Tiny 2x3x4 in.

MFJ-906/903 ***6 Meter*** Tuners

MFJ-906 $99.95

MFJ-906 has lighted Cross-Needle SWR/Wattmeter, bypass switch. Handles 100 W FM, 200W SSB. **MFJ-903, $69.95**, Like MFJ-906, less SWR/Wattmeter, bypass switch.

MFJ-921/924 ***VHF/UHF*** Tuners

MFJ-921/924 $89.95

MFJ-921 covers 2 Meters/220 MHz. **MFJ-924** covers 440 MHz. SWR/Wattmeter. 8x$2^{1}/_{2}$x3 in.

MFJ-931 ***artificial*** RF Ground

MFJ-931 $109.95

Eliminates RF hot spots, RF feedback, TVI/RFI, weak signals caused by poor RF grounding. Creates artificial RF ground or electrically places far away RF ground directly at rig. **MFJ-934, $209.95**, Artificial ground/300 Watt Tuner/Cross-Needle SWR/Wattmeter.

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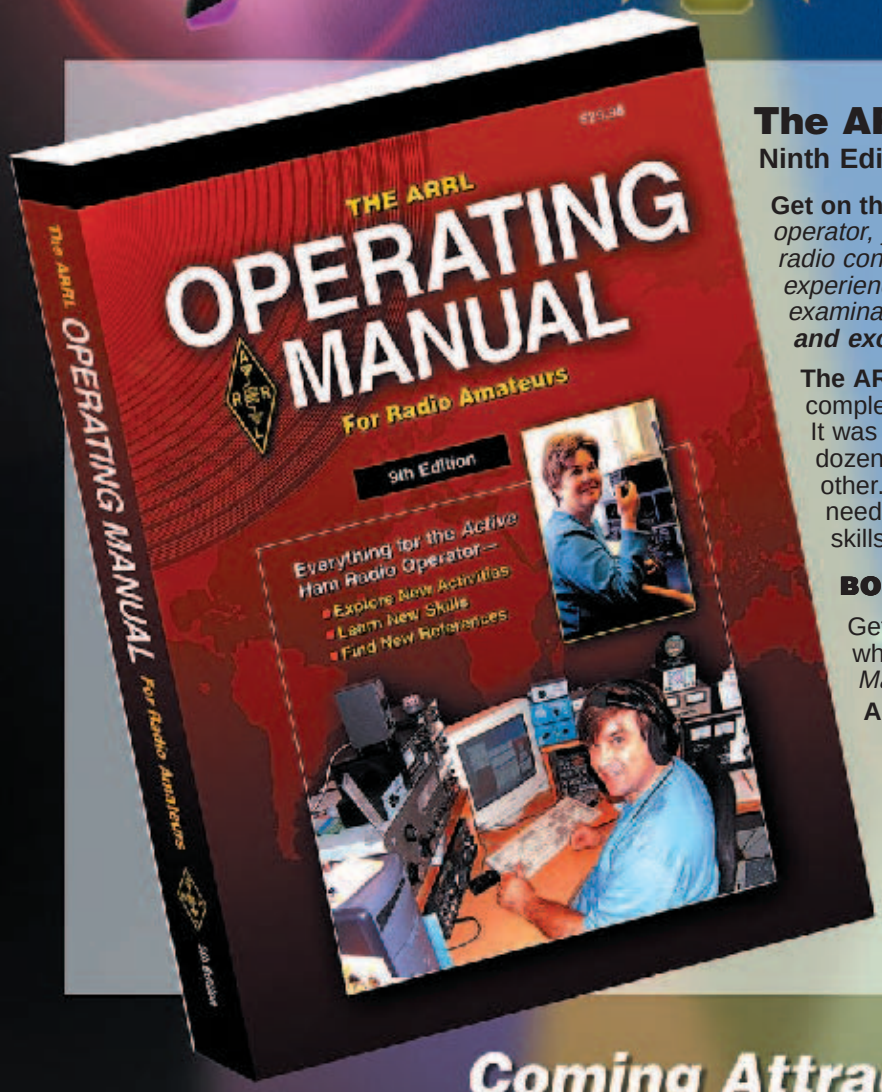
ARRL's Feature of the Month!



The ARRL Operating Manual
Ninth Edition

Get on the air! *If you're an active ham radio operator, you probably have a story about your first radio contact. Many hams remember that experience even more than their first license examination. That's because* ***operating is fun and exciting!***

The ARRL Operating Manual is the most complete book about Amateur Radio operating. It was written to help guide you through the dozens of ways hams communicate with each other. It contains information that every ham needs to explore new activities, learn new skills, find new references, and more!

BONUS OFFER!

Get a FREE **ARRL Carabiner Keychain** when you purchase *The ARRL Operating Manual* now through April 30, 2009.

A great way to carry your keys!

BONUS!

ARRL Order No. 1093
Only $29.95*

*Shipping $8 US (ground)/$15.00 International.

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MFJ high-accuracy *Digital* SWR/Wattmeter

MFJ's high-accuracy digital SWR/Wattmeter gives you three 10-bit frequency compensated power ranges!

MFJ-826B
$179.95

New!

An optimum power range is automatically selected. Each range has full 10-bit resolution. A low range (25 Watt full scale), a mid-range (250 Watt full scale) and a high-range (1500 Watts full scale) covers the entire amateur power spectrum with high accuracy.

A built-in frequency counter selects the appropriate frequency compensated data set to insure highest accuracy for each band. It also displays your transmitted frequency and provides digital frequency readout for older rigs and QRP rigs such as MFJ-9420/9040/9340.

True peak or average forward and reflected power, SWR and frequency are *simultaneously* displayed.

Bargraphs makes tuning antenna tuners, amplifiers and transmitters easy. You can select bargraphs to display forward and reflected power *or* forward power and SWR *or* SWR only.

MFJ's PeakHold™ freezes high-est forward power displayed (bar segment also) for 1, 2 or 3 seconds.

MFJ's *TrueActive*™ peak reading circuit gives you *true* peak or average power.

When SWR is greater than 1.5 to 3 (selectable) an alarm LED lights and buzzer sounds.

Has large high-contrast *backlit* LCD display.

Use 12 VDC or 110 VAC with optional MFJ-1312D, $15.95. 6½Wx2⅝Hx6D inches.

MFJ *giant* SWR/Wattmeter

World's *largest HF SWR/Wattmeter has giant 6½ inch meter!*

This one you can SEE! Extra-long scales gives you highly accurate SWR and power measurements. Huge numbers makes reading easy across your shack.

Like your analog watch, one glance at the meter needle gives you fast and accurate readings without actually reading the scale.

MFJ's exclusive *TrueActive*™ peak reading circuit captures *true* peak or average forward and reflected power readings.

Has 20/200/2000 Watt ranges for accurate QRP or QRO operation.

MFJ-868
$149.95

Exclusive MFJ Wattmeter *Power Saver*™ circuit turns on meter only when RF power is being measured.

Covers 1.8-30 MHz. Use 9 volt battery or 12 VDC or 110 VAC with MFJ-1312D, $15.95. 7Wx5½Hx5D in. SO-239 connectors.

New!

Giant 144/220/440 MHz SWR/Wattmeter

MFJ-867, $159.95. Like MFJ-868 giant SWR/Wattmeter, but covers 144/220/440 MHz.

www.mfjenterprises.com . . . World's largest selection of HF/VHF/UHF SWR Wattmeters!

MFJ-822
$59.95

Lighted 3" Cross-Needle Meter, SWR/Watts, 1.8-200 MHz, Fwd/Ref pwr, 30/300W. Compact.

MFJ-862
$59.95

Lighted Cross-Needle Meter, SWR/Watts, 144/220/440 MHz, 30/300 Watts Fwd, 60/6 W Ref.

MFJ-864
$99.95

Lighted Cross-Needle,SWR/Watts, 1.8-60/144/440 MHz, 30/300W Fwd, 6/60W Ref. Hook up HF&VHF/UHF rigs.

MFJ-815C
$109.95

Lighted 3" C/N Meter, SWR/Watts, 1.8-30 MHz, 300/3000W Fwd, 60/600W Ref. True Peak.

MFJ-812B
$39.95

VHF SWR Wattmeter, 2M/220 MHz, built-in field strength meter, Fwd/Ref, Pwr in 2 30/300W ranges.

MFJ-4416 *Super* Battery Booster

Boost battery voltage as low as 9 Volts back up to 13.8 VDC! Keeps your transceiver at full power output, compensates for run down battery, wiring voltage drop, car off . . .

MFJ-4416
$139.95

Boost battery voltage as low as 9 Volts back up to 13.8 VDC! Keeps your transceiver at full power output, provides full performance/efficiency, prevents output signal distortion and transceiver shutdown. Compensates for run-down battery, wiring voltage drop or when car is off. Provides up to 25 Amps peak with 90% efficiency. Selectable 9/10/11 Volts minimum input voltage prevents battery damage from over-discharging. RF sense turns MFJ-4416 off during receive to save power and increase efficiency. Adjustable 12 to 13.8 VDC output pass-through voltage improves efficiency and lets transceiver run cooler. Has output over-voltage crowbar protection. *Anderson PowerPoles*® and high-current 5-way binding posts for DC input, regulated output. 7¾Wx4Hx2⅛D inches.

100 Watts SSB from cigarette lighter socket!

MFJ-4403
$119.95

4-Farad capacitors supply 25 Amps needed for 100 Watts SSB peaks and replenished by 10 Amps average from cigarette lighter socket. Protects against reverse/over voltage, voltage transients, short circuits. Provides super noise/ripple filtering.

MFJ AC Line RFI Filter

Eliminate obnoxious power line and computer hash and noise by 6 S-units!

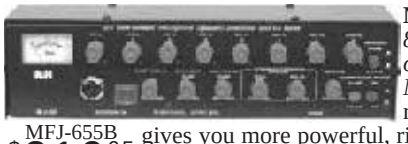
MFJ-1164B
$79.95

Filters and reduces AC power line RFI, hash, noise, transients, surges generated by computers, motors, RF transmitters, static/lightning by 30 db and up to 60-80 dB with a good earth ground. Super fast, *nano-second* overvoltage protection. Four 3-wire 15A, 120VAC outlets.

Transceiver Surge Protector

MFJ-1163, $69.95. Protects your expensive transceiver from damaging power surges. Capacitive decoupling and *ultra-fast* MOVs protection. 4 AC outlets.

MFJ all-in-one *Transmit Audio Console*



MFJ-655B
$219.95

MFJ all-in-one *Transmit Audio Console* gives you an *8-Band Equalizer* for full quality ragchewing audio *or* powerful, pileup penetrating speech . . . Adjustable *Noise Gate* gives you transparent, back-ground noise reduction . . . Clean low-distortion *Compressor* gives you more powerful, richer, fuller sounding speech and higher average power SSB . . . Smooth *Limiter* keeps audio peaks from over-driving your transmitter, prevents SSB distortion and splatter. *Universal Mic-Interface* lets you use any microphone with any transceiver. Has low-noise preamp, mic voltages, PTT jack, impedance matching, level controls, RF/audio isolation, VU meter, headphone monitor, auxiliary input.

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MFJ Dummy Load/Wattmeter

1.5 kW Dry Dummy Load has built-in precision, true peak-reading SWR/Wattmeter switchable to external antenna!

MFJ-267
$159.95

World's most versatile 1.5 kW dummy load has a *built-in* true peak reading SWR/Wattmeter that you can switch and use independently!

You'll find tons of uses!

Tune up your transceiver, linear amplifier or antenna tuner into a safe 50 Ohm dummy load at *full power*. Then instantly switch to your antenna and monitor SWR, forward and reflected power.

Use for testing/tuning transmitters, transceivers, amplifiers, antenna tuners, baluns, transformers, filters, matching networks, coax, stubs, transmission lines and antennas.

The 50-Ohm dry dummy load works DC to 60 MHz. SWR is below 1.3:1 at 30 MHz. Can handle 100 Watts for ten minutes or 1500 Watts for ten seconds. Comes with power derating curve.

Extra-large three-inch lighted Cross-Needle meter reads SWR (1:1 to 8:1), forward and reflected power *simultaneously*.

Reads *true peak* PEP or average power on 300/3000 Watts forward and 60/600 Watts reflected power ranges 1.8-54 MHz.

High accuracy comes from a carefully designed directional coupler, an accurate active-peak reading circuit and a precision d'Arsonval meter movement.

RF tight perforated aluminum cabinet. 4½Wx3½Hx10½D inches. Uses 12 VDC or 120 VAC with **MFJ-1312D, $15.95.**

MFJ HF/VHF/UHF Dummy Loads

Dry 300 Watt *HF /VHF* Dummy Load

MFJ-260C
$39.95

Air-cooled, non-inductive resistor in a perforated metal housing; Has SO-239 connector. Full load for 30 seconds. Silk-screened derating curve to 5 minutes. Handles 300 Watts. SWR is below 1.1:1 to 30 MHz, 1.5:1 from 30 to 650 MHz. Compact 2¼x2¼x7 inches.

MFJ-260CN, $49.95. With type "N" connector.

Dry 1.5 kW *HF/VHF/UHF* Dummy Load

MFJ-264
$74.95

Ham radio's most versatile 50 ohm *dry* dummy load. Works with all radios from 160 Meters through 650 MHz. SWR below 1.3 to 650 MHz and below 1.1 at 30 MHz. Handles 100 watts for ten minutes, 1500 Watts for 10 seconds. 3Wx3H x9D inches. Has SO-239 connector.

MFJ-264N, $84.95. With type "N" connector.

Oil-Cooled 1 KW CW, 2 KW SSB VersaLoad ™

MFJ-250X
$49.95

Run 1KW CW or 2 KW PEP for 10 minutes. Run *continuous duty* with 200 Watts CW or 400 watts PEP. Transformer oil not included. Low VSWR to 400 MHz. Under 1.2:1 to 30 MHz. SO-239 connector. Safety vent with cap, carrying handle. 7½Hx6⅝D inches.

MFJ-250, $69.95. Includes transformer oil (no PCB).

3 GHz, 300 Watts Dry Dummy Load

MFJ-263
$99.95

New high-tech metal film resistor gives low SWR up to 3 GHz at 300 Watts! Mounted on large heavy-duty air-cooled heatsink. SWR is less than 1.1 DC to 1 GHz, 1.2 at 1.5 GHz and 1.5 at 3 GHz. Handles 125 Watts *continuous* and 300 Watts for ten seconds. High quality *Teflon*(R) N connector. 10¾Wx2¼Hx5¼D in. New!

MFJ Frequency Counters

MFJ-886
$129.95

MFJ-886 covers 1 MHz to 3 GHz with 300 MHz direct count, 0.1 Hz resolution. 4 gate times. 10-digit high-contrast 3/4 inch LCD display. Lock display button. Bargraph shows RF field strength. Includes rechargeable Ni-Cad batteries, charger, telescopic antenna. Black anodized aluminum. 2¾x2¼x1¼ inches.

MFJ-888
$199.95

MFJ-888, like MFJ-886, but covers *10 Hz*-3 GHz. Measures frequency/ period, has 50/1M Ohm input, auto hold, LED backlight, beeper. 2¾x4¼x1¼ inches

Field Strength Meters

MFJ-802
$49.95

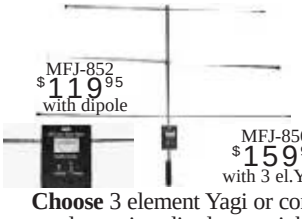
MFJ-802 shows relative antenna field strength. Use to determine radiation pattern. Has large 3 inch meter. Telescoping *dipole* reduces influence of surrounding objects and is more reliable and repeatable than monopole. Sensitivity control. Jack for remote sensor.

MFJ-802R, $34.95.

MFJ-801
$29.95

MFJ-801 has 1¾ inch meter, sensitivity control, 20 inch extended telescoping monopole antenna.

Find Power Line Noise fast!

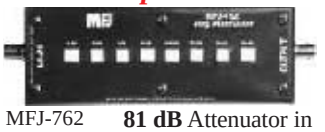


MFJ-852
$119.95
with dipole

MFJ-856
$159.95
with 3 el.Yagi

Choose 3 element Yagi or compact telescoping dipole to quickly pinpoint noise. Walk or drive with these handheld, directional noise finders to search out leaky insulators, loose hardware and corroded ground lines quickly. Track noise directly to pole, transformer, insulator or others. Has field-strength meter, headphone jack to listen or record. Operates in optimum 135 MHz region. Sensitive .3uV receiver, 70 dB AGC.

81 dB Step Attenuator



MFJ-762
$89.95

81 dB Attenuator in 1 dB steps. 50 Ohms. Usable to 500 MHz. 250 milliwatt maximum input. BNC connectors. Shielded stages. Connect between receiver and antenna and use S-meter as a precision calibrated field strength meter. Prevent receiver blocking, cross-modulation. Determine gain/loss, ideal for fox hunting. Evaluate linearity. Isolate circuits. Extend range of sensitive equipment. Measure input/output level differences.

Compact Cross-Needle SWR/Wattmeters

MFJ-822
$59.95

MFJ-822, $59.95. Large 3-inch *lighted* Cross-Needle meter covers 1.8-200 MHz in 2 power ranges: 30/300 Watts. Read forward, reflected power, SWR *simultaneously*. Compact 3¼Wx3¼H x3¼D inches takes little space. Perfect for home, mobile or portable use. SO-239 connectors. Use 12 VDC for lamp (cable included).

MFJ-842, $59.95. Like MFJ-822, but covers 140-525 MHz, 15/150 Watt ranges.

25-1300 MHz Discone Antenna

MFJ-1868
$59.95

Ultra wide-band antenna receives 25-1300 MHz. Perfect for scanners. Transmit 50-1300 MHz. Handles 200 Watts. Ideal for 6/2/1¼ Meters, 70/33/23 CM ham bands. Excellent for testing various transmitters on single coax. SO-239, 50 feet coax, stainless steel elements.

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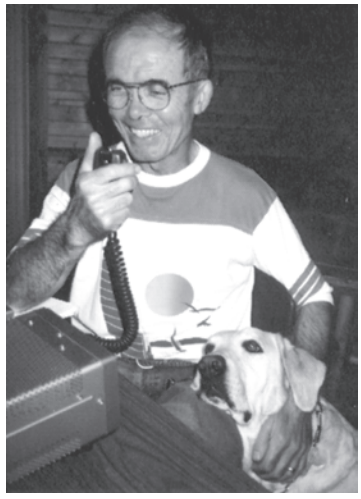

Jerry and guide dog, Kerwin.

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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.

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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.

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A whisper quiet internal fan efficiently cools your power supply for long life.

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Ham Radio's smallest and lightest 22 Amp continuous power supply is also its best selling!

MFJ-4125 $109.95

22 Amps continuous/25 Amps max at 13.8VDC. 5-way binding posts on front, 5A quick connects on back. 85-135/170-260 VAC input. 2.9 lbs. 5¾Wx3Hx5¾D".

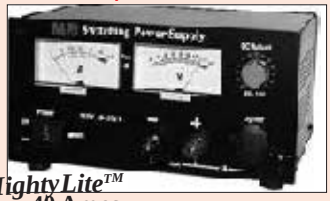
MFJ-4125P, $124.95. Adds 2-pairs *Anderson PowerPoles*™.

22 Amp Continuous

MFJ-4225MV $149.95

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.

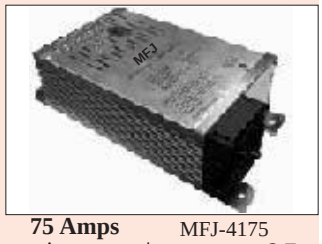
40 Amp Continuous



MFJ-4245MV $199.95

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 . . .

Versatile 5-Way Binding Posts

MFJ-1118 $84.95

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

MFJ-1116, $59.95. 8 pairs binding posts, 15A total.Voltmeter, on/off switch.

MFJ-1112 $44.95

MFJ-1112, $44.95. 6 pairs binding posts, 15 Amps total.

MFJ-1117 $64.95

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

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

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.

MFJ-1129 $114.95

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

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

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.

MFJ-4115 $79.95

30 Amps Continuous

Linear with 19.2 lb.Transformer

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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- EMS-59, EMS-47 Speaker/Microphone
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- EME-23A Earphone Microphone
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- Wire-cloning capability
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- Clean, crisp and loud 500mW audio

Standard Accessories

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- EDC-165 Trickle charger
- EA-141 Flexible whip antenna

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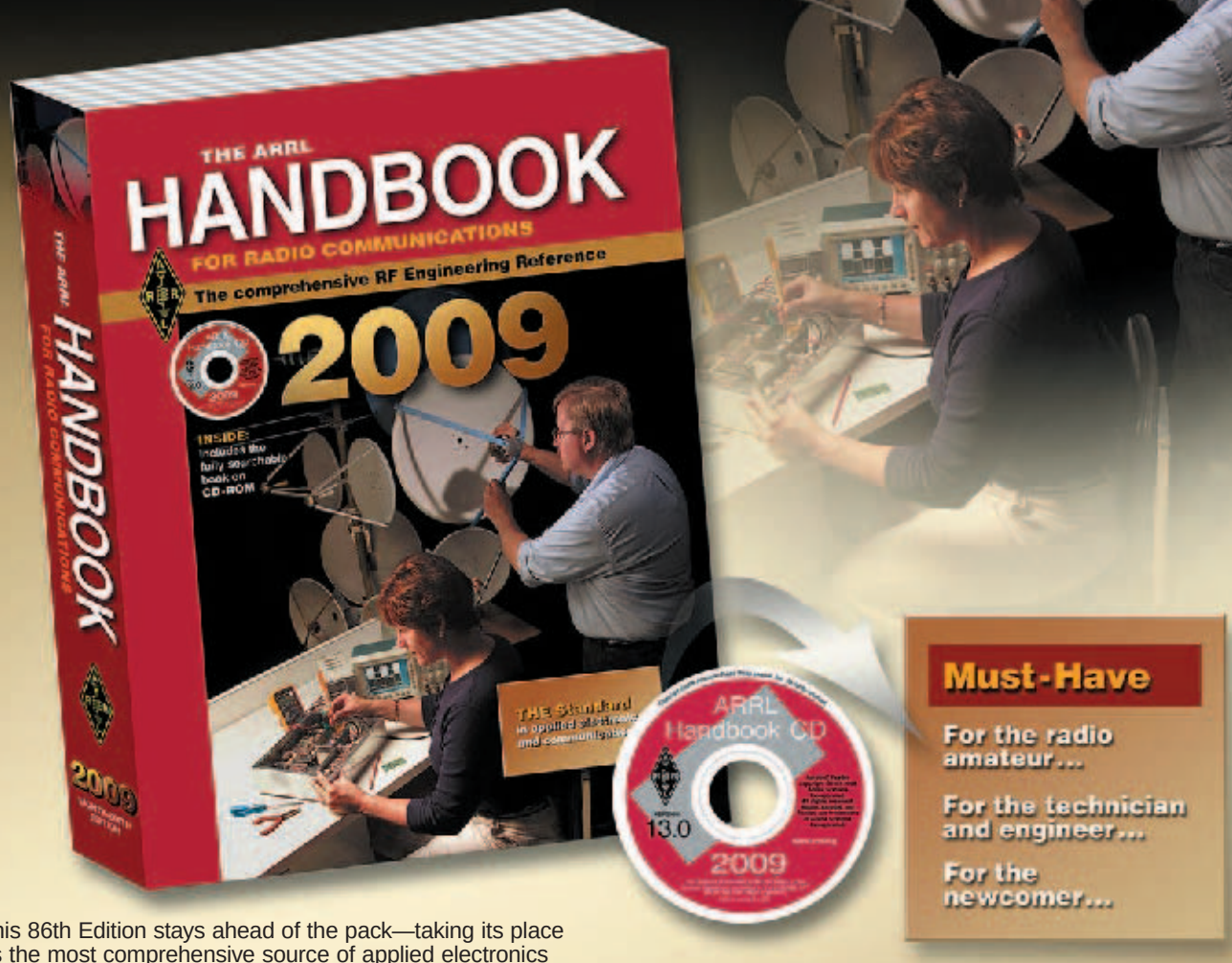

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6. New firms or individuals offering products or services for sale must check with us to determine if a production sample (which will be returned) should be submitted for examination. Dealers are exempted, unless the product is unknown to us. Check with us if you are in doubt. You must stand by and support all claims and specifications mentioned in your advertising.

The publisher of *QST* will vouch for the integrity of advertisers who are obviously commercial in character and for the grade or character of their products and services. Individual advertisers are not subject to scrutiny.

The American Radio Relay League does not discriminate in its advertising on the basis of race, color, religion, age, sex, sexual orientation, marital status or national origin. The League reserves the right to decline or discontinue advertising for any other reason.

7. AN IMPORTANT NOTICE TO ALL HAM AD POSTERS AND RESPONDERS, FROM THE ARRL ADVERTISING DEPARTMENT Greetings from ARRL HQ! Please note that we have received reports from many ARRL members who have placed classified ads in these listings, and have received responses from individuals proposing "creative" payment schemes. These particular instances involved offers of overpayments for goods by bank check, followed by instructions to deduct the cost of your item from the overpayment, and to transfer the overage back or to another individual. This is a well-known scam. Unfortunately, we have no control over this and other scams of this type. Once your email address is posted, you are vulnerable to those individuals seeking to provide you with questionable information. See **http://www.arrl.org/news/features/2005/07/15/1/?nc=1** for further details. REMEMBER: TRANSACT CAREFULLY AND PROTECT YOURSELF.

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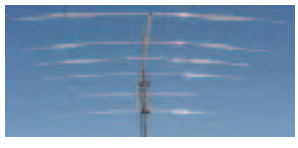

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Ride Cycle24 to the Top with Yaesu

The radio... FT DX 9000

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

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

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

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

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

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

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

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

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

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

"The Best of the Best Just Got Better"

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

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℠

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KENWOOD
Listen to the Future

TM-G707A

TM-V7A

TM-D700A

With the supplied accessories the RC-D710 is a full upgrade to the TM-V71A. The TM-V71A will have full functionality of the TM-D710A by exchanging the TM-V71A panel with the RC-D710.

This is where it gets interesting!

PG-5J connection kit makes the RC-D710 a complete standalone APRS/TNC for your current radio. This option allows connectivity with previous and current Kenwood models* as an external modem.

Compatible models include: TM-D710A / TM-V71A / TM-D700A / TM-G707A / TM-V7A / TM-733A / TM-255A / TM-455A
SmartBeaconing™ from HamHUD Nichetronix

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