QST

Official Journal of ARRL The national association for AMATEUR RADIO

Devoted entirely to **Amateur Radio**

www.arrl.org

September 2008

Special Emergency Communications Issue!

***QST** reviews:*

ICOM IC-92AD
Dual Band Handheld Transceiver

Inside:

APCO Project 25 and Amateur Radio

An All-Band HF Dipole

Riley Hollingsworth Leaves the FCC

$4.99 US $6.99 can.

09>

19260

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The pattern of perfection continues...

IC-7700

IC-7800 lineage.

Ergonomically sound.

High end performance.

Dependability you can count on.

Ideal addition to your contest station.

*This device has not been approved by the FCC. This device may not be sold or leased, or be offered for sale or lease, until approval by the FCC has been obtained.

ICOM®

Expanding your world of possibilities!

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 • Dual DSP • Digital IF Filter • Multi-function Spectrum Scope • 7-inch TFT LCD Display • Noise Blanker • Noise Reduction • Multi-scan Functions • Voice Synthesizer • Digital Voice Recorder • USB Connector • Receive Assist Functions

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
- Optional 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 RECEIVERS IN ONE

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

IC-R75

WIDE-BAND RECEIVER

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

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

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

ICOM®

hy-gain® ROTATORS

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

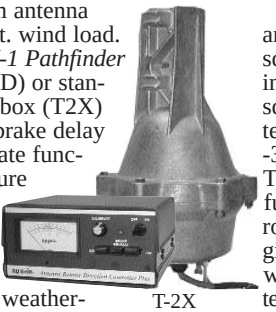
HAM-IV

HAM-IV
$559.95

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
$699.95

T-2XD
$1129.95
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
$389.95

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 brngs**
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
$1049.95
with DCU-1

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

AR-40

AR-40
$289.95

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
$1379.95

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.**

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.

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
$79.95

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

http://www.hy-gain.com
Nearest Dealer, Free catalog, To Order . . .
800-973-6572
Voice: 662-323-9538 **Fax:** 662-323-6551

NEW! Automatic Rotator Brake Delay

RBD-5
$29.95

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.

hy-gain®

Antennas, Rotators & Towers

308 Industrial Park Road,Starkville, MS 39759, USA

Life is a JOURNEY. Enjoy the ride!

MINI COOPER SHOWN WITH CP-5M UNIVERSAL LIP MOUNT ON THE DOOR EDGE.

All the mounts attach to van doors, truck side doors, SUV doors, etc... and require no holes. Includes 16' 6" deluxe cable assy w/18" mini RG-1888A/U type coax for weather seal entry.

Choose a mount depending on the antenna size and vehicle mounting location space.

For Small Antennas & Limited Space

MODEL / ANT CONN / COAX CONN

Maldol **EM-5M** SO-239 / PL-259
Footprint: 1.1"x .75"
Max Antenna: 40"

For Medium Size Antennas

MODEL / ANT CONN / COAX CONN

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

For Tall or Multi-band HF Antennas

MODEL / ANT CONN / COAX CONN

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

COMET and Maldol Mobile

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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Emergency Communications Issue

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Technical

News and Features

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QST Workbench

Top photo: Northeast Louisiana ARES® (WA5WX) participated in the First annual Louisiana Public Safety Expo on July 12 at the Monroe Civic Center. The photo shows the Northeast Louisiana ARES Mobile Command Unit and Tri-Ex 100 foot mobile tower. *Photo by David Gore, W5DSG.*
Middle photo: Phil Karras, KE3FL, is an ARRL Life Member and *QST* author from Mount Airy, Maryland. Phil is active on the Maryland Emergency Phone Net as well as the Carroll Amateur Radio Emergency Team. A former ARRL Emergency Coordinator, he is presently an assistant EC. *Photo by Phil Karras, KE3FL.*
Bottom photo: Steve Jax, N4SJJ, of Winter Haven, Florida, operating 6 m SSB. Steve serves as Liaison to the local government agency, Polk County, by way of Polk County Emergency Services. *Photo by Evans Mitchell, KD4EFM, EC, Polk County ARES.*

Radiosport

Departments

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The Hottest Field Gear Anywhere!

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

FT-897D

TCXO DSP 60 m Band

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

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

FT-857D

DSP 60 m Band

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

Automatic Matching for FT-897/857 Series Transceivers

FC-40

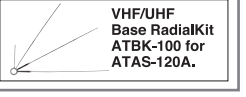
Automatic-Matching 200-Memory Antenna Tuner
(160 m ~ 6 m Band)

WATERPROOF

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

ATAS-120A

Active Tuning Antenna System
(no separate tuner required)



VHF/UHF Base RadialKit ATBK-100 for ATAS-120A.

REAL PERFORMANCE, REALLY PORTABLE

FT-817ND

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

60 m Band

ATAS-25
Manually-Tuned Portable Antenna

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

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

DMU-2000
Data Management Unit

Photograph shows 100-Watt version. Computer display and keyboard are after-market items, not supplied with the FT-2000.

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

Options

SP-2000
External Speaker
with Audio filters

RF μ-Tune Kits

160m Band	80/40m Band	30/20m Band
RF μ-Tune Kits A	RF μ-Tune Kits B	RF μ-Tune Kits C

- Up to three μ-Tune Kits may be connected.
- μ-Tune Kit is included in purchase price of μ-Tune Unit.

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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

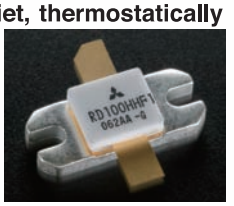
■ Large informative Front Panel Display, convenient Control knobs and Switches

■ 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.

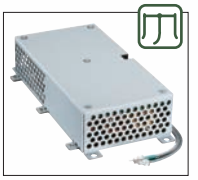
■ The rugged FT-450 aluminum die-cast chassis, with its quiet, thermostatically controlled cooling fan provides a solid foundation for the power amplifier during long hours of field or home contesting use.



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

●10 kHz Roofing filter ●20 dB ATT / IPO ●Built-in TCXO for incredible ±1 ppm/hour (@+77 °F, after warmup) stability ●CAT System (D-sub 9 pin): Computer programming and Cloning capability ●Large, Easy-to-See digital S meter with peak hold function ●Speech Processor ●QUICK SPLIT to automatically Offset transmit frequency (+5 kHz default) ●TXW to monitor the transmit frequency when split frequency operation is engaged ●Clarifier ●Built-In Electronic Keyer ●CW Beacon (Up to 118 characters using the CW message keyer's 3 memory banks) ●CW Pitch Adjustment (between 400 to 800 Hz, in 100 Hz steps) ●CW Spotting (Zero-Beating) ●CW Training Feature ●CW Keying using the Up/Down keys on the optional microphone ●Two Voice Memories (SSB/AM/FM), store up to 10 seconds each ●20 seconds Digital Voice Recorder ●Dedicated Data Jack for FSK-RTTY operation ●Versatile Memory System, up to 500 memory channels that may be separated into as many as 13 Memory Groups ●CTCSS Operation (FM) ●My Band / My Mode functions, to recall your favorite operating set-ups ●Lock Function ●C.S. Switch to recall a favorite Menu Selection directly ●Hand Microphone included ●IMPORTANT FEATURE FOR THE VISUAL IMPAIRED OPERATORS - Digital Voice Announcement of the Frequency, Mode or S-meter reading

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"It Seems to Us"

Planning for the ARRL's Second Century

"From time to time the ARRL Board of Directors tackles the formidable task of strategic planning. The mission of the ARRL — to advance Amateur Radio and advocate on its behalf — is well understood, but the resources available to us are limited and the environment in which we pursue that mission is dynamic and somewhat unpredictable."

Strategic planning is an imperfect but necessary art. It involves:

- assessing the present and future environment;
- setting long-range goals that will lead to fulfillment of the mission;
- considering and selecting among alternative means of achieving these goals;
- setting priorities; and
- establishing milestones so that progress can be measured.

In July 2006 the Board devoted the second day of its meeting to a revision of the League's Strategic Plan. The document was refined by the Executive Committee in October 2006 and adopted by mail vote of the Board later that month. The Plan begins with a list of ten-year assumptions and key external trends that may represent future opportunities or threats. Space precludes listing them all, but here are some examples:

- growing competition from other means of communication;
- continued growth of non-licensed transmitters;
- increasing land use regulations that restrict or prevent amateur operation;
- growing complexity of government relationships; and
- changes in publishing technology.

Next the Plan lists the key questions — the "mega issues" — that we must try to answer as we confront these opportunities and challenges, for example:

- How can ARRL increase Amateur Radio's overall image and relevance with the public?
- What is unique, different or interesting about Amateur Radio that will keep the interest of current amateurs and attract new ones?
- How can ARRL make the needed cultural, organizational and financial changes to sustain future success?

There are other aspects to the Plan, but the Board's vision is best summarized in the following five long-range goals for 2014, the League's Centennial Year:

- ARRL will be Amateur Radio's proactive advocate and representative voice in achieving key regulatory and legislative goals.
- ARRL will be the primary source of high quality Amateur Radio educational information and resources.
- ARRL will be the recognized and respected leader in Amateur Radio public service and emergency communications.
- ARRL shall attain the financial security to advance and advocate Amateur Radio.
- ARRL will have a well-trained, team based, member-responsive environment to advance its membership base.

The Board intends to conduct a top-to-bottom review of the Strategic Plan at its July 2009 meeting. As a part of the process leading up to that review, the Board would like to hear from *you*. You are invited to share *your* thoughts on the future direction and priorities of *your* national association.

The current ARRL Strategic Plan, down to the level of the long-range goals listed above, is posted at **www.arrl.org/stratplan.** (To view the Plan you will have to be logged into the Web site as an ARRL member.) Please look it over with the following questions in mind:

- *Assumptions and Key External Trends:* What items should be added? Modified? Deleted?
- *Mega Issues:* Again, what should be added, modified or deleted? Also, what are your thoughts about how to answer these key questions?
- *Value:* Do you agree with the statements of what the ARRL must offer, and must do, to enhance its value to Amateur Radio?
- *Long-Range Goals:* Do the five long-range goals capture your vision of how the ARRL should be positioned for its Second Century? If not, how could they be strengthened or improved?
- *Strategies:* What should the ARRL do over the next several years to pursue its long-range goals?

The Board wants to tap the wealth of experience, in virtually every field imaginable, that exists within the ARRL membership. Your job and your other activities and interests outside of Amateur Radio may give you a unique insight that will contribute to the success of our planning endeavor. Your detailed knowledge of some aspect of Amateur Radio could illuminate an opportunity that the Board itself might overlook.

In particular, we need the perspective of newer members and amateur licensees. Those of us who have enjoyed decades of involvement in Amateur Radio know that what attracted *us* is quite different from what attracted *you*. We know that our needs as ARRL members are likely to be different from yours. But — as hard as we may try — we cannot put ourselves in your shoes. To do a better job of serving today's and tomorrow's radio amateurs, we need to hear from *you*.

The Web site will explain how to share your input with the Board and with your fellow members. If you would like to participate but do not have Web access, drop me a note (the address is on page 14).

With your help, the next revision of the ARRL's Strategic Plan will set the stage for a successful Second Century for our national association — and for Amateur Radio itself.

David Sumner, K1ZZ
ARRL Chief Executive Officer

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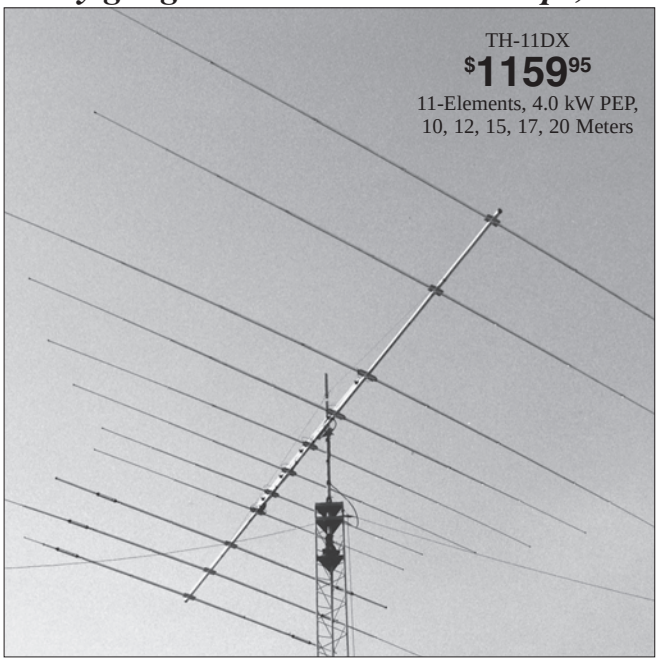

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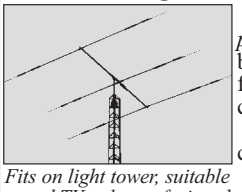

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TH-11DX	11	*For Gain and F/B ratio--See...* • www.hy-gain.com • Hy-Gain catalog • Call toll-free 800-973-6572		4000	10,12,15,17,20	12.5	100	24	37	22	88	1.9-2.5	T2X	$1159.95
TH-7DX	**7**			**1500**	**10, 15, 20**	**9.4**	**100**	**24**	**31**	**20**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

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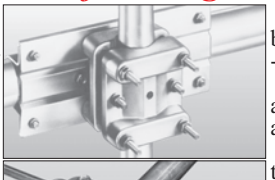
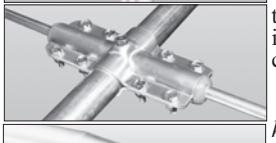


2. ***Tooled*** *Boom-to-Element Clamp*



3. Thick-wall *swaged* aluminum tubing

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Quad Band FM Mobile
FT-8900R *70 cm 35 W

DUAL BAND DUAL RECEIVE

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FT-8800R *70 cm 35 W

DUAL BAND

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VX-6R

2 m / 70 cm Dual Band

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2 m/70 cm Dual Band FM Hand held
FT-60R

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70 cm Mono Band

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(16 key)

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This Just In

Joel P. Kleinman, N1BKE
jkleinman@arrl.org

In Brief

- The ARRL Board of Directors met July 18-19 in Windsor, Connecticut. A full report will appear in the October issue.
- In the next step of developing a long-term procedure to mitigate interference to the Air Force PAVE PAWS radar site at Cape Cod Air Force Station in Massachusetts, the ARRL has brokered a deal that will allow new coordinations to be considered by the New England Spectrum Management Council (NESMC) on the 70 cm band.
- President Joel Harrison, W5ZN; Chief Executive Officer David Sumner, K1ZZ, and General Counsel Chris Imlay, W3KD, met with members of the FCC's Office of Engineering and Technology to discuss the recent US Court of Appeals decision regarding broadband over power lines (BPL).
- President Reinaldo Leandro, YV5AMH, has appointed Dr César Pio Santos A., HR2P, of San Pedro Sula, Honduras, as IARU Region 2 Emergency Communications Coordinator.
- Edward Thomas, KCØTIG, of Kansas City, Kansas, and his son, 27, were electrocuted July 13 while putting up backyard antennas. Details appear in Happenings, this issue.
- The United States Court of Appeals for the District of Columbia Circuit has ordered that the FCC reimburse ARRL for the docketing fee and the cost of reproducing copies of briefs and appendices in the ARRL's successful challenge of the FCC's broadband over power line (BPL) rules.
- Special Event Station W1AW/KL7 was to be on the air just 300 miles south of the Alaskan Arctic Ocean July 26-August 10.
- ARES® members in the ARRL Sacramento Valley Section are actively involved in supporting the agencies they serve during the outbreak of fires in the section.
- The man who has come to embody Amateur Radio Enforcement, Riley Hollingsworth, K4ZDH, retired from the FCC July 3. For more about Riley, see pages 48 and 57.
- ARRL President Joel Harrison, W5ZN, has written to Armond T. Mascelli, Vice President for Domestic Disaster Response for the American Red Cross (ARC) to identify the ARRL's remaining concerns over the background check policy for ARC partners.
- HAM RADIO 2008, the 33rd International Exhibition for Radio Amateurs, was held in Friedrichshafen, Germany. The fourth annual Global Amateur Radio Emergency Communications Conference (GAREC) preceded the event.
- The Administrative Council of the International Amateur Radio Union (IARU) held its Annual Meeting June 24-25 in Konstanz, Germany.
- The *ARRL Annual Report* for 2007 is available online and in print.
- The winner of the *QST* Cover Plaque Award for June is Tom Sowden, KØGKD, for his article "Homebrew Solid-state 600 W HF Amplifier."
- The IARU HF World Championship was held July 12-13.

Media Hits

Allen Pitts, W1AGP

Where do I start? Except for Katrina operations, in the past month there have been more Amateur Radio related media hits in one month than I can remember. Hundreds of them! I have 40 pages of just the hyperlinks to them and they are still coming in.

The swarm began with the Kohls interference story in Philadelphia, which was carried on their NBC News10 TV station. Reporter Lu Ann Cahn worked with Reginald Leister, N3KAS, and Bob Rex, K3DBD, of the Pottstown Area Radio Club, and generated an excellent TV feature.

Some locations had double hits such as the Austin area which had FD with News 8 Austin doing a live remote on Sunday morning and more on Monday. Then, one week later, the Austin Club did an ARISS contact with Blackland Prairie Elementary School and Cub Scout Pack 304 covered by Fox 7 News, KVUE 24 News and News 8 Austin.

San Diego hams also scored a double play with Field Day events plus continuing coverage about their activity in keeping a fire watch in the dry regions. Their work was shown on ABC-Ch 10 News and Ch 6 Fox News.

The drive to get state level proclamations resulted in 13 documents that can be used to promote Amateur Radio, be sources for future quotes, open doors in legislative and regulatory actions, and impress folks in general. These included Alabama, California, Connecticut, Delaware, Kansas, Michigan, Minnesota, North Carolina, New Hampshire, Ohio, Texas, Washington and West Virginia.

The MSN.com Technology section promoted Amateur Radio on June 17 with "Ham radios bring people from different countries, class and creed together," followed by NetworkWorld.com's July 3 article, "When networks fail, hams to the rescue." *Electronic Engineering Times* did an Under the Hood feature, "Extreme Design: SuitSat pushes engineers' limits," which highlighted Amateur Radio technologies, engineering and ARISS while *Electronic Design* did an article "Amateur Radio Still Going Strong."

And then came Field Day itself. Hundreds of articles appeared in local and regional papers. We noted there was a great deal more television coverage than ever before and most of it was excellent! Many reporters apparently used the web based ARRL Field Day site locator option to find activity local to them and also were impressed by all the dots on the map — confirming this was not just a local event. The ARRL's own wire release resulted in over 210 hits but even that success was lost among the tidal wave results of hundreds of PIOs and other volunteers. I would list *all* of them here if I could. The listings are still growing but many can be seen at **www.arrl.org/pio/2008mediaHits.pdf**. We continue to receive e-mails such as, "The good news is the list of interested news directors wanting to be informed as next year's event evolves." — *John Hochscheid, KDØBKD*

Every one of these, both great and small, deserves recognition. The cumulative effect is overwhelming. Of the hundreds of great hits, which ones do you list? It's a wonderful problem to have! Perhaps we can summarize it by the little e-mail that came in this morning showing what it's all about:

"Our 'rag tag' group didn't make many contacts during Field Day but our public relations was GREAT! We were too busy recruiting! We expect three new people at our next VE session! For our small area...that's great! Thanks so much!" — *Mike, KE5CJ*

DEE YINGST, W4CKF

The Effingham County (IL) Emergency Management Agency, which sponsors the annual 4th of July parade, named the National Trail ARC, K9UXZ, Grand Marshal of the 2008 parade for their weather spotting activities and emergency communications volunteerism. — *Russ Thomas, WI9B*

S. KHRYSTYNE KEANE, K1SFA

ARRL President Joel Harrison, W5ZN (left), who presided over the July 18-19 meeting of the ARRL Board of Directors, and RAC President David Goodwin, VO1AU/VE3AAQ. Full details will appear in the October issue.

HOT-HOG Presents ARRL Service Awards

In June, HOT-HOG (the Heart of Texas Ham Operators Group) and McCulloch County ARES® presented Special Service Awards to the Heart of Texas Memorial Hospital and Concho Valley Regional Advisory Council in appreciation for funding provided by those two organizations. The funds were used to upgrade HOT-HOG's UHF repeater link to the KC5EZZ weather link repeater near San Angelo, about 75 miles distant. This improves the ability of HOT-HOG/ARES to provide the hospital's backup communication for patient transfers and coordination with other hospitals in CVRAC during emergencies and disasters. The same equipment is used to coordinate SKYWARN efforts with N5NWS at the National Weather Service Forecast Office in San Angelo. — *Rick Melcer, N5KAO*

ANGELINA DEANS, KE5CTC

From the left: **Tim Jones, Administrator, Heart of Texas Memorial Hospital (HOTMH); Danny Hinman, WM5C, HOT-HOG President; Nickie Bright, Director of Nursing, HOTMH; Danny Updike, Coordinator, Concho Valley Regional Advisory Council (CVRAC), and Rick Melcer, N5KAO, ARES EC, McCulloch County, Texas.**

Inside HQ

We have devoted much of this issue of *QST*, our special Emergency Communications issue, to articles about Amateur Radio Emergency Communications and Public Service.

For starters, we have created new graphic look for the Public Service column beginning with this issue. We will also be moving in a new editorial direction that will focus on Amateur Radio's Emergency Communication Readiness, Response and Resilience. This new direction will focus less on specific activities in the field and more on specific topics related to Amateur Radio emergency preparedness. The revised column will feature best practices from the field, practical operating techniques and organizational issues related to Public Service.

This month's collection of EmComm articles begins with a comprehensive *QST* Product Review of the ICOM IC-92AD analog/D-STAR handheld VHF/UHF transceiver. Our second D-STAR article shows how to expand D-STAR's usefulness by adding text chatting, file sharing and other helpful applications. It was written by Dan Smith, KK7DS, and it is titled "D-RATS — an Application Suite for D-STAR."

Bob Bruninga, WB4APR, is the author of our third technical article called "Maximizing the Mobile Motorist Mission." It provides details on how hams can use APRS and GPS in Emergency Communications (and other applications) for more than simply tracking the position of another user. You will also find an article about APCO Project 25 (P25) protocol, an open digital standard used by many public service agencies. For an interesting look at EmComm practices of the past, there is "World War 2 Emergency Radio," by William McMurray, K4SG, about some resourceful young amateurs' radio homebrewing adventures during World War II.

In this issue we have also published the official announcement of the 2008 Simulated Emergency Test (SET) and the now quarterly EmComm course Honor Roll listing that honors amateurs who have successfully passed all three EmComm courses. The three Emergency Communications courses have had over almost 18,000 course completions. You can find information about these online courses at **www.arrl.org/cce/courses.html**. We will also debut a brand new Digital Emergency Communications course on a CD-ROM in late September.

Along with this special Emergency Communications issue, here at HQ we have expanded our existing EmComm programs. These include Ham-Aid, a program that temporarily replaces, augments or reestablishes Amateur Radio equipment capabilities that existed prior to a disaster. The monthly *ARES® E-Letter* continues to grow and now has over 25,000 subscribers. We will debut a new and improved HTML version of this newsletter in September. You can sign up for this newsletter at no charge either at your member data page or at **www.arrl.org/FandES/field/ares-el/about.html**.

Do you find these special issues of *QST* such as the Antenna Issue, Contest Issue or Vintage Issue interesting, helpful and informative? What other topics are you interested in having us cover? Let us know your mind!

73,

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

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Officers

Founding President (1914-1936)
Hiram Percy Maxim, W1AW

President
JOEL M. HARRISON,* W5ZN
528 Miller Rd, Judsonia, AR 72081
w5zn@arrl.org

First Vice President
KAY C. CRAIGIE,* N3KN
570 Brush Mountain Rd
Blacksburg, VA 24060
540-552-3903; n3kn@arrl.org

Vice President
RICK RODERICK, K5UR
PO Box 1463, Little Rock, AR 72203
501-988-2527; k5ur@arrl.org

International Affairs Vice President
RODNEY STAFFORD, W6ROD
5155 Shadow Estates
San Jose, CA 95135; 408-238-4671
w6rod@arrl.org

Chief Executive Officer
DAVID SUMNER,* K1ZZ

Secretary
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Treasurer
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Circulation Manager

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Business Staff

Business Manager
Barry J. Shelley, N1VXY

Comptroller
LouAnn Campanello

Information Services Manager
Don Durand

*Executive Committee Member

Atlantic Division

Bill Edgar, N3LLR*
22 Jackson Ave, Bradford, PA 16701
(814-362-1250); **n3llr@arrl.org**

Vice Director: **Tom Abernethy, W3TOM**
PO Box 73, Accokeek, MD 20607
(301-292-6263); **w3tom@arrl.org**

Central Division

George R. Isely, W9GIG*
736 Fellows St, St Charles, IL 60174
(630-584-3510); **w9gig@arrl.org**

Vice Director: **Howard S. Huntington, K9KM**
25350 N Marilyn Ln, Hawthorn Woods, IL 60047
(847-438-3452); **k9km@arrl.org**

Dakota Division

Jay Bellows, KØQB
1925 Bidwell St, West St Paul, MN 55118
(651-238-4444); **k0qb@arrl.org**

Vice Director: **Gregory P. Widin, KØGW**
13457 Sixth St N, Stillwater, MN 55082
(651-436-8811); **k0gw@arrl.org**

Delta Division

Henry R. Leggette, WD4Q*
7335 Ginger Snap Cove, Memphis, TN
38125-4732 (901-757-0444); **wd4q@arrl.org**

Vice Director: **Karl Bullock, WA5TMC**
321 CR 458, Ripley, MS 38663
(662-512-8053); **wa5tmc@arrl.org**

Great Lakes Division

Jim Weaver, K8JE
5065 Bethany Rd, Mason, OH 45040-8130
(513-459-0142); **k8je@arrl.org**

Vice Director: **Gary L. Johnston, KI4LA**
3056 Hergott Dr, Edgewood, KY 41017
(859-391-6399); **ki4la@arrl.org**

Hudson Division

Frank Fallon, N2FF
30 E Williston Ave, East Williston, NY 11596
(516-746-7652); **n2ff@arrl.org**

Vice Director: **Joyce Birmingham, KA2ANF**
235 Van Emburgh Ave, Ridgewood, NJ
07450-2918 (201-445-5924); **ka2anf@arrl.org**

Midwest Division

Bruce Frahm, KØBJ
1553 County Rd T, Colby, KS 67701
(785-462-7388); **k0bj@arrl.org**

Vice Director: **Cliff Ahrens, KØCA**
65 Pioneer Trail, Hannibal, MO 63401
(573-221-8618); **k0ca@arrl.org**

How to Find an ARRL HQ Staff Member

Can't find the department you're looking for? Call 860-594-0200 or e-mail **hq@arrl.org**. Sending e-mail to any ARRL Headquarters staff member is a snap. Just put his or her call sign (or first initial and last name) in front of **@arrl.org**. For example, to send to Allen Pitts, W1AGP, Media Relations manager, use **w1agp@arrl.org** or **apitts@arrl.org**. If all else fails, send a message to **hq@arrl.org** and it will get routed to the right person or department.

New England Division

Tom Frenaye, K1KI*
PO Box J, West Suffield, CT 06093
(860-668-5444); **k1ki@arrl.org**

Vice Director: **Mike Raisbeck, K1TWF**
85 High St, Chelmsford, MA 01824
(978-250-1235); **k1twf@arrl.org**

Northwestern Division

Jim Fenstermaker, K9JF
1525 NW 57th St, Seattle, WA 98107
(360-256-1716); **k9jf@arrl.org**

Vice Director: **William J. Sawders, K7ZM**
51442 Mac Ct, La Pine, OR 97739
(541-536-5963); **k7zm@arrl.org**

Pacific Division

Bob Vallio, W6RGG
18655 Sheffield Rd, Castro Valley, CA 94546
(510-537-6704); **w6rgg@arrl.org**

Vice Director: **Andy Oppel, N6AJO**
1308 Burbank St, Alameda, CA 94501-3946
(510-864-2299); **n6ajo@arrl.org**

Roanoke Division

Dennis Bodson, W4PWF
233 N Columbus St, Arlington, VA 22203
(703-243-3743); **w4pwf@arrl.org**

Vice Director: **Patricia Hensley, N4ROS**
164 N Main St, PO Box 70, Richburg, SC
29729-8223 (803-789-5810); **n4ros@arrl.org**

Rocky Mountain Division

Brian Mileshosky, N5ZGT
PO Box 20186, Albuquerque, NM 87154-0186
(505-463-9468); **n5zgt@arrl.org**

Vice Director: **Dwayne Allen, WY7FD**
PO Box 191, Beulah, WY 82712
(605-210-2005); **wy7fd@arrl.org**

Southeastern Division

Greg Sarratt, W4OZK
912 Pine Grove Rd, Harvest, AL 35749;
(256-337-3636); **w4ozk@arrl.org**

Vice Director: **Sandy Donahue, W4RU**
PO Box 9424, Dothan, AL 36303
(404-403-1513); **w4ru@arrl.org**

Southwestern Division

Richard J. Norton, N6AA
21290 West Hillside Dr, Topanga, CA 90290
(310-455-1138); **n6aa@arrl.org**

Vice Director: **Marty Woll, N6VI**
21301 Candice Pl, Chatsworth, CA 91311-1404
(818-773-9655); **n6vi@arrl.org**

West Gulf Division

Coy C. Day, N5OK*
20685 SW 29th St, Union City, OK 73090-9726
(405-483-5632); **n5ok@arrl.org**

Vice Director: **Dr David Woolweaver, K5RAV**
2210 S 77 Sunshine Strip, Harlingen, TX 78550
(956-425-3128); **k5rav@arrl.org**

*Executive Commitee Member

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Delaware: Frank T. Filipkowski, Jr, AD3M, 1130 N Hilton Rd, Oak Lane Manor, Wilmington, DE 19803-5216 (302-656-0409); **ad3m@arrl.org**

Eastern Pennsylvania: Eric Olena, WB3FPL, 284 Blimline Rd, Mohnton, PA 19540 (610-775-0526); **wb3fpl@arrl.org**

Maryland-DC: James E. Cross III, WI3N, 16013 Dorset Rd, Laurel, MD 20707-5314 (301-725-6829); **wi3n@arrl.org**

Northern New York: Tom Valosin, WB2KLD, 117 Warrior Way, Middleburgh, NY 12122-4712 (518-827-4800); **wb2kld@arrl.org**

Southern New Jersey: Jean Priestley, KA2YKN, 7158 Chandler Ave, Pennsauken, NJ 08110 (856-662-3587); **ka2ykn@arrl.org**

Western New York: Scott Bauer, W2LC, 1964 Connors Rd, Baldwinsville, NY 13027 (315-638-7551); **w2lc@arrl.org**

Western Pennsylvania: John Rodgers, N3MSE, 803 S Main St, Butler, PA 16001 (724-287-0424); **n3mse@arrl.org**

Central Division (IL, IN, WI)

Illinois: Tom Ciciora, KA9QPN, 1887 Irene Rd, Sandwich, IL 60548 (815-498-4929); **ka9qpn@arrl.org**

Indiana: James S. Sellers, K9ZBM, 54676 County Road 8, Middlebury, IN 46540-8710 (574-825-5425); **k9zbm@arrl.org**

Wisconsin: Donald Michalski, W9IXG, 4214 Mohawk Dr, Madison, WI 53711 (608-274-1886); **w9ixg@arrl.org**

Dakota Division (MN, ND, SD)

Minnesota: Richard H. "Skip" Jackson, KSØJ, 1835-63rd St E, Inver Grove Heights, MN 55077 (651-260-4330); **ks0j@arrl.org**

North Dakota: Kent Olson, KAØLDG, 7702 Forest River Rd, Fargo, ND 58104-8004 (701-298-0956); **ka0ldg@arrl.org**

South Dakota: Richard L. Beebe, NØPV, 913 S Gordon Dr, Sioux Falls, SD 57110-3151 (605-376-4241); **n0pv@arrl.org**

Delta Division (AR, LA, MS, TN)

Arkansas: David Norris, K5UZ, 640 Josephine, Batesville, AR 72501 (870-793-6431); **k5uz@arrl.org**

Louisiana: Gary L. Stratton Sr, K5GLS, 8424 Kaw Court, Shreveport, LA 71107 (318-309-0023); **k5gls@arrl.org**

Mississippi: Malcolm Keown, W5XX, 64 Lake Circle Dr, Vicksburg, MS 39180 (601-636-0827); **w5xx@arrl.org**

Tennessee: Glen Clayton, W4BDB, 238 Old Parksville Rd NE, Cleveland, TN 37323; (423-472-7751); **w4bdb@arrl.org**

Great Lakes Division (KY, MI, OH)

Kentucky: Jim Brooks, KY4Z, 7099 Louisville Rd, Cox's Creek, KY 40013 (502-349-2099); **ky4z@arrl.org**

Michigan: Dale Williams, WA8EFK, 291 Outer Drive, Dundee, MI 48131 (734-529-3232); **wa8efk@arrl.org**

Ohio: Joe Phillips, K8QOE, 2800 Jupiter Dr, Fairfield, OH 45014-5022 (513-874-0006); **k8qoe@arrl.org**

Hudson Division (ENY, NLI, NNJ)

Eastern New York: Pete Cecere, N2YJZ, 329 W Saugerties Rd, Woodstock, NY 12498 (845-246-4359); **n2yjz@arrl.org**

NYC-Long Island: Tom Carrubba, KA2D, 226 Sheffield Ave, West Babylon, NY 11704 (631-422-9594); **ka2d@arrl.org**

Northern New Jersey: Richard Krohn, N2SMV, 23 Sweetmans Ln, Manalapan, NJ 07726; **n2smv@arrl.org**

Midwest Division (IA, KS, MO, NE)

Iowa: Jim Lasley, NØJL, PO Box 5, Chillicothe, IA 52548 (641-935-4337); **n0jl@arrl.org**

Kansas: Ronald D. Cowan, KBØDTI, PO Box 36, LaCygne, KS 66040 (913-757-3758); **kb0dti@arrl.org**

Missouri: Dale C. Bagley, KØKY, PO Box 13, Macon, MO 63552-1822 (660-385-3629); **k0ky@arrl.org**

Nebraska: Matthew N. Anderson, KAØBOJ, 2342 Clay St, Ashland, NE 68003 (402-944-7488); **ka0boj@arrl.org**

New England Division (CT, EMA, ME, NH, RI, VT, WMA)

Connecticut: Betsey Doane, K1EIC, 92 Mohegan Rd, Shelton, CT 06484-2448 (203-929-7759); **k1eic@arrl.org**

Eastern Massachusetts: Arthur S. Greenberg, K1GBX, 123 Pond St, Georgetown, MA 01833 (978-352-2095); **k1gbx@arrl.org**

Maine: William Woodhead, N1KAT, 68 Madison St, Auburn, ME 04210 (207-782-4862); **n1kat@arrl.org**

New Hampshire: Alan K. Shuman, K1AKS, PO Box 681, New Boston, NH 03070-3520 (603-487-3333) **k1aks@arrl.org**

Rhode Island: Bob Beaudet, W1YRC, 30 Rocky Crest Rd, Cumberland, RI 02864 (401-333-2129); **w1yrc@arrl.org**

Vermont: Paul N. Gayet, AA1SU, 11 Cherry St, Essex Junction, VT 05452 (802-878-2215); **aa1su@arrl.org**

Western Massachusetts: Ed Emco, W1KT, 37 Bullard Ave, Worcester, MA 01605 (508-853-3333); **w1kt@arrl.org**

Northwestern Division (AK, EWA, ID, MT, OR, WWA)

Alaska: Jim Larsen, AL7FS, 3445 Spinnaker Dr, Anchorage, AK 99516-3424 (907-345-3190); **al7fs@arrl.org**

Eastern Washington: Mark Tharp, KB7HDX, PO Box 2222, Yakima, WA 98907-2222 (509-965-3379); **kb7hdx@arrl.org**

Idaho: Doug Rich, W7DVR, 2025 Regal Dr, Boise, ID 83704-7153 (208-376-7651); **w7dvr@arrl.org**

Montana: Doug Dunn, K7YD, 216 Fiddle Creek Rd, Livingston, MT 59047-4116 (406-686-9100); **k7yd@arrl.org**

Oregon: Bonnie Altus, AB7ZQ, 7770 Harmony Rd, Sheridan, OR 97378 (971-237-0711); **ab7zq@arrl.org**

Western Washington: Jim Pace, K7CEX, PO Box 1602, Centralia, WA 98531 (360-736-2221); **k7cex@arrl.org**

Pacific Division (EB, NV, PAC, SV, SF, SJV, SCV)

East Bay: James Latham, AF6AQ, 1798 Warsaw Ave, Livermore, CA 94550-6140; (925-447-6136); **af6aq@arrl.org**

Nevada: Dick Flanagan, K7VC, 2851 Esaw St, Minden, NV 89423 (775-267-4900); **k7vc@arrl.org**

Pacific: Bob Schneider, AH6J, PO Box 131, Keaau, HI 96749-0131 (808-966-8146); **ah6j@arrl.org**

Sacramento Valley: Ronald D. Murdock, W6KJ, 998 Bogue Rd, Yuba City, CA 95991-9221 (530-674-8533); **w6kj@arrl.org**

San Francisco: Bill Hillendahl, KH6GJV, PO Box 4151, Santa Rosa, CA 95402-4151 (707-544-4944); **kh6gjv@arrl.org**

San Joaquin Valley: Charles P. McConnell, W6DPD, 1658 W Mesa Ave, Fresno, CA 93711-1944 (559-431-2038); **w6dpd@arrl.org**

Santa Clara Valley: Bill Dale, N2RHV, 142 N Milpitas Blvd #264, Milpitas, CA 95035 (408-263-5325); **n2rhv@arrl.org**

Roanoke Division (NC, SC, VA, WV)

North Carolina: Tim Slay, N4IB, 141 Queens Cove Rd, Mooresville, NC 28117-9609 (704-382-4646); **n4ib@arrl.org**

South Carolina: James F. Boehner, N2ZZ, 525 Barnwell Ave NW, Aiken, SC 29801-3939 (803-641-9140); **n2zz@arrl.org**

Virginia: Carl Clements, W4CAC, 4500 Wake Forest Rd, Portsmouth, VA 23703 (757-484-0569); **w4cac@arrl.org**

West Virginia: L. Ann Rinehart, KA8ZGY, 1256 Ridge Dr, South Charleston, WV 25309 (304-768-9534); **ka8zgy@arrl.org**

Rocky Mountain Division (CO, NM, UT, WY)

Colorado: Jeff Ryan, KØRM, 9975 Wadsworth Pky K2-275, Westminster, CO 80021 (303-432-2886); **k0rm@arrl.org**

New Mexico: Donald D. Wood, W5FHA, 9100 Wimbledon Dr NE, Albuquerque, NM 87111 (505-828-0988); **w5fha@arrl.org**

Utah: Mel Parkes, NM7P, 2166 E 2100 North, Layton, UT 84040 (801-547-1753); **nm7p@arrl.org**

Wyoming: Christopher J. Pritchard, WY7UPR, 325 Greasewood St, Green River, WY 82935-4770 (307-870-6258); **wy7upr@arrl.org**

Southeastern Division (AL, GA, NFL, PR, SFL, VI, WCF)

Alabama: Jay Isbell, KA4KUN, 2290 Quail Dr, Bessemer, AL 35022 (205-424-9993); **ka4kun@arrl.org**

Georgia: Susan Swiderski, AF4FO, 772 Camelot Way, Norcross, GA 30071 (770-449-0369); **af4fo@arrl.org**

Northern Florida: Paul L. Eakin, KJ4G, PO Box 625, Panacea, FL 32346 (850-591-0442); **kj4g@arrl.org**

Puerto Rico: Roberto Jimenez, KP4AC, PO Box 360536, San Juan, PR 00936-0536 (787-756-7276); **kp4ac@arrl.org**

Southern Florida: Sharon T. "Sherri" Brower, W4STB, 736 34th Ter, Vero Beach, FL 32968-1226 (772-562-3240); **w4stb@arrl.org**

Virgin Islands: John Ellis, NP2B, PO Box 24492, Christiansted, St Croix, VI 00824 (340-773-9643); **np2b@arrl.org**

West Central Florida: Dee Turner, N4GD, 10132 64th St N, Pinellas Park, FL 33782 (727-548-7474); **n4gd@arrl.org**

Southwestern Division (AZ, LAX, ORG, SDG, SB)

Arizona: Thomas J. Fagan, K7DF, 10650 E Bridgeport St, Tucson, AZ 85747-5925 (520-574-1129); **k7df@arrl.org**

Los Angeles: Phineas J. Icenbice Jr, W6BF, 19323 Halsted St, Northridge, CA 91324 (818-349-3186); **w6bf@arrl.org**

Orange: Carl Gardenias, WU6D, 20902 Gardenias St, Perris, CA 92570 (951-443-4958); **wu6d@arrl.org**

San Diego: Stephen M. Early, AD6VI, 4724 Maple Ave, La Mesa, CA 91941 (619-461-2818); **ad6vi@arrl.org**

Santa Barbara: Robert Griffin, K6YR, 1436 Johnson Ave, San Luis Obispo, CA 93401-3734 (805-543-3346); **k6yr@arrl.org**

West Gulf Division (NTX, OK, STX, WTX)

North Texas: Tom Blackwell, N5GAR, Box 25403, Dallas, TX 75225 (214-361-5275); **n5gar@arrl.org**

Oklahoma: John Thomason, WB5SYT, 1517 Oak Dr, Edmond, OK 73034-7408 (405-844-1800); **wb5syt@arrl.org**

South Texas: E. Ray Taylor, N5NAV, 15426 Spring Coral, San Antonio, TX 78247 (210-233-8971); **n5nav@arrl.org**

West Texas: John Dyer, AE5B, 9124 County Road 301, Cisco, TX 76437 (254-442-4936); **ae5b@arrl.org**

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From QST Magazine, March, 2005

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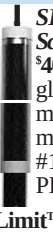

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Productive KP Visit

On a visit to Puerto Rico in June, Southwestern Division Director Greg Sarratt, W4OZK, was welcomed by a newly created organization, the Puerto Rico Amateur Radio Society. We gave him a tour of Old San Juan and a local TV station, and visited a local hamfest. We also exchanged views on plans for enhancing emergency communications. — *Angel Santana, WP3GW*

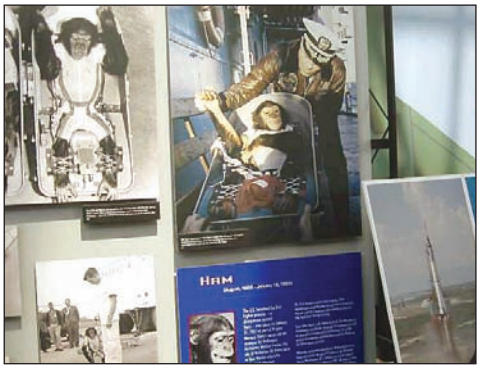
WP4F

From left to right: **Hector Reyes, WP3ZZ; Tony Santiago, KP4IA; Danny Ponce, WP4F; W4OZK; Angel Santana, WP3GW, and Aris Javier Quinones, WP4DX.**

First Ham in Space

Among the exhibits at the Museum of Flight adjacent to King County Airport (commonly known as Boeing Field), near Seattle, Washington is a commemoration of the first hominid to fly in space — a chimp named Ham. In addition to the Apollo 7 capsule, other exhibits include the Wright Brothers Flier, SR-71 Blackbird, complete aircraft such as the Douglas DC-3, MIG-15 and -21, F-4 Phantom, Grumman F-14 Tomcat, and the SkyLab capsule. — *John Marthens, NU6A*

JOHN MARTHENS, NU6A

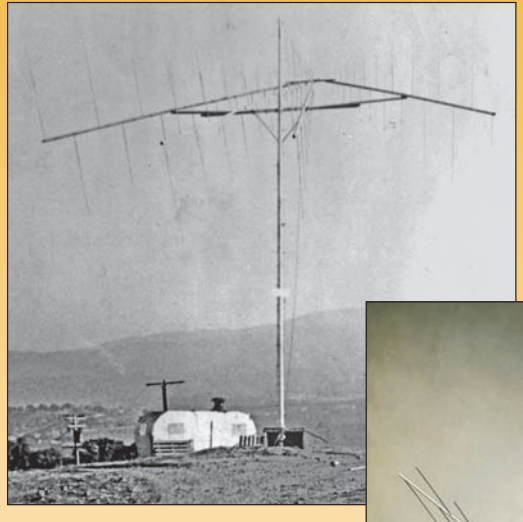


The Museum of Flight near Seattle features an exhibit of chimp space pioneer Ham, by all accounts the first Ham to fly in space. Ham's 13 minute suborbital flight, in 1961, paved the way for the manned space program.

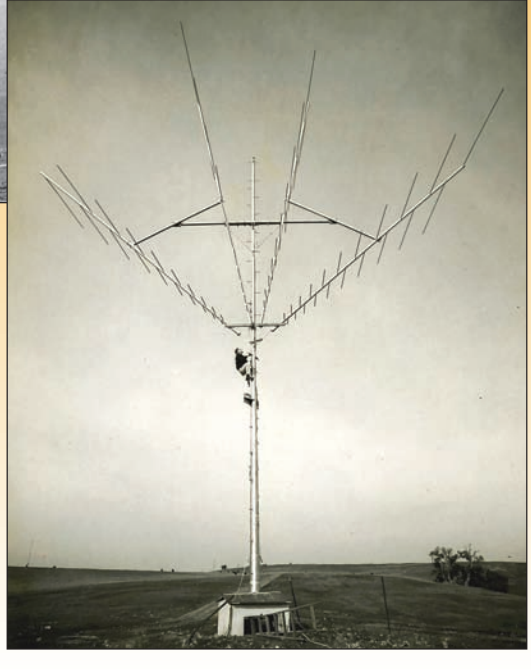
Stanford U Tower... Then and Now

Stew Gillmor, W1FK

It was with surprise that I saw on page 79 of the July 2008 issue of *QST* a photo of Stanford's current W6YX ham shack and antennas. I operated W6YX years ago in a site a mile or so away from the location in your photo. The photo shows the remains, at the left, of my 60 foot rotating steel pole tower from 1960, however. I published some results of my project in *Electrical Engineering*, January 1962 and included a photo of the antenna array. The pole was originally 40 feet tall, about an 8 inch diameter steel rotating mast with ½ inch wall thickness. I cut off the top and added a 20 foot section to bring it to 60 feet. I installed four 40 foot log periodic antennas with 21 elements each and a common feed point. I hung them on an aluminum horizontal pipe held with U-bolts in a welded triangular support. In your photo you can still see the triangular support. My big log periodics are long gone, and some Yagis seem to be hung at the 30 and 60 foot heights.



Writes Stew Gillmor, W1FK: **Here are two photos of the steel mast and my log periodics. One photo, showing the antenna in normal operating position, was taken in the summer of 1960. The second, taken probably in 1961 (when I was in the Antarctic) shows a friend climbing the mast while the antenna was stowed in the rest position. My 84 element, four boom periodic array is long gone, but the tower remains and is used by student hams today.**



PHOTOS COURTESY STEW GILLMOR, W1FK

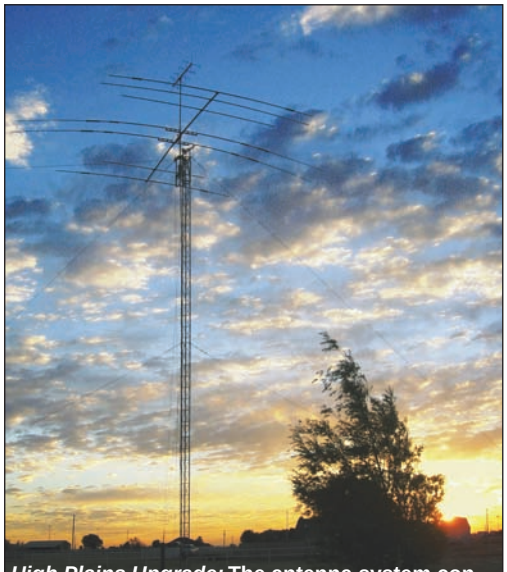
My project was to record solar radio noise looking for HF solar radio bursts, and used the IF from a WWII radar receiver as a 25-35 MHz "Panadaptor" sweep receiver. I used an 8 mm movie camera and pulled the film across a Z-axis modulated oscilloscope. Thus, I got a vertical frequency, horizontal time and brightness amplitude record. I moved the azimuth with the motor drive for the rotating steel mast, and moved elevation by a rope and pulley arrangement.

Before recording too many results, I left Stanford and went to the Antarctic as a guest scientist with the 6th Soviet Antarctic Expedition, 1960-62, and did not return to the antenna site until I was a visiting professor at Stanford in 1999-2001.

Texas Tower at Sunrise

I have recently made some major changes to my antenna system because of wind damage here in the high plains of Texas. I replaced my rotator with the Orion OR2800PDC. I put all new coax on the tower, buried 2 inch PVC pipe between the tower and the house, and put three runs of Bury-Flex, one run of RG-8X, rotator cable and a pull rope for future replacement if needed. My coax is grounded to the base of the tower with braided shield. I took some pictures of my antenna installation at sunrise on June 15, two days after I raised it. — *Ralph Oakes, KØCWD*

RALPH OAKES, KØCWD



High Plains Upgrade: **The antenna system consists of a Rohn 25G tower at 54 feet. The beam is a Mosley PRO-67A at approximately 64 feet headed NE at 15 degrees. The rotator is an Orion OR2800PDC. The rotator loop is Bury-Flex.**

Hams in the Faculty Senate at Iowa State

At the recent retreat of Iowa State University's senior administrators and faculty leaders, it was noted that three members of the Faculty Senate Executive Board were hams: Arnold van der Valk AG3V; Rob Wallace, WAØRW, and Skip Walter, ADØH. Iowa State, located in Ames, has 26,000 students and is a member of the Big 12 Conference. ISU is best known as the home of the 1939 Attanasoff-Berry Computer, ultimately recognized after a court hearing as the first digital computer, years after many history books were written stating otherwise.

Van der Valk is Professor of Ecology in the Department of Ecology, Evolution, and Organismal Biology and has been at ISU since 1973. He is the President-Elect of the Faculty Senate. He also serves as the President of the Story County ARC, is a DXCC and WAS holder and is the husband of Suzanne, NDØD.

Wallace is an Associate Professor of Ecology, Evolution, and Organismal Biology and has been an ISU faculty member since 1990. As WAØRW, he is active on 20 meters, including mobile operation, and also enjoys woodturning, coaching and home brewing beer. His son David, KDØAQB, recently received his Technician license at age 10.

Walter has been at Iowa State since 1984 and is Professor of Logistics and Supply Chain Management. ADØH is a Volunteer Examiner, DXCC and WAS holder, and county-hunter and faculty advisor to the Cyclone Amateur Radio Club at ISU. Another member of a ham family, his brother Don is W7NG. — *Skip Walter, ADØH*

STEVEN A. FREEMAN

Faculty Senate hams: **From the left — Rob Wallace, WAØRW; President Gregory Geoffroy; Provost Elizabeth Hoffman, Arnold van der Valk, AG3V, and Skip Walter, ADØH, pictured at The Knoll, the official residence of the president of Iowa State University.**

CHARILE SCHLIEPER, N5TD

Charlie Schlieper, N5TD, of Temple, Texas built this unique adaptation of a 70 cm J-Pole antenna into a walking cane for Mike, WB5PBS. He says the coax tap was higher than expected, but it achieved an SWR of 1.1:1 at the UHF D-STAR frequency of 440.525 MHz.

Edison the Railroad Telegrapher

On a recent family visit to the Thomas Edison Depot Museum in Port Huron, Michigan, my wife and daughters and I learned about the first inventions of telegraph, phonograph and communications systems. Edison, it turns out, spent his teen years in Port Huron on the railroad, where he honed his telegraph skills. — *Mike Van Voorhis, N8VIQ*

Mike, N8VIQ; Lauren; Kaitlin, and the Kenwood TH-D7A transceiver we brought along on our visit to the Edison Depot Museum.

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CORRESPONDENCE

THE HUMAN TOUCH

♦ I have been licensed for 52 years, and as Joshua Long, KD8BVB ["Op-Ed," August 2008, page 100] describes in his article, am one of those who define Amateur Radio as what it was: The enjoyment of being in making a contact with something I created. The joy was hearing a voice out of the ether in all that interference and static. The joy was also in speaking to as many people and then re-contacting them as I got proficient enough to recognize voices as well as call signs.

Modern digital communications is of course much more efficient, but it lacks the human factor. There are no voices to recognize; there are no "fists" to recognize, either. There are just digits, and like the rest of our world, your call becomes just a number in the spectrum. So take that new radio you received as a gift, plug it in and hook it up to the multi-thousand dollar antenna system and poof! you are a ham. Save all that money and just get on the Internet instead; it is very efficient and relatively inexpensive.

Let's save "modern" digital communications for emergencies and leave the hobby as a way for humans to interchange ideas on a more personal level

BURT YELLIN, K2STV
Sun City Center, Florida

SPECIAL DELIVERIES

♦ I received my August *QST* on July 1 in pristine condition. I am amazed at how promptly this issue was delivered. You worked your magic! Thanks for the superb service.

AL BAKER, W5IZ
Burleson, Texas

♦ I was quite surprised yesterday (July 10) to find the August issue of *QST* in my mailbox. I knew that lately it had been coming earlier, but this seems really early. When I opened it, I immediately saw your article on how *QST* gets to your mailbox and was quite intrigued with the methods you use. Whatever you are doing to get mail to rural Canada, it sure is working — it is arriving well before your target date. Thanks for your efforts to get us the magazine.

DON PETERSON, VE5DP
ARRL Life Member
Silton, Saskatchewan, Canada

MORSE MELODIES

♦ Arriving home one evening after work, I was making my way to the front door when I heard the unmistakable sound of melodic Morse wafting through the air. Being certain that I hadn't left the rigs in the car or the shack on, I went in the house where I found that my wife had purchased a plastic "recorder," a flute-like wind instrument that my granddaughter Kara was playing. When I asked her what she was playing, she replied that she was "making sounds that come out of Poppy's radio." The four year old was piping out perfectly formed Morse letters at nearly 15 WPM!

Keep up the great work at ARRL HQ. The Vintage Radio column rocks!

JOE MAHONEY, KI4GAP
Mechanicsville, Virginia

A LITTLE EXTRA STUDYING

♦ I enjoyed the article about the new licensing materials ["Inside HQ," July 2008, page 13]; at the end of it, you said to let you know what I think. I just got off the phone with ARRL's Customer Service department to order the *2007 Handbook* and the new versions of the *Extra Class License Manual* and the *Extra Class Q&A Manual*. I am presently an Advanced class ham, and want the Extra ticket.

I'm sorry to hear that the League doesn't provide an Amateur Extra class course as you've done for the other license classes, so I urge you to consider an interactive Extra class Web-based study forum. I like the idea of posting questions and receiving guidance from instructors. I don't mind studying on my own, but having a study forum and being able to post questions while receiving guidance for instructors would be very beneficial.

GERRY MORAVEC, WD5AAM
ARRL Life Member
Austin, Texas

TOWER TALK

♦ Congratulations, ARRL, on winning a long and difficult battle with BPL. I congratulate all of the staff: Officers, lawyers, technical folks and PR teams. You did a marvelous job in defending our hobby, and the *coup de gras* is the court decision that the FCC has to pay the ARRL for docket fees. Vindication!

Now, on to the next battle. This one, to my mind, is a far more serious and a greater threat: Private covenants and restrictions. The real estate lobbyists are a strong political force to be reckoned with and almost every new subdivision has severe restrictions on what hams can do on their own property.

PRB-1 is being consistently overruled by subdivision covenants and restrictions. Those hams trying to find an antenna-friendly neighborhood with reasonable commutes to work are facing very challenging situations. While I understand the reluctance of the FCC to interfere with local regulations, the precedent has already been set for the satellite TV industry. In my neighborhood, 50 percent of the homes have dishes. I don't think these are any more of an eyesore than if I were to put a tri-band beam in my back yard at 32 feet.

Yes, we have options: mobile operation, stealth antennas (I am doing both, but only because I have a couple of trees). The fact remains that restrictions that were virtually nonexistent 30 years ago represent a real threat today.

What I would like is some sort of reasonable exemption to permit amateurs to erect antennas on their property. Would it be so terrible to attach a ham tower to the side of the house and have a tri-band beam no more than 10 feet above the peak of the roof? Could there not be some sort of accommodation given to hams? Is that any more ugly than a satellite dish (or three) on the roof of the house?

ARRL, I wish you luck in this next endeavor. There is a balance that should be found here.

MARK LUNDAY, WD4ELG
Hillsborough, North Carolina

ARRL Regulatory Information Manager Dan Henderson, N1ND, replies: Remember that PRB-1 only covers regulations implemented by governmental actions, such as zoning and planning boards. Deed covenants and restrictions are matters of private contract, not public law. As such, the FCC continues to decline to extend PRB-1 to cover CC&Rs. Extension of PRB-1 to cover CC&Rs is something that the ARRL continues to push at the Congressional level, but to date we have not been able to secure a sponsor for the legislation in the 100th Congress. You may find it helpful to read "PRB-1 and CC&Rs — What Should I Do Now?" [May 2008, page 44]. The article can also be found online at **www.arrl.org/FandES/field/regulations/hender.pdf**.

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

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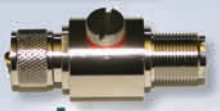

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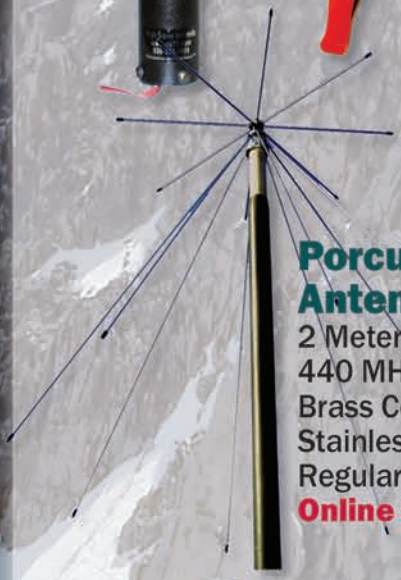

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RF Drive:
75 - 90W
Output Power:
SSB 750W PEP max.,
CW 650W, RTTY 400W
Circuit:
Class AB parallel push-pull
Cooling Method:
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Maximizing the Mobile Motorist Mission

Making the most of available tools, including APRS, can make mobile operation more rewarding.

Bob Bruninga, WB4APR

Figure 1 — W4HFZ's typical mobile setup includes VHF, UHF, HF, a GPS and APRS.

Did you know that on the typical interstate, you are probably passing another ham about every 10 minutes? Yet how often can you raise anyone for a contact (QSO)? There are over 10,000 repeaters in the *ARRL Repeater Directory*, but how hard is it to find a QSO on the open road?[1] Visit the Washington, DC and Baltimore area with almost 100 repeaters. Which one is recommended for travelers? What is the required CTCSS tone?

Did you know that ham radio operators have been able to use mobile and handheld radio keypads for local and global text messaging and e-mail for the last 10 years? This was long before the present teenager craze of text messaging on cell phones. In a time when chatter on the VHF FM radio channels is declining, this article should shed some light on how we can find each other in the RF wilderness and communicate more easily. Finding each other is important when there is a local emergency, a disaster or simply when something exciting is happening to share with others. We equip our cars with Amateur Radio technology (see Figures 1 and 2), but are we really using it effectively?

National Simplex and Voice Alert

Of course, the national 2 meter simplex calling frequency, 146.52 MHz, is a good channel for the traveler, but you are only in range of a passing mobile for perhaps 3 to 5 miles and are passing at a combined rate of over a mile every 30 seconds. Finding others on 146.52 would require everyone to be calling CQ every 2 to 3 minutes for their entire trip. This doesn't happen. But there is another national calling channel on 2 meters that can be far more effective, 144.39 MHz.

Many traveling mobile operators discovered that they can get dual-use from their automatic position reporting system (APRS) radios by not turning the *packet racket* volume down. Instead, they turn the volume up and mute the packet noise on the North American APRS channel by simply setting a CTCSS receive tone of 100 Hz. This mutes the packet noise, but makes their speaker fully ready to receive a voice call. We call this *Voice Alert* where you can make simplex voice contact with an APRS operator by just making a voice call with 100 Hz CTCSS enabled.[2] Of course, as soon as contact is made, you should change frequency to a packet free voice channel to continue the contact.

Voice Alert Radar

A side benefit of Voice Alert on 144.39 is that any other Voice Alert APRS station within simplex range (usually about 3 to 5 miles) may occasionally hear the once every minute or so packet from another nearby Voice Alert mobile. This is like a proximity radar, and is better than '52 because these Voice Alert stations are automatically transmitting their *radar* ping every minute or so. This guarantees you can't pass each other unannounced.

Voice Alert is not just for APRS operators. Anyone with any CTCSS receive equipped mobile radio can use it. Just monitor 144.39 MHz in North America with your receive tone set to 100 Hz while on the open road and if you hear a packet, just ask who's calling (QRZ?) by voice. After contact is made, request the other operator to switch to a simplex voice channel and make a new acquaintance.

Operating Frequency Identification

Voice contact can be even better than that. Although Voice Alert is a really neat way to meet nearby travelers on the national APRS simplex channel, the solution for longer range contacts has always been a part of APRS. That is, most mobile operators will try to maintain their present operating frequency included in their position packets. This makes it possible to simply look at the station list on the front panel of the APRS radio, laptop or heads-up display (HamHUD) and see who is close enough for repeater contact (see Figure 2) and give them a call! This extends the voice operating contact range to the typical hundreds of square mile range of voice repeaters, not just the simplex range of Voice Alert.

Automatic Frequency Announcing

But wait, it is even better than that! The new Kenwood TM-D710 dual band radio can be configured to insert the frequency of the voice band of the radio into the real time position packets on the data band automatically. If the operator changes frequency, the position report will include the new frequency. As shown in Figure 3, the wider screen of the new 'D710 has an added column to display these frequencies.

Recommended Voice Repeaters

But wait — there are more frequencies to tune! Since the purpose of APRS is local situational awareness, the most important local object should be the recommended voice repeater frequency for travelers in the area.[3] You can see three of these objects in Figures 3 and 4. These local repeater APRS

[1]Notes appear on page 33.

Figure 2 — For over 10 years, there have been a variety of fully integrated APRS radios as shown here. Shown left to right (top row), first was Kenwood's 'D7 and then 'D700. Then the Alinco DR-135 with add-on HamHUD to give it an APRS display capability. Then (bottom) in 2007 the fully capable 'D710 and recently the VX-8R was announced by Yaesu.

objects include the frequency right on the front panel list and when selected, even include the CTCSS tone, any net times and even club meeting dates. Since these repeater objects contain a frequency, as you drive into a new area you can just push the TUNE button to tune to the locally recommended voice channel.

Other Local Frequency Objects

There should also be local APRS objects informing the APRS equipped mobile operator of everything else going on around him regarding Amateur Radio in that area. This includes EchoLink, IRLP and Winlink Telpac nodes. EchoLink and IRLP nodes are shown on the APRS list as node numbers instead of call signs to facilitate ease of use by mobiles as shown in Figure 5. Included are their frequency, tone, range and status (RDY, BSY, LNK).

With these VoIP systems and APRS, the infrastructure is already in place to make mobile to mobile real time global voice communications possible. The APRS operator just sends a message requesting a call to station X1XX. An engine somewhere monitoring the APRS global data feed grabs this message, looks up the nearest VoIP node to the two mobiles, then sends a message to each telling them the frequencies. The operators tune to their local VoIP frequency and make contact. All we need is someone to write this automatic voice relay system (AVRS) engine software.[4]

Automatic Frequency Tuning

But wait, there's more! The new Kenwood TM-D710 has a TUNE button. Select any station that is showing their frequency, press the TUNE button and instantly you go to her frequency for a QSO. In addition there is the new SORT button that can sort the list, either alphabetically or by range. The above display is after an alphabetic sort so that all the frequency objects show up at the top of the list.

Not Just a Vehicle Tracking System

APRS was originally (all the way back to the 1980s) conceived as a local real time information distribution and display system, even before GPS position tracking was added.[5] That is, APRS is a digital information channel monitored by everyone for distribution of short beacons about anything going on now in ham radio in the area.

APRS made it easy for anyone with new data to beacon it on the channel, and for everyone to receive, capture and sort it into a consistent set of useful displays. The '80s was a time when packet radio was spread out over dozens of local VHF and UHF channels with dozens of bulletin boards, DX clusters and nodes so there was no simple way to get the big picture. APRS was designed to monitor packet channels and to then build a database and a map of all the beacon information available.

To avoid having to tune to each of those channels, APRS established a continent wide single data beacon channel and invited all other systems to beacon their presence and activities there as a resource of local information. Just knowing who was on the air was valuable information.

Then in the early '90s, GPS became inexpensive and position tracking was added for those stations that were moving, lost or didn't know how to read a map. This led to lots of APRS mobiles and in many cases the appearance to the casual observer that APRS was just a vehicle tracking system. Unfortunately, this is the wrong impression. APRS is about hams communicating with hams and being situationally informed about all ham radio activities around them. In the case of the mobile operator, it means receiving information about everything local that can be of interest.

Transmitting *and* Receiving Local Information

Not only are many people not aware of what they could be receiving in their mobile, but many do not even receive APRS at all. Some just transmit their GPS data. There are

Figure 3 — The new 'D710 mobile radio includes an added column for frequency information and also has a TUNE button for instant QSY to contact one of those stations. The first three objects are nearby voice repeaters, and AB9FX has two stations nearby, another 'D710 monitoring 52 and his 'D7 handheld monitoring 446.000.

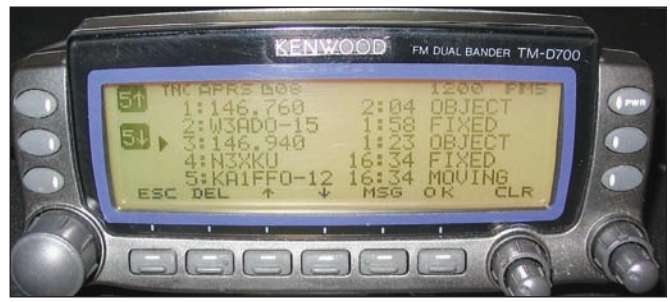


Figure 4 — By using the recommended local voice repeater frequency as an APRS object name, these recommendations show up for the mobile traveler whenever he enters a new area. This 'D700 shows the most recently received 146.76 is in direct range. The older 146.94 has moved down the list since it was heard 35 minutes earlier.

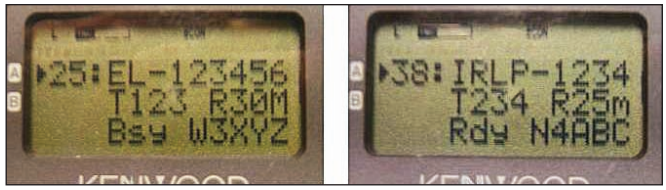


Figure 5 — Nearby EchoLink and IRLP nodes can also beacon their position, frequency, tone and their node numbers. This makes mobile-to-mobile dial-up global communications possible. These displays show the node number and tone, but the second line should actually be the frequency.

Figure 6 — This HamHUD display shows that station KE4NYV is 141 miles north and is doing 63 mi/h on a heading of 123°. His device is identified as an OpenTracker2 (APOT2A). His position report includes his voice operating frequency as 146.52 with a tone of 107 Hz for voice contact. His position is translated to a waypoint and displayed on the map of the attached GPS.

Figure 7 — The new AVMAP-G5, when connected to the 'D710, even supports the full APRS symbol set so that the mobile operator does not need his PC to see the full APRS tactical display.

Figure 8 — Typical flashed display of a new local packet. We like to concentrate information into the first 20 or 28 bytes of a packet so that it displays well on the 10×10 display of the 'D7 and the 10×10×8 display of the 'D700 shown here. This packet shows the local repeater, its tone, its typical range and its weekly net time.

very few ham radio applications that are based on transmit-only systems and APRS is not intended to be one of them. APRS is a network for the two way exchange of information. This article should show the general ham population how useful this single channel digital information network can be to the mobile operator as a resource in not only maintaining situational awareness of all of ham radio around him, but also being a rapid text messaging channel and a national alert calling channel.

The transmit-only tracking devices should have receivers set to a CTCSS tone frequency of 100 Hz and the speaker volume turned up so that this person can receive a Voice Alert call from someone trying to contact him. Conversely, if any station is not listening they should never transmit with that tone. That is like calling CQ with no receiver.

Heads-Up Display for Any Radio

There is a kit available called the HamHUD that can be connected to any radio so that it can not only transmit APRS, but also receive and display the information in a similar way to the TM-D700 family display.[6] Recent versions have the TNC built in for an easy one-plug solution. This is an inexpensive way to receive and display APRS local information on any radio while mobile. See Figure 6.

As an added capability, the display head of the new 'D710 can also be used as a stand-alone APRS display when hooked to the audio connections of any radio. This is useful when removed from the mobile, perhaps carried inside to the club or EOC, and operated with any handheld transceiver.

Participating in the Local Situation

Since many people have been misled to believe that APRS is only a vehicle tracking system, they are unaware of all the other potential applications. For example, the following applications are all included in the basic APRS radio display, requiring no external PC or laptop. All of this information is available to the traveler on the front panel.

- APRS, map displays, APRS messages and e-mail.
- Voice Alert providing a full-time intercom channel to other operators.
- Proximity radar alerting you to all other equipped mobiles in simplex range.
- IRLP and EchoLink alerts to repeaters in range, along with their frequency and tone.
- Satellite alerts showing you FM mobile satellites when they come into view.
- Query/response to the local area for locations of important local services or assets.
- Winlink emergency access to your e-mail.
- DX Cluster spots to alert you to DX and any other information on a DX cluster.
- Remote control (sky command) of your HF or other remote base radio.
- Direct control of SSTV if you have the Kenwood VH-C1 handheld SSTV system.

GPS Map Displays

Not only can you plug in a GPS and have the radio automatically transmit your positions and status as you drive, but the APRS radios or HamHUD also converts all other packet positions received into objects for automatic display on the attached GPS map. The map shows all surrounding APRS stations, mobiles, weather stations and objects, right there on the GPS. With a good GPS with built-in maps, no laptop is needed in most APRS mobiles. Recently, the AVMAP G5 even includes the full APRS symbol set so these other stations appear on the GPS map with full color symbols as shown in Figure 7.

Instant Information Display

The text information in each new incoming packet will flash up on the radio or HamHUD screen for 10 seconds or so as shown in Figure 8. This alerts you to anything new in range without your hands ever leaving the steering wheel. This display is useful for conveying to travelers the location, frequency and CTCSS tone of the local calling frequency and in this case, the net meeting time.

If you miss any of these new items when they come in and are flashed on the screen for 10 seconds, you can always call up the list of the last 40 to 100 stations heard with just a press of the LIST button.

Global Real-Time Text Messaging

Although APRS on RF is only a local sys-

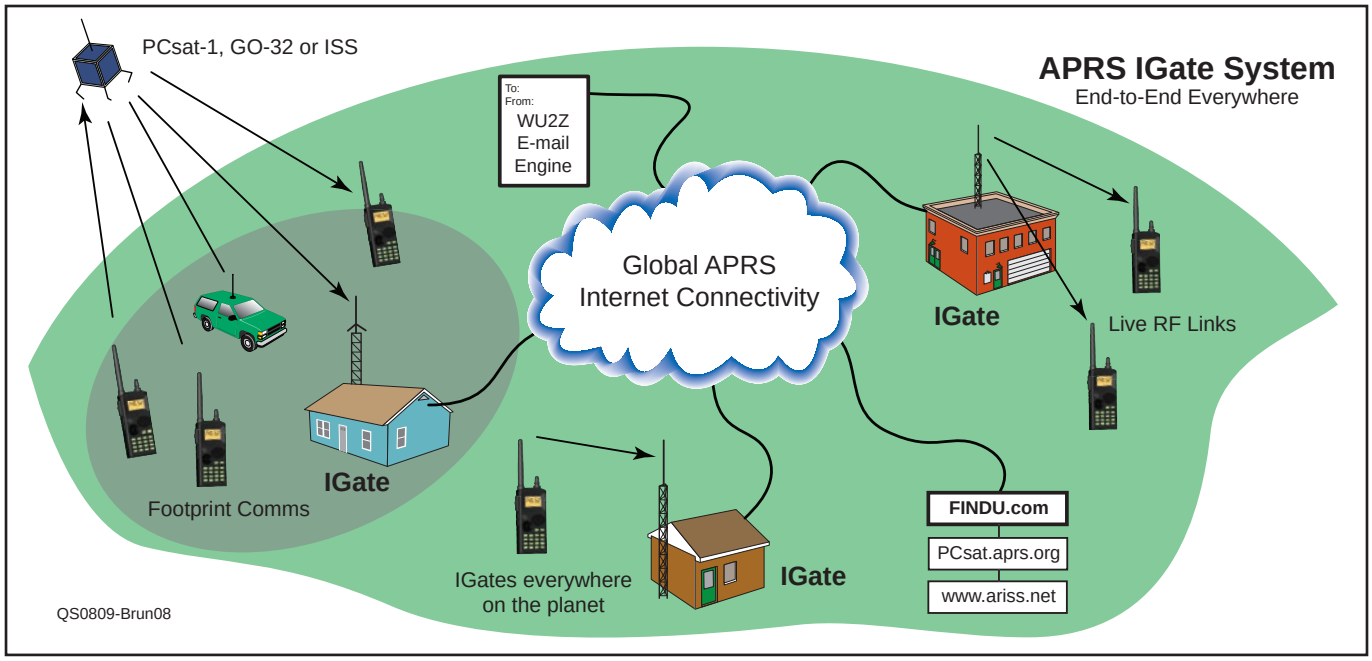


Figure 9 — Although APRS is a local RF information resource, it is also globally connected via the free bandwidth of the Internet. Everything goes into the Internet and can be monitored there. End-to-end messages go in locally and can reach any other user on the planet in real time via local IGates.

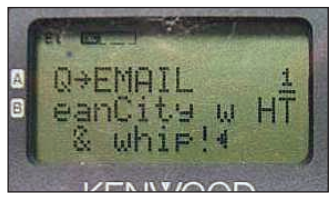


Figure 10 — APRS messages are local, global and real-time as long as both stations are on the air. This message is not to another call sign, but to a special pseudo-call of E-MAIL. This message will be turned into a real e-mail for standard delivery anywhere in the world. The 'D7 can display text messages up to 45 characters.

tem, it is also globally connected for station-to-station messages as shown in Figure 9. APRS has had local and global text messaging for 10 years. This is because all APRS packets transmitted anywhere get captured into the APRS-Internet system (APRS-IS) by home stations, called *IGate*s, linked to the Internet. If any such IGate anywhere sees the recipient of a message packet in its local RF area, it will automatically gate that live message packet from the APRS-IS and send it in real time via RF to the targeted user. His system will generate an *ack* (acknowledgment) and the ack will travel the reverse route to the sender in real time. This is not e-mail. These messages are live. If both stations are on the air anywhere in the global APRS system, their messages get to each other without any prior routing or address knowledge required.[7] Messages up to 45 characters show up nicely on the D7 display as shown in Figure 10.

Global CQs

Although APRS has global instant text messaging, it assumes you know the call sign of the distant party. This makes it impossible to call a general CQ or send a group message beyond the local RF range. But recently, AA5PL has added a CQ server that allows anyone on the planet to send a single message to everyone else on the server in the same CQSRVR group. With the CQSRVR, a CQ JOTA goes to all other CQ JOTA stations, even CQ FD is supported. This server is very powerful in providing instant global text messaging to any group for any purpose. All members of the group get the messages instantly.[8]

Conclusion

Many of us only have time to really enjoy ham radio while we are mobile. The purpose of this article is to make sure everyone is aware of the vast potential of information out there that appears on a front panel screen of the mobile APRS operator. The techniques allow us to find each other just by call sign in the global RF world. In the future, even existing radio and handheld users without specialized APRS radios should be able to check in to the global APRS network by just sending their call sign from a DTMF memory to their local repeater or EchoLink/IRLP channel.[9]

So think outside the box! APRS has been available as a local RF resource for over 15 years, but many operators are still not taking advantage of this valuable local and global information resource. Due to limited space, only a few of the dozens of display screens and data formats could be shown in this article.

For detailed setup and application data see the file on the *QST* binaries Web site.[10]

Notes

[1]*The ARRL Repeater Directory,* 2008/2009 Edition. Available from your ARRL dealer or the ARRL Bookstore, ARRL order number 1271. Telephone 860-594-0355, or toll-free in the US 888-277-5289; **www.arrl.org/shop/**; **pubsales@arrl.org**.

[2]Voice Alert Web page: **www.ew.usna.edu/~bruninga/VoiceAlert3.html**.

[3]Local repeater information: **www.ew.usna.edu/~bruninga/localinfo.html**.

[4]EchoLink and IRLP on APRS: **www.ew.usna.edu/~bruninga/avrs.html**.

[5]The original APRS Web page: **www.ew.usna.edu/~bruninga/aprs.html**.

[6]HamHUD Web page: **www.hamhud.net/**.

[7]APRS Email Emergency Tests: **www.ew.usna.edu/~bruninga/sset.html**.

[8]**www.ew.usna.edu/~bruninga/aprsjota.html**.

[9]**www.ew.usna.edu/~bruninga/aprstt.html**.

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

Photos by the author.

Bob Bruninga, WB4APR, holds an Amateur Extra class license and is a Life Member of the ARRL. Bob is considered the "Father of APRS," the automatic position reporting system. He is the director of the US Naval Academy Satellite Lab. Bob can be reached at 115 Old Farm Ct, Glen Burnie, MD 21060 or at **bruninga@usna.edu**.

D-RATS — an Application Suite for D-STAR

Make D-STAR meet your needs with text chatting, file sharing and other applications.

Dan Smith, KK7DS

Anyone who has already taken the plunge into using the digital audio and data D-STAR system has probably heard of *d*Chat*.[1,2] This application, by Brian Roode, NJ6N, provides keyboard-to-keyboard chat over the low speed data channel of a D-STAR radio. While text chat is a critical function, additional features such as file transfers and structured data transport would make the digital radios even more useful. For these reasons, as well as the desire to have something that works on other platforms, I was motivated to create *D-RATS*.

[1]Notes appear on page 35.

K7TAY

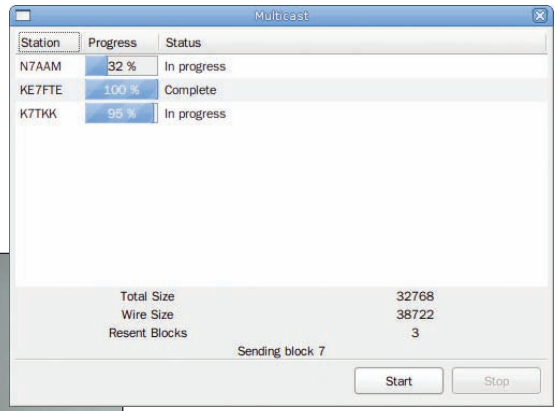


Figure 2 — Multicast file transfer status report.

D-STAR Put to the Test

In December 2007 Oregon's northwest coast and coastal mountain range experienced major flooding. Conventional communication systems were interrupted for up to seven days in many areas. The Amateur Radio Emergency Service (ARES) was immediately activated and was the primary source of communications, handling emergency traffic for both 911 centers and the American Red Cross. It was this quick and determined response that earned the Governor's praise for ham radio operators as the "unsung heroes" of the disaster.

The small coastal mountain range community of Vernonia was hit particularly hard during this event — it received over 15 inches of rain in a very short period of time. Massive flooding followed. Washington County was the closest county to the affected areas and its ARES organization provided much of the communications assistance. Multnomah and Clackamas Counties also provided service.

At this time D-STAR is still new to the Washington County ARES group. Some members have already purchased radios and the local governmental agencies are also beginning to buy equipment. There was no D-STAR repeater at the time (although one has since been ordered by the Washington County Sheriff's Office), so simplex was the only option.

Once the event had stabilized, Washington County ARES had the opportunity to test the available D-STAR equipment. They used *d*Chat* to send small bits of text from the Vernonia Emergency Operations Center (EOC) to the Red Cross Shelter, about two miles away. In one test, digital signals were successfully transmitted from Vernonia to the Washington County community of Aloha, approximately 17 miles away.

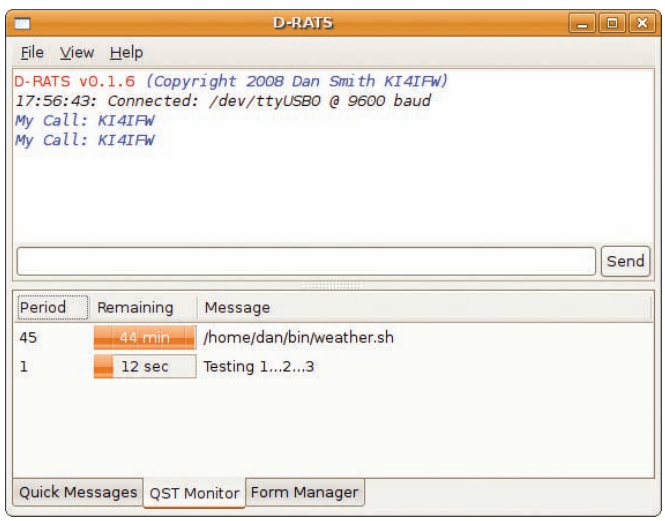


Figure 1 — Main *D-RATS* window showing multiple QSTs.

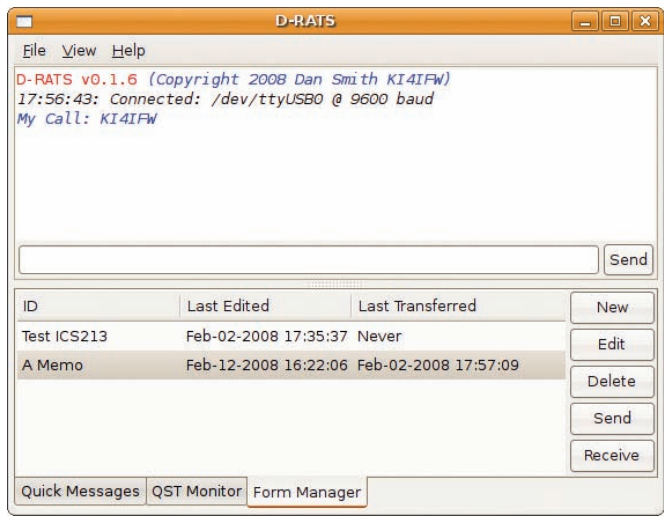


Figure 3 — *D-RATS* form manager makes filling out forms easy.

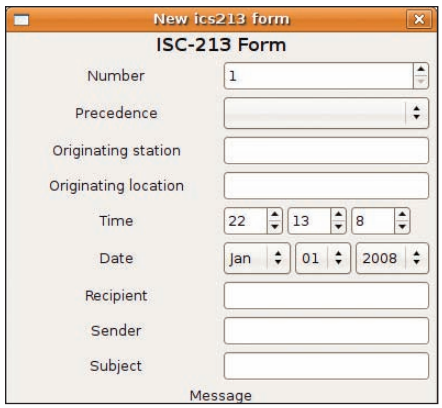


Figure 4 — An ISC-213 form ready to be filled out for transmission over *D-RATS*.

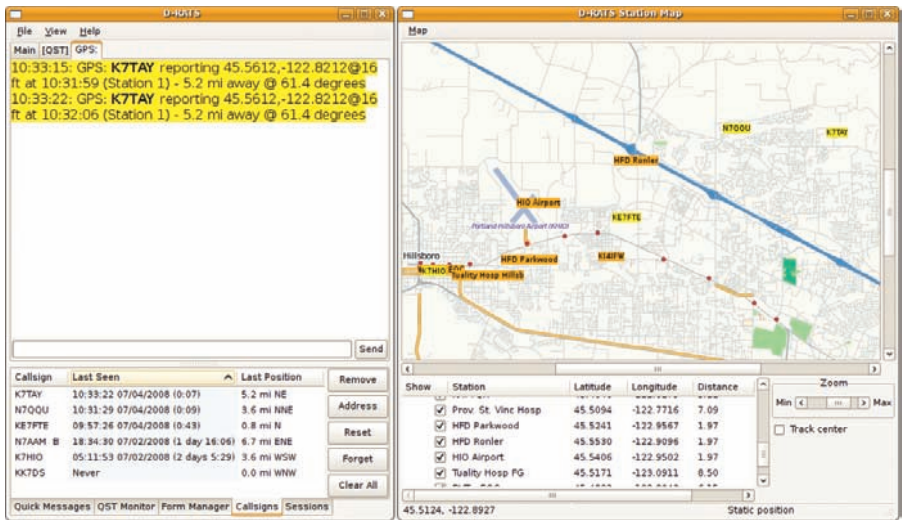


Figure 5 — The integrated GPS and mapping feature.

Text is Great, but Files are Important Too

The ability to send files during this event would have meant that the hams could have sent spreadsheets and other agency-provided data much more quickly. Larger volumes of traffic could have been collected and organized into a file in any format and transmitted with greater precision and speed between locations. While this is possible with terminal programs that support Kermit (or similar protocols), *d*Chat* is the only tool they had available and had been trained to use.

D-RATS Fills the Gap

D-RATS was created to provide a cross platform base for many of the additional features that *d*Chat* was lacking. The first major goal was to implement file transfer capabilities into the application itself, as well as improve upon some of the features that *d*Chat* already supported. Some of these improvements include allowing multiple automatic *all call* or QST messages at varying schedules, and creating an unlimited number of preset or canned messages (*d*Chat* supports only seven). As soon as the ability to have multiple QSTs defined was available (see Figure 1), it quickly became apparent that some indication of when the next QST was to be sent would be important. D-RATS has a display panel showing each of the QSTs with a countdown progress bar showing the time remaining until the next broadcast (see Figure 2).

As more local people started sending regular QSTs, it became clear that the message display was reaching a point at which it became difficult to determine which of the messages were important. *D-RATS* supports *dimming* and *highlighting* of certain messages based on a search string to help improve readability (see Figure 3). Additionally, traffic can be split off into tabs to keep it separate from the rest. This can be useful to keep automatic beacon messages out of view, or to pull important messages (such as from a net control station) into a dedicated screen.

File transfers are, of course, one of the major features of *D-RATS*, and have been improving steadily since the beginning. However, one of the very important points that attracts a lot of attention is the structured data or *form* support. Almost every organization has one or more standardized formats for sending specific types of information. There are NTS forms and Red Cross forms, as examples. *D-RATS* allows you to recreate these forms in the application by defining a list of form fields and associated types into a template. Once a template is defined, a user can easily create a new instance of (for example) an NTS form, fill it out, save it and then send it to one or more stations using the error free file transport mechanism. See Figure 4 for an example of a form template.

Multicast Saves Bandwidth

D-RATS has also recently gained *multicast* support, allowing efficient broadcasting of a file from one station to multiple receiver stations simultaneously. This function ensures that everyone receives the complete file, free of errors, without having to send a separate file to each receiver one at a time. This also results in (up to) a 100% duty cycle transmission, which minimizes transfer time. With the least expensive (and slowest) 2 meter radios, a 55 kB, 640 × 480 pixel, photograph can be sent in just under eight minutes. A multi-page MS *Word* document compressed to 11 kB would take just under two minutes to send. The same content in text format (6 kB) compressed to 3 kB would take less than 30 seconds. Assuming no block resends are needed, the time to transfer the file itself is independent of how many stations are receiving the file. *D-RATS* now includes integrated compression for file transfers.

Keep Track of the Team

D-RATS also incorporates integrated global positioning system (GPS) support for interacting with compatible ICOM radios. It can broadcast your position (with or without the use of an external GPS) and can calculate distance and direction to other stations. An integrated map view (see Figure 5) can even plot known stations using freely available geographical data.

D-RATS is written in Python/GTK, which means it runs on Linux, MacOS and Windows. It is free, open-source and can be downloaded from **d-rats.danplanet.com**. The Web page for the application uses a community editable wiki, which I encourage people to update and extend with their own suggestions, comments and experiences.[3]

Notes

[1]W. Silver, NØAX, "D-STAR Digital Voice and Data — An Overview" (sidebar to Product Review of the ICOM IC-2820H Dual Band FM Transceiver), *QST*, Jun 2005, pp 67-69, available on the ARRL Members Web site at **www.arrl.org/members-only/prodrev/pdf/pr0711.pdf**.

[2]**nj6n.com/dstar/dstar_chat.html**.

[3]**d-rats.danplanet.com/wiki/DownloadPage**.

Dan Smith, KK7DS, is an ARRL member who has been licensed since 2004 and currently holds an Amateur Extra class license. He earned BS and MS degrees in computer science (the latter from North Carolina State University) and is a software engineer at IBM's Linux Technology Center in Beaverton, Oregon. His professional background is mostly programming, supplemented with a healthy amount of self-motivated, and mostly self-taught, electronics tinkering. You can reach Dan at **dsmith@danplanet.com**. *Check out his Web site at* **www.danplanet.com**.

Project 25 for Amateur Radio

The FM repeater era began nearly 40 years ago with hams "repurposing" commercial analog transceivers. Now they're doing it again, but this time it's digital!

Mike Kionka, KIØGO

There is increasing interest in digital voice and data activities on the ham bands, particularly above 50 MHz. Many amateurs have probably heard of D-STAR, a digital voice and data system developed by the Japan Amateur Radio League in cooperation with ICOM. However, there is another approach that is attracting attention as well: APCO Project 25.

APCO Project 25 (P25) is a set of digital radio standards developed by various electronics manufacturers, along with input from local, state, and federal governments, and support from the Telecommunications Industry Association (TIA). P25 has been around since 1995, and provides guidance for building digital radio equipment for public safety users. P25 systems have proliferated among public service agencies. Chances are a police department, fire department or other public agency near you is using a P25 system right now.

Within the last several years hams have been acquiring commercial Project 25 mobile and handheld transceivers and converting them for amateur use, mostly on 2 meters and 70 cm. Because P25 is an open digital standard, it is perfectly legal for hams to use P25 on the air.

One common misconception about P25 is that all systems are trunked, where radios on the system are automatically directed to assigned frequencies by a central controller, as opposed to conventional systems where the users manually choose operating frequencies. In fact, P25 defines both trunked and conventional systems. While trunked systems aren't a real good fit for Amateur Radio for a variety of reasons, conventional P25 is much more useful.

The number of manufacturers making P25 equipment has greatly increased in the last eight years or so. In the 1990s Motorola and EF Johnson had a virtual monopoly, but now most major manufacturers of two-way radios for the public safety market have at least some kind of P25 offering. Modern scanners and communications receivers often have P25 decoding capability, adding to the number of P25 radios out there.

There are numerous amateur P25 repeaters around the US, so one might be closer than you think! The latest *ARRL Repeater Directory* identifies these repeaters, where known. Another source of information is on the Web **www.p25ham.com**.

P25 Features

With P25, voice and data share the same channel seamlessly and simultane-

The Thales 25 (formerly Racal 25) is a P25 digital radio covering the 136-174 MHz band. Notice that this one has been reprogrammed for use on the 2-meter ham band. It features a very intuitive user interface, which allows channel parameters to be quickly programmed or changed from the front panel.

To reprogram a Motorola Astro Saber, you need Motorola's programming software, a Radio Interface Box (RIB) and the appropriate cables. You can find the RIB and cables on eBay and other sites.

ously. Conventional P25 also supports data messages such as "digital DTMF" dialing packets, individual radio paging with acknowledgement, and even text messaging on some of the newer radios. P25 radios remain muted whenever data messages intended for other stations are received, so the user isn't annoyed by hearing data packets between voice transmissions.

The P25 standard supports *unit ID* numbers, which is another useful feature. This means that each transceiver is treated as a unique radio with its own digital ID. Many P25 radios have a unit ID alias list that can be programmed with text labels such as a name or call sign. You can configure the radio to display the alias whenever a particular person is talking.

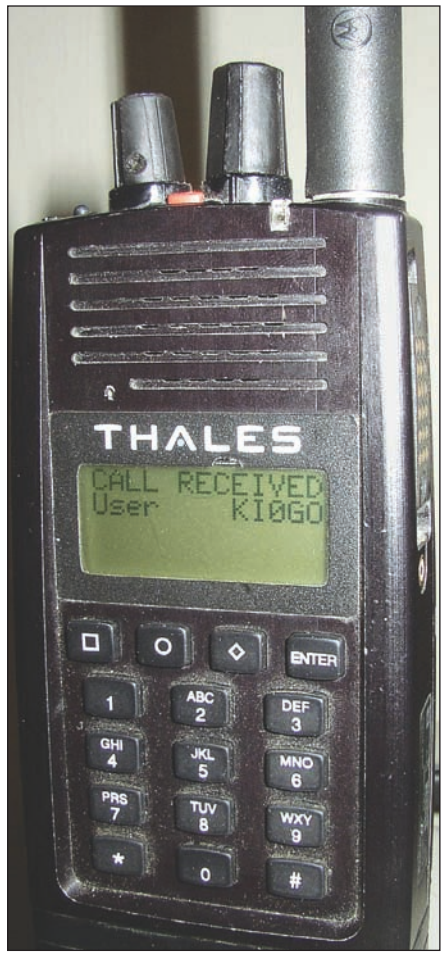
Like CTCSS tones on analog FM repeaters, P25 supports what are known as *Network Access Codes* (NAC) to allow radios or repeaters to ignore transmissions that are not intended for them. There are 4096 possible NAC values, which include the special reserved "hear all" value of F7E, and the "repeat all" F7F value.

Even though most P25 repeaters are set up to only repeat transmissions with a single NAC value, it's still possible to separate groups of users into *talkgroups*, if desired. As with the NAC, the talkgroup value is continuously sent throughout the P25 voice transmission. Any P25 radio can be programmed to operate with "Selective Squelch", where the radio will only unmute if both the NAC and talkgroup values match. This operation is very similar to having several groups of users on one frequency, but each using their own CTCSS tone. Imagine you and several friends carrying on your own "private" conversations while another group does the same — all on the same frequency.

P25 Repeaters

There are a few different ways repeaters can be set up to relay P25 signals. The simplest would be using a standard analog FM repeater set up for total carrier squelch operation (no CTCSS tones). If the audio response of the repeater is flat enough down to very low frequencies, P25 signals may pass through it sufficiently undistorted so that they can be demodulated on the output. Of course, this method provides no error correction of any kind to clean up the received signal, and has all the normal disadvantages of a carrier squelch repeater.

Another way to repeat P25 signals is to construct a repeater out of a couple of P25 radios, so that the audio from the receiver of one radio is routed to the transmitter of the other. A repeater constructed this way does at least provide a consistently clean P25 signal, but since the digital receive audio is converted to analog and then back to digital again, the quality suffers. This is known as "double vocoding." Another disadvantage to double vocoding repeaters is that the information continuously embedded in a P25 transmission doesn't pass through the repeater, so unit ID, talkgroups and data messages can't be used.



The Thales/Racal25 transceiver notifies the user of an incoming call with an audible alert and a display message. If the unit ID list in the radio is properly programmed, the radio displays the caller's name or call sign.

The best way to repeat a P25 signal is to use a repeater designed to do just that. These repeaters take the received digital signal, correct any errors to the maximum extent possible and send a totally regenerated P25 signal on the output. This permits the passing of all the embedded information like unit ID numbers, talkgroups, individual calls and even data messages, depending on the repeater.

Using P25

Getting a couple of P25 radios to communicate on simplex or through a repeater isn't all that much more difficult than doing the same with analog radios. The most important difference is to make sure the NACs are properly set in each radio.

One might be quick to conclude that the simplest way to do this would be to not use NACs at all, thinking it would be the equivalent of using no CTCSS tones. P25 doesn't work this way, as every frame in every transmission contains a NAC value, so something must be sent.

The default NAC value is 293 hexadecimal, and is the most commonly used value on amateur P25 repeaters. Most P25 radios require the NAC to be entered in hexadecimal format using the programming software, and some have the option to enter it in decimal format as well. Some of the P25 radios can be programmed from the front panel and in that situation the NAC must be entered in decimal. It's important to know which format your radio expects, so that you can convert it if necessary. Most scientific calculators make this hexadecimal/decimal conversion a snap.

Motorola P25 radios can be programmed for "Digital Carrier Squelch," where the radio will unmute on any P25 signal. However, this setting forces the transmitted NAC to 293, which may not always be what you want.

The P25 standard specifies NAC value F7E as a special "hear all" NAC that can be used in receivers to allow them to unmute on any NAC. Unfortunately, this wasn't specified until later in the life of the standard, so there are many P25 radios out there that don't treat F7E as a special NAC. A quick test for this is to try and program the value F7E into your radio as the *transmit* NAC. If the radio or programming software accepts this value, it probably doesn't treat F7E as the special value. Since F7E is a special NAC for receivers only, the standard states it isn't allowed to be transmitted. If a radio allows F7E to be transmitted, it was probably developed before F7E was declared a special reserved NAC, and would treat F7E just like any other value.

Once the NAC is properly programmed, that's pretty much it for basic operation. If coordinated with the other P25 users on the channel, talkgroups can be used if some users don't want to listen to all the channel activity. This involves selecting a talkgroup and reprogramming the squelch mode from "normal" to "selective," so the radio will require both the received NAC and talkgroup values to be correct to unmute. The highest conventional talkgroup, 65535 decimal, is designated by the P25 standard as the "all call" talkgroup and all radios will unmute on reception of this one, regardless of which talkgroup they're programmed to.

The programming software for some P25 radios has the ability to enable or disable talkgroup operation. Like the NAC, there's a slot for a talkgroup value in each standard

P25 voice frame, so something must be transmitted even if talkgroups are disabled. Most radios just send talkgroup 1 in this case, and unmute on reception of any talkgroup. Talkgroups are probably a little too complex for most amateur use, but the capability is there in all P25 radios.

Sharing a Channel with Analog Users

When using P25 or any other digital voice mode, care should taken to prevent interference to other users of the channel. Depending on how they're programmed, some P25 radios may not indicate when analog traffic is present, so it would be possible to unknowingly "double" with an analog user.

The best way to avoid this is to program every P25 channel in your radio as *mixed mode*, which allows the radio to receive both analog and digital traffic. Nearly every P25 radio supports some kind of mixed mode operation, so it's pretty easy to monitor the channel prior to transmitting. If you only want to listen to digital traffic on a channel, it's a good idea to program the channel as mixed mode anyway, but set the receive CTCSS/DCS value to one you wouldn't expect to be used. On most P25 radios that don't provide a busy indication for analog signals on a digital-only channel, setting the channel to mixed mode with a wrong receive CTCSS/DCS value will often provide some kind of busy indication.

Just about every P25 repeater can be configured for mixed mode operation, and repeat both analog and digital signals. This allows both analog and digital radios to use the machine, but it can create some problems, as well. Since the repeater can only repeat one mode at a time, it needs to be shared by users that may not be able to decode the opposite mode. Using CTCSS tones on the repeater output lets analog users with tone decode capability keep their radios muted while digital traffic is present. Of course, analog users without tone decode capability would just hear the unpleasant noise whenever digital traffic is there.

Any repeater owner or club considering replacing an existing analog-only repeater with a P25-capable one should carefully think about how it will be used by both analog and digital users. In many cases, replacing a heavily used analog repeater with a mixed mode repeater may cause too many problems. A better use of a P25 repeater may be to replace an existing repeater that doesn't see as much use. This may breathe new life into the machine, while not ruffling the feathers of too many analog-only users who may have been using it for years.

Just about every P25 repeater can be configured for mixed mode operation, and repeat both analog and digital signals.

On the Thales/Racal25, accessing the unit ID list to make an individual call is as simple as pressing and holding the pound (#) key.

Finding P25 Rigs

So where do you get a P25 radio? Since these are mostly intended for the public safety and government markets, buying a brand new one may be surprisingly expensive or even difficult, depending on the manufacturer. Many manufacturers of P25 radios have an entry-level model with a list price in the $900-$1500 range, which is really steep compared to typical VHF/UHF analog ham gear. Full-featured radios can easily exceed $5000 list price, which would be out of the price range of most individuals.

Rather than buying new gear, most P25 hams look to the used/surplus market on auction Web sites (such as eBay) and radio web forums. Prices of P25 radios in this market typically range from $200 to $2000, depending on the radio. There are a quite a few used P25 radios in new or like-new condition.

There are several things to watch out for when shopping for a used/surplus P25 transceiver. The first is making sure the radio you're considering is really capable of P25 digital operation, and covers the desired frequency range. Many manufacturers sell their P25 models with digital voice as an *option*, so you need to ensure this option is actually enabled in the particular radio. This means that finding a P25 radio isn't as simple as searching for a model number.

Older Motorola radios, such as the Astro Saber and Astro Spectra may have an outdated proprietary *VSELP* digital voice option, which isn't compatible with P25. There is information available on the Internet detailing which firmware versions and flash code options are necessary for P25 operation. See **www.batlabs.com** to get started with the popular Motorola Astro radios.

Another very important thing to consider when purchasing a used/surplus P25 radio is where the radio came from. Ideally, the seller would have some kind of proof that the radio was obtained legally, as it isn't uncommon for these to disappear from public safety or government agencies. If the seller can't provide this information, or doesn't even know what band the radio operates on, it's probably best to move on.

Finally, before spending your hard earned cash on a P25 radio, you'll need to think about how to get it programmed. The PC programming software and the necessary cables are usually proprietary and can be quite expensive, depending on manufacturer. While some P25 radios like the Racal/Thales 25 and Relm/BK DPH are front-panel programmable, there are some initial settings that need to be set via the PC software.

Photos by the author.

Mike Kionka, KIØGO, received his BSEE from the University of Colorado at Boulder in 2001. He has been a ham since 1995 (originally licensed as KBØUCA). An ARRL Life Member, Mike currently works as a consultant designing and engineering two-way radio systems. You can contact him at 8735 W 67th Pl, Arvada, CO 80004; **kionka@colorado.edu**. QST

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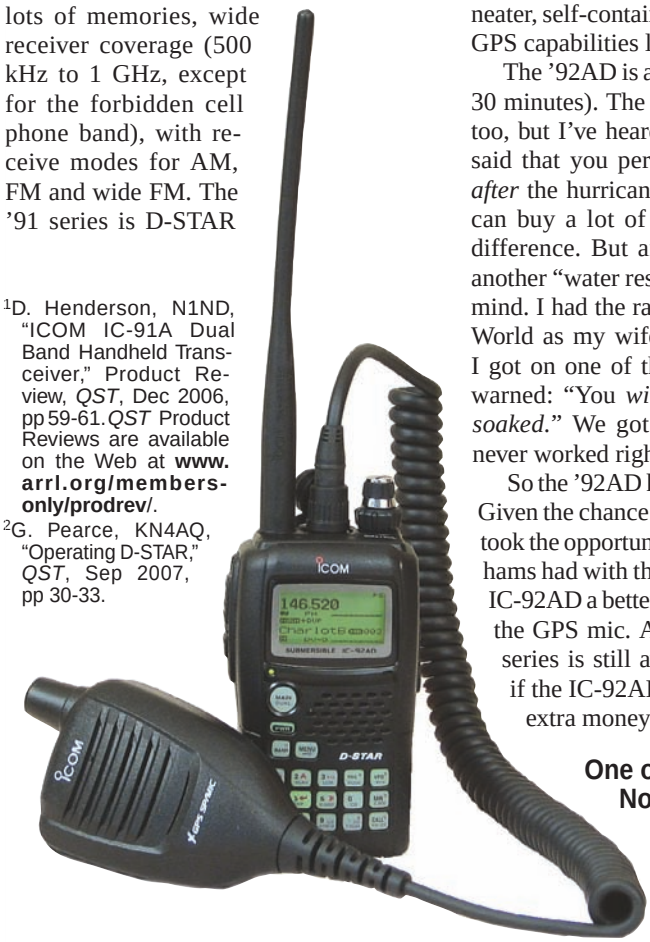
PRODUCT REVIEW

ICOM IC-92AD Dual Band Handheld Transceiver

Reviewed by Gary Pearce, KN4AQ
ARRL Contributing Author

The IC-92AD came along pretty quickly as an addition to the IC-91AD, ICOM's flagship dual-display, D-STAR capable VHF-UHF handheld. The two models are so similar in form and function that you may wonder why there *is* an IC-92AD, and what justifies its higher price. I'll try to explain that. And since Dan Henderson, N1ND, reviewed the '91A model (without D-STAR) in December 2006 *QST*, I'll look at the digital capabilities of both the IC-91AD and IC-92AD.[1] For more general information on D-STAR, see my article "Operating D-STAR" in September 2007 *QST*.[2]

Both the IC-91AD and IC-92AD are very full featured dual band (144 and 440 MHz) FM handhelds. They have lots of memories, wide receiver coverage (500 kHz to 1 GHz, except for the forbidden cell phone band), with receive modes for AM, FM and wide FM. The '91 series is D-STAR optional. The '92AD is available only with D-STAR built in.



The IC-92AD exists to make emergency responders happy. It does that by having an optional GPS equipped speaker-mic. With that mic, in D-STAR digital mode, the radio can transmit the operator's position with every voice transmission as part of the data stream. And it can be set to beacon a position report at adjustable intervals, similar to APRS. If you have a second GPS equipped '92AD, or a GPS equipped ICOM IC-2820H mobile, you can use that information to show a compass bearing and distance between the radios, right on the radio's display — "He's 2.8 miles that-a-way" (Figure 1). Other D-STAR radio models can display the received coordinates numerically. The IC-91AD can be connected to an external GPS, so the '92AD with the GPS mic just makes a neater, self-contained package. More on the GPS capabilities later in the article.

The '92AD is also submersible (1 meter, 30 minutes). The Emcomm guys like that, too, but I've heard a few hams scoff. One said that you perform emergency service *after* the hurricane, not during it, and you can buy a lot of umbrellas for the price difference. But an experience I had with another "water resistant" handheld came to mind. I had the radio on my belt at Disney World as my wife Cyndi, KD4ACW, and I got on one of those water rides. A sign warned: "You *will* get wet. You *may* get *soaked*." We got soaked. That radio has never worked right since.

So the '92AD has a couple of exclusives. Given the chance for a do-over, ICOM also took the opportunity to address a few issues hams had with the '91 series and made the IC-92AD a better package, with or without the GPS mic. As this is written, the '91 series is still available. You can decide if the IC-92AD's updates are worth the extra money.

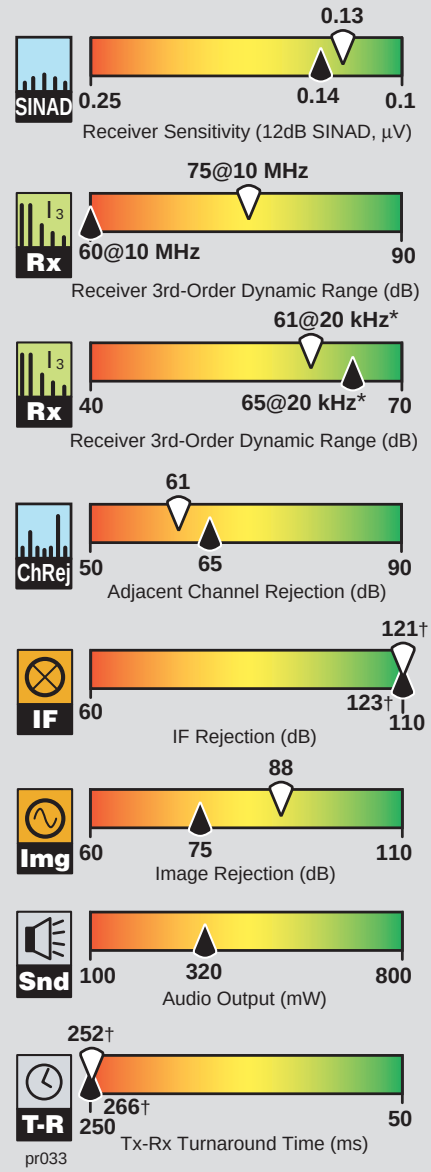
One of These Things is Not Like the Other

Most reviewers like to see how much they can make a radio do before they crack the manual.

[1]D. Henderson, N1ND, "ICOM IC-91A Dual Band Handheld Transceiver," Product Review, *QST*, Dec 2006, pp 59-61. *QST* Product Reviews are available on the Web at **www.arrl.org/members-only/prodrev/**.

[2]G. Pearce, KN4AQ, "Operating D-STAR," *QST*, Sep 2007, pp 30-33.

Key Measurements Summary



Key:
† Off Scale
*Measurement noise limited at value shown.
2 M
70 cm

See **www.arrl.org/members-only/prodrev**, "A New Look For Product Review."

Bottom Line

The IC-92AD is a very capable radio for analog and D-STAR digital VHF/UHF operation. It's expensive compared to analog-only dual-banders, and you'll need to spend some time learning the digital features. In return, D-STAR offers many capabilities not available in the analog world. If you're into emcomm or search and rescue, check out the HM-175GPS speaker/mic with a built-in GPS receiver.

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

Can they turn it on, set a frequency, offset and tone, then key up a repeater and make a contact all without help? With the complexity of radios these days, that's not a given. Since I already had an IC-91AD, and the '92AD is very similar, my challenge was more like the "Game of Seven Differences" or the *Sesame Street* tune quoted in the heading for this paragraph. I went hunting for the changes. Most of the time, when I found one my reaction was, "Yes, that's better."

The very first thing I noticed was the VOLUME control, the outer ring on the dual-control shaft on the top of the radio. It rotates too easily on the '91AD, so it's easy to bump too loud or soft. The IC-92AD's control is stiffer and has detents, so it stays in place.

Ah, the humble VOLUME control. Today's diminutive dual display radios have a problem: not enough real estate on top for two VOLUME controls. One knob does double-duty, controlling both bands. That forces a choice. Do you control both bands at once? Do you only control the "Main" band? Each choice is a compromise. The '91AD and '92AD let you select either method, with options in the SET menu. The '92AD has another SET menu option labeled DIAL REPLACE. I saw that while playing the seven differences game, but didn't know what it meant until I read the manual. It lets you swap the functions of the center and ring knobs on that top shaft. This radio is nothing if not choices. Another example: Scan delays are adjustable from 2 to 20 seconds.

The DIAL REPLACE mystery prompts me to mention that the display has a fine-grain dot matrix that permits lots of real English words in the various menus (see Figure 2). DIAL REPLACE may have stumped me, but SET MODE, SCAN, DUP/TONE, DISPLAY and SOUNDS are all pretty intuitive, at least if you speak basic ICOM. I can never remember some of the more obscure abbreviations of earlier radio menus — what does 100 DT mean on my IC-W32A? And if you forget your reading glasses, the font size can be adjusted between large and small.

My next observation was that the mic connector wasn't the usual two-pin affair. It's a round, multi-pin connector, covered with a heavy rubber cap. That connector is needed for the GPS/mic, and also handles all other data and programming connections to the radio. If you have an ICOM mic from an older radio, you can get an adapter cable. The rubber cap is a little hard to put in place once popped off. It's obviously there to maintain submersibility. The rubber plug covering the dc power connector is heavy duty, too.

Physically, the '92AD is a little taller than the '91AD, and maybe a hair wider and thicker. Even so, several hams who held it said they liked the feel of the newer model. Another change is the belt clip. The IC-91AD has a very stiff, single-piece steel clip. The '92AD has a lever with a hook at the bottom that I find easier to clip to my belt single-handed.

All these discoveries came while the radio was addressing its "A" side. I tried to switch to the "B" side. Couldn't do it. ICOM swapped the functions of three main front panel buttons, but my fingers had muscle

Table 1
ICOM IC-92AD, serial number 0201019

Manufacturer's Specifications	Measured in ARRL Lab
Frequency coverage: Receive, 0.495-999.990 MHz (cell blocked); transmit, 144-148, 420-450 MHz.	Receive and transmit, as specified.
Modes: FM, AM (receive only), WFM (receive only), DV.	As specified
Power requirements: 10-16 V dc or specified battery pack.† Receive, 150 mA at rated output (single watch, FM), 38 mA (single watch FM power save), 220 mA (dual watch, FM/DV) with 7.4 volt battery pack. Transmit, 2.1 A (high power, 440 MHz), 0.4 A (lowest power, 144 MHz).	Receive (max vol, no signal), 180 mA; transmit (hi/med/low/s-low, with 8.2 V measured battery voltage), 144 MHz: 1.75/1.24/0.6/0.35 A; 440 MHz: 1.98/1.37/0.67/0.36 A.
Receiver	**Receiver Dynamic Testing**
AM Sensitivity: 10 dB S/N, 0.5-5 MHz, 1.3 μV, 5-30 MHz, 0.56 μV, 118-137 MHz, 0.5 μV, 222-247 MHz, 0.79 μV, 247-330 MHz, 1.0 μV.	10 dB S+N/N, 1-kHz tone, 30% mod: 1, 3.9 MHz, 0.5 μV; 14, 53 MHz, 0.34 μV; 120, 146, 440 MHz, 0.42 μV.
FM sensitivity: 12 dB SINAD, 1.6-30 MHz, 0.4 μV, 30-118 MHz, 0.25 μV, 118-174 MHz, 0.14 μV, 174-350, 470-600 MHz, 0.32 μV, 350-470 MHz, 0.16 μV, 600-999 MHz, 0.56 μV; WFM, 76-108 MHz, 1 μV, 175-222 MHz, 1.8 μV; 470-770 MHz, 2.5 μV.	For 12 dB SINAD, 29 MHz, 0.13 μV; 52 MHz, 0.17 μV; 146 MHz, 0.13 μV; 222 MHz, 0.24 μV; 440 MHz, 0.14 μV; 902 MHz, 0.26 μV; WFM, 100 MHz, 0.97 μV.
FM two-tone, third-order IMD dynamic range: Not specified.	20 kHz offset: 29 MHz, 60 dB*; 52 MHz, 59 dB; 146 MHz, 61 dB*, 222 MHz, 63 dB*; 440 MHz, 65 dB*; 902 MHz, 65 dB. 10 MHz offset: 146 MHz, 75 dB; 440 MHz, 60 dB.
FM two-tone, second-order IMD dynamic range: Not specified.	146 MHz, 62 dB.
FM adjacent-channel rejection: Not specified.	20 kHz offset: 29 MHz, 60 dB; 52 MHz, 57 dB; 146 MHz, 61 dB; 222 MHz, 60 dB; 440 MHz, 65 dB; 902 MHz, 54 dB.
Spurious response: VHF, 60 dB; UHF, 50 dB.	IF rejection, 52 MHz, 22 dB; 146 MHz, 121 dB; 440 MHz, 123 dB; 902 MHz, 110 dB; Image rejection, 52 MHz, 79 dB; 146 MHz, 88 dB; 440 MHz, 75 dB; 902 MHz, 2 dB.
Squelch sensitivity: Not specified.	At threshold, VHF, 0.1 μV; UHF, 0.13 μV.
Audio output: 200 mW at 10% THD into 8 Ω.	320 mW at 10% THD into 8 Ω.
Transmitter	**Transmitter Dynamic Testing**
Power output: VHF and UHF, 5.0/2.5/0.5/0.1 W.	With battery pack or external 13.8 V dc, VHF, 5.3/2.8/0.5 /0.1 W; UHF, 5.0/2.8/0.5/0.06 W;
Spurious signal and harmonic suppression: 60 dB	VHF, 66 dB; UHF, >70 dB. Meets FCC requirements.
Transmit-receive turnaround time (PTT release to 50% of full audio output): Not specified.	Squelch on, S9 signal, VHF, 252 ms, UHF, 266 ms.
Receive-transmit turnaround time ("tx delay"): Not specified.	VHF, 74 ms; UHF, 77 ms.
Size (height, width, depth): 4.4 × 2.3 × 1.3 inches; weight, 11.5 ounces.	
Price: IC-92AD, $580; HM-175GPS speaker/mic, $350; RS-92 software and cable, $70.	

†BP-256 battery pack (7.4 V, 1620 mAh Li-ion) and BC-167 wall charger (approx 6 hour recharge time) supplied. Available options: Replacement BP-256, $75. BC-177 desktop drop-in rapid charger (2.5 hours), $60; BP-257 battery case (2 AA cells, TX power limited to 100 mW), $30; CP-12L ($36) and CP-19R ($44) cigarette lighter cables; OPC-254L external power cable, $14.
*Measurement was noise limited at the value shown.

memory from the ’91AD. Reading the labels on the ‘92AD solved my problem, still without resorting to the manual.

After reaching the B side, I tried DV (Digital Voice) mode to key up the local D-STAR repeater. The ’91AD and ’92AD do digital only on the B side of the radio (they do analog on both sides). I programmed the key call sign fields needed for local repeater use (see Figure 3; this procedure is described in more detail later). But I got nothing. Stock-from-ICOM D-STAR repeaters don’t have hang-time or a courtesy beep, so it can be hard to tell if you’ve keyed it up. I was listening on my ID-800H base station, so I’d hear myself — and I didn’t.

There are a lot of DV settings, but I was pretty sure things were right. I looked harder at the main display and noticed the tiny legend SLO in the corner. Hmmm. SLO. Slow? Something prompted me to push (and hold) the output power button. The legend changed to LOW. Okay, it’s the power indicator. Another push brought MID, and another brought… a blank spot (for HIGH).

The 2.5 W Sweet Spot

The IC-92AD has four power levels — 100 mW (SLO), 500 mW, 2.5 W and 5 W. The ’91AD has just the 500 mW and 5 W levels. The new radio’s extra power levels address two complaints about the IC-91AD: battery life and heat. On longer transmissions at 5 W, both radios get pretty hot and uncomfortable to hold. They should. They’re dissipating about 4 W, the same as one of those old, big Christmas tree light bulbs. Try wrapping your hand around one of *them* for a minute! The manual warns you about it (the radio’s heat, not the Christmas light). Both radios use lithium-ion batteries that seem to give other handhelds nearly indefinite life, but the ’91AD appears to chew up its battery quickly.

The IC-92AD has a somewhat higher capacity battery and marginally lower current drain. The big advantage for battery life is that 2.5 W MID power setting. It’s just 3 dB down from 5 W and not very noticeable in FM (a slightly noisy signal will get a little noisier). It’s not noticeable at all in DV, where signals stay “full quieting” until they’re almost gone, unless you’re right at that minimum signal threshold. At 2.5 W, current drain drops significantly (see Table 1). The radio gets warm, but not hot, with long transmissions. The batteries for the ’91AD and ’92AD are slightly different sizes so, alas, they can’t share batteries or drop-in chargers.

I was successful in keying up the repeater once I raised power. My call sign and the short message I’d programmed with my name and the radio model number scrolled

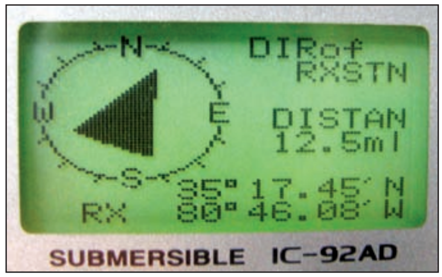


Figure 1 — The GPS compass display shows that the last reported position of the received station is 12.5 miles North-Northeast, and gives the exact latitude and longitude. As this radio moves, the direction and distance to the last received report is continuously updated.

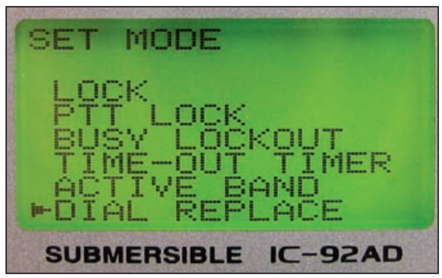


Figure 2 — The large display and fine dot-matrix pattern allow longer words, many in something like real English.

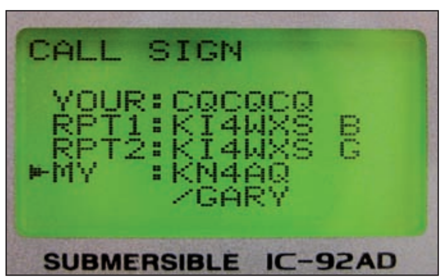


Figure 3 — These four key call sign fields (YOUR, RPT1, RPT2 and MY) are the heart of D-STAR repeater operation and routing through the Internet.

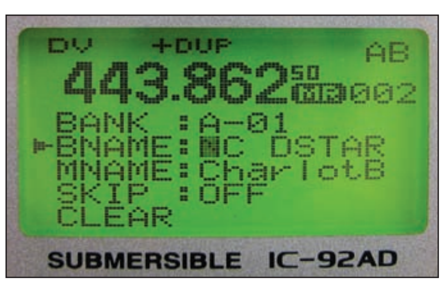


Figure 4 — The display shows many of the memory channel parameters on one screen.

across my base station display. D-STAR digital sends that information with each transmission, right along with your voice.

I kept the IC-92AD turned on from 7 AM to near midnight several times, with a few short ragchews at 2.5 W, a little more listening, but mostly squelched receive. It had enough juice left for a finger-frying test of the adjustable time-out timer (set for three minutes) at 5 W before the battery indicator dropped the first of its two bars. Switching down to 2.5 W brought that bar back for many more minutes of transmitting. I never managed to kill the battery. I plugged in the charger and ticked off another little upgrade: a big CHARGING indicator on the display. The ’91AD just flashes the tiny battery icon when charging.

Audio Reports and Memories

On the air, I asked for audio reports in both analog and digital. The first analog report was “very natural — sounds like you.” But other reports weren’t so flattering, especially when I offered a comparison with the ’91AD and my IC-2820H mobile. The ’91AD had better fidelity, with more lows and highs. The ’2820H rolled off the low end and was very sharp, giving it marks for “most readable.” The ’92AD seemed somewhat restricted, right in the middle of the vocal spectrum. I’ve heard a couple of other IC-92ADs on the air, and they sounded okay to me.

I’ve made recordings of all three radios, in both analog and digital mode, recorded directly from the speaker jack of my ID-800H into my computer line input. You can judge for yourself by listening to the audio file, available for download from the ARRLWeb binaries page.[3]

The receive audio was reasonable for a handheld. I’ve seen complaints that the volume isn’t loud enough, but I could hear it just fine in a car with open windows at highway speeds. I don’t know what more you could ask.

Next it was time to fill up some memories with local repeaters. ICOM offers optional software and an interface cable for this, but it didn’t come with the review radio so I did it manually. The big display makes this easy. It presents your options for naming and storing the memory all on the same screen (Figure 4). Tone settings are buried in another menu. And remember when turning tone on and off was simple? Now pressing the TONE button brings an endless series of options. Here’s a secret: hold the TONE button and turn the top knob to move quickly forward *and backward* through the options.

An UP/DOWN, LEFT/RIGHT “rocker switch” is embedded in the keypad for navigation through the menus. That fine-grain display lets you name your memory channels with eight characters, including upper and lower case text, numbers and lots of special characters. With the radio set for single-band display, it shows both the

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

frequency and your memory name. In dual-display, you choose one or the other.

Programming is easy, but with 800 memory channels on the A side, 400 more on the B side (the A and B sides are separate — they don't share memory channels), and 24 more scan-limit pairs on each side, it's going to take some time. Memory channels are especially useful for D-STAR, which I'll explain in a minute. So the software is a good investment.

There is no "national simplex channel" for D-STAR, as 146.52 MHz is for FM voice. The D-STAR community is discussing the options, and the leading contender is 145.67, but that is used for conventional packet in some areas. The UHF discussion hasn't even gotten that far.

Back to memory programming — the BANK NAME doesn't refer to the financial institution from which you obtained a loan to buy the radio (if you loaded it up with the GPS mic, software, cables, a rapid charger and extra battery, you crossed the $1000 mark a while ago). With that many memories, you need a second level of management. Both the '91AD and '92AD have 26 memory "banks," labeled A through Z. Each bank holds 100 channels. You can cherry-pick individual memory channels and place them in banks. When you select a bank, you're limiting the radio to the 100 or fewer memories in that bank for scanning or manual tuning.

Figure 5 — The HM-175GPS speaker/mic includes a GPS receiver, making a self-contained package. It's big, as shown here with a more conventional speaker/mic.

Let's Do Digital

Now I'm going to tax your ability to absorb new stuff. The details of D-STAR programming aren't easy to grasp at first. I interviewed several of the hams at the leading edge of D-STAR for my video documentary *Digital Voice for Amateur Radio*.[4] I asked each of them to demonstrate how to program a radio for the various D-STAR functions. Doing this off the cuff, each of my experts made a mistake in one detail or another. What chance do we mere mortals have?

Let's all take a deep breath and give it a try. I'm only going to touch the basics. This is a review, not an instruction manual. But I am planning on producing a short, new video that concentrates on D-STAR radio programming. The one will be free, hosted on YouTube, and it should be ready by the time this review is printed. Check my Web site **www.ARVideoNews.com**.

To describe programming, I'm going to shift perspective and write mostly in the first-person — *I* do something with *my* call sign. That's because the nomenclature of ICOM's programming is from that perspective. My call is KN4AQ. Your call is… well, you know what your call is.

Here's the key — D-STAR operation is based on call signs. There are four call sign "fields" in every D-STAR radio. What I put in those fields controls where my signal is heard.

The '91AD and '92AD present these four fields together on one screen labeled CALL SIGN (see Figure 3). The bottom field, MY, gets my call sign, KN4AQ, as long as I'm using the radio. If I hand the radio to my wife, she switches it to KD4ACW.

The top field, YOUR, is where I put your call sign if I want to talk to you. For routine, local operation on repeaters or simplex, that field holds CQCQCQ, but there are circumstances in which I'd put your individual call sign. One example is *call sign squelch*. You can tell your D-STAR radio that you only want to hear transmissions directed specifically to you — a very personal squelch control. So to open your speaker, I put your call sign in the YOUR field. Neat trick.

If you'll bear with me, I'll push that YOUR example a little further. D-STAR is a network of repeaters, linked by the Internet through Gateways — *Linux* based computers running at the repeater sites. The Gateway keeps a list of all the users who have keyed up the repeater recently, and the list is shared with other Gateways. That's part of what MYCALL is for. So if I plug your call in to my radio's YOUR field, my local repeater plays another game — a D-STAR version of *Where's Waldo?* It looks at its list to see what repeater, anywhere on the network, anywhere in the world, you keyed up last. Then it instantly routes my transmission to that repeater. I can also put a specific *repeater's* call sign in the YOUR field to "manually" route my transmission to that repeater. In that case, I'd need to precede the call sign with a "/" that says "this is a repeater call." And I'd need to include the *port letter*, which I'll explain next.

The middle two fields shown in Figure 3 are RPT1 and RPT2. RPT1 is almost always the call sign of the local repeater. In this example, it's KI4WXS in Charlotte. But notice the "B" hanging out there on the end. That's the port letter. ICOM has D-STAR repeaters for 144, 440 and 1200 MHz, and many installations have all three bands. They all share a single call sign. Since transmissions are routed by call sign, I need to enter the extra letter to specify which repeater I want my signal to reach. The convention is A for 1200 MHz, B for 440 MHz and C for 144 MHz.

The RPT2 field in Figure 3 shows KI4WXS G. The G stands for "Gateway." The current recommendation is that I leave the Gateway call sign in RPT2 pretty much all the time. When D-STAR first arrived, ICOM said to set that to "Not Use" if you weren't going to actually use the Gateway. You'll see that in the manual. That's changed, primarily to support use of a device called the DV Dongle, which lets hams access D-STAR repeaters from their home computers over the Internet. Dongle users (get over it, that's the name) can only hear stations that have the Gateway addressed in RPT2.

Now, if you think about it, you've got the potential for a lot of call sign programming. as you route your signal to specific hams around the world. Fortunately, the memory channels store the YOUR, RPT1 and RPT2 fields along with the usual frequency, offset, tone and mode. So for every combination of local repeater, distant repeater, and friend's call sign, you use a memory channel. You'll need to get creative in naming those channels.

By the way, to use a Gateway, you have to be registered. That's done locally, through

[4]S.Ford,WB8IMY, "ShortTakes — Amateur Radio Video News," *QST*, August 2008, p 64.

your repeater's *Gateway Administrator*. You'll be able to track him or her down through **dstarusers.org**.

There is news on the Gateway front. Until recently, we've all said that you can't "link" repeaters in D-STAR in the same way as IRLP and Echolink — all network communication was between individuals. Now you can, two different ways. ICOM's G2 Gateway software now permits connections between as many as 10 individual repeaters. The Administrator sets up the conference and users must put a conference name in the YOUR field. And the third-party *Dplus* program lets the Administrator connect the repeater to a conference server. Users don't have to do anything special. Everyone on all the conferenced repeaters hears everyone else.

That wasn't so hard, was it? We've still got to cover two more features, and that GPS microphone.

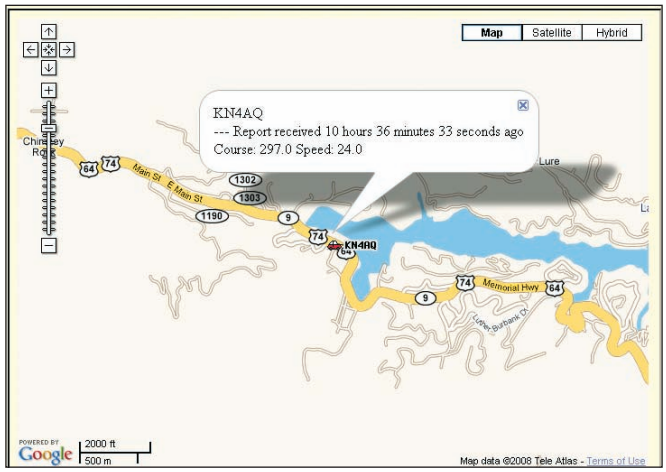


Figure 6 — My position, course and speed, as reported on FindU.com, courtesy of the *Dplus* program running on the Charlotte D-STAR Gateway.

Turn Up the Volume!

The last two features I'll describe are the Break-In and Emergency modes, common to the '91AD and '92AD handhelds, and the ID-800H and IC-2820H mobiles.

These transmit modes allow you to be heard by D-STAR stations who are using any of the various forms of selective squelch (call sign squelch, which I described earlier, and Digital Code Squelch (DCS), which is similar to analog's CTCSS). Just turn on BREAK-IN with a keypad button on the IC-91AD, or in a menu on the '92AD, and everyone on the channel hears you, regardless of their squelch settings.

Emergency mode is even cooler.

What do you do when a conversation on the radio interrupts something you're doing — a phone call, writing an article on your computer, sleeping…? You turn the volume down. And there it sits until you remember to turn it up again. If I activate EMERGENCY MODE (again, keypad on the '91AD, menu on the '92AD), I can reach into your radio and turn your volume back up!

I felt a little strange as I experimented with this, almost like I was dialing 911 just to see if it worked. Only problem was, it didn't work! I tried all four of my D-STAR radios. I turned their volume down, then transmitted to them with a radio in EMR. They stayed quiet. The manual was just as silent, referring to "the specified volume level" without telling me how to specify that level (or even who specifies it, because apparently it isn't me). I experimented, and only after receiving an EMR transmission with my volume up once was I able to then hear them with my volume down. After that, EMR worked every time. Try this before you rely on it!

GPS on D-STAR

The IC-92AD's GPS speaker-mic (HM-175GPS) shown in Figure 5 comes with built-in sticker shock. We're not used to paying $350 or more for a speaker/mic, but of course this one has a GPS receiver and it plugs conveniently into the radio with no adapter or power cables.

The mic is large and heavy for a handheld. It'll tug hard at the collar of your shirt if you clip it there. And GPS is its only trick. There are no up/down buttons or volume control. You might expect some extras for the price, but this mic is designed for emergency responders in the field, so KISS applies. It has one illuminated yellow button to turn the GPS on and off. That button lights up while the GPS is acquiring satellite signals and blinks when it has a lock. Under open sky, it took about a minute to lock. It took longer but did get a lock indoors in some single-story, wood-frame buildings.

I turned to the manual (for the first time!) before trying to use the GPS function. I understood the instructions up to the point of telling me to plug in the mic. Then it lost me under the heading "Sentence formatter setting." While ICOM's manuals are usually above average, they all fall short in explaining general D-STAR operation. Without some prior knowledge, they leave you hanging.

I gleaned enough from the manual to let me poke around the menus and get the GPS functions turned on in both the '92AD handheld and my IC-2820 mobile. It turns out that you need very little from the manual to get GPS data to flow between these radios and show up on the compass display that shows the direction and distance between radios (see Figure 1). And that was very cool. I was following Ken, KC4YOZ, up to the Charlotte D-STAR repeater site, and we got far enough apart that I could read his bearing and distance.

If GPS has you thinking APRS, I'll warn you that D-STAR data is not "on-air" compatible with AX.25 packet data. They're both digital, but the similarity ends there. The '91AD and '92AD *do* have D-STAR's "low speed" data capability. A 1200 bps data "signal" rides along with every voice transmission. You need a computer and another optional cable to use it — there's no access to this data via the radio's controls or display. There are several third-party programs already available for using this data stream for text messages and small file transfers, and more on the way. Again, this data is not AX.25 packet compatible.

There is a bridge between D-STAR and the APRS networks. A third-party application called *Dplus* runs on the Gateway. It can pick off your GPS data and forward it to the APRS network via the Internet. Your location shows up on APRS displays, and on Internet sites like Find-U (see Figure 6). The manual falls short here. I was successful using instructions supplied by Ken, KC4YOZ. I suggest contacting your local D-STAR experts.

In Conclusion

The IC-92AD is a very capable, complete radio for analog and digital VHF/UHF operation. The only significant downsides I found are the mediocre transmit audio, the price and the complexity (you'll need some local help to get the most out if this radio). If you're into emcomm or search and rescue, the GPS mic is a great addition.

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

TECHNICAL CORRESPONDENCE

A SIDE-MOUNT PRECISION ROTATOR DISPLAY CIRCUIT (FEB 2006 *QST*)

◊ The excellent article, "A Side-Mount Precision Rotator for Microwave and Millimeter Wave Antennas," by Greg McIntire, AA5C, in the Feb 2006 issue of *QST* took me back to 1960. At that time I was designing circuitry similar to the 10-turn potentiometer and digital panel meter part of his system for a living. Mr McIntire copied a circuit from another source for that portion of his project. I believe that this part of the circuit can be improved. If other hams can benefit from my experience, fine. I am glad for the opportunity to give something back to the ham community.

Here is my take on the design problem. The high accuracy of the 10-turn potentiometer and the digital panel meter deserves a simple circuit that uses as much of the performance of these two components as possible. Here is a step-by-step analysis of the way I would design the display portion of the circuit.

First, I would use a Beckman 1000 Ω, 10-turn potentiometer to acquire the antenna rotation angle information. My reason for choosing a 1000 Ω pot is a compromise between low-output resistance and wire size. Before mounting anything on the antenna, I would use a 10-turn dial to test the position accuracy performance on the workbench. The 10-turn dial has 100 divisions for one turn of the dial. As the dial is turned past one revolution, a turns counter is incremented. Thus, the 10-turn dial indicates the potentiometer arm position with a resolution of one part in 1000. The accuracy of the potentiometer is close to the resolution. If you were to put a precision power supply of 10.000 V on the ends of the potentiometer and turned the 10-turn dial to, say, exactly 5 turns, the measured voltage on the arm of the potentiometer to one end, would measure very close to 5.000 V. Most digital panel meters will match this accuracy.

Since the digital panel meter operates on a 5-V power supply, use the full 5 V to supply the potentiometer for maximum signal. If you have a 9 to 1 gear ratio from the antenna to the potentiometer, you will use 9 turns of the potentiometer for 360° of antenna rotation. Then at least one turn of the potentiometer would be unused. Divide the leftover section of the potentiometer equally between the counter-clockwise and clockwise ends to protect the potentiometer from being rotated into its stops and breaking. Every 40° of antenna rotation will cause the potentiometer to rotate one turn when installed in the final assembly. The unused portion of the potentiometer is offset ½ turn at each limit switch, so the potentiometer arm never gets closer than ½ turn from an end. Table 1 summarizes the circuit conditions.

Ten turns of the potentiometer moves the arm from 0 V (ground) to +5 V (power supply voltage.) The change in voltage at the hot input terminal of the digital panel meter is required to change 400 mV. This sets the R1, R2, R3 voltage divider in Figure 1. Make R1 100 kΩ to minimize error due to loading the potentiometer. Use R2 to adjust out any error caused by the worst case limits of the power supply voltage and resistor tolerance. Temporarily make R2 a potentiometer connected as a rheostat. With R3 open and the 10-turn potentiometer arm disconnected, touch the input end of R1 to the +5 V con-

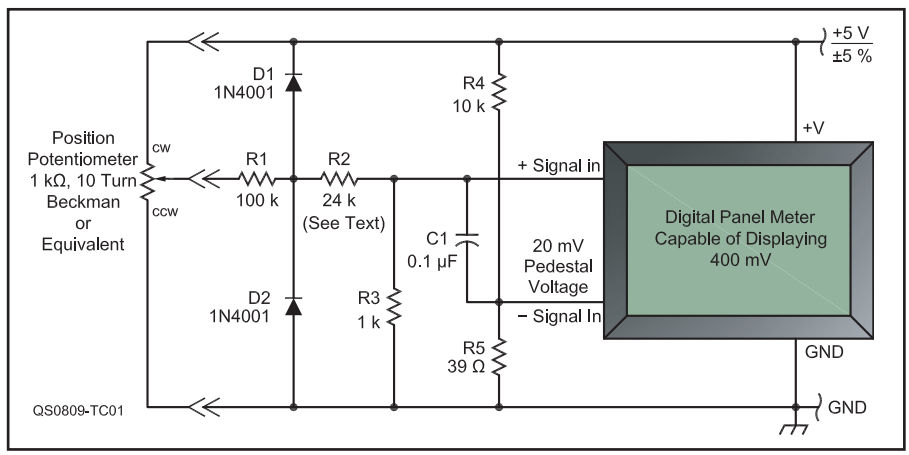


Figure 1 — This schematic diagram shows a simple circuit to provide a precision readout of antenna rotator position.

Table 1

The Test Setup to be Used with the 10-Turn Dial

Pot Position (Turns)	*Dial Reading (Divisions)*	*Nominal Arm Voltage Output (V)*	*Nominal Digital Panel Meter Reading (mV)*	*Antenna Direction Rotation*	*Comment*
0	000	0.000	–020	20 degrees Short of North	Pot CCW limit Antenna –20 degrees Don't Go There
0.5	050	0.250	000	North	Antenna 0 degrees CCW limit switch
2.75	275	1.375	090	East	
5.0	500	2.500	180	South	
7.25	725	3.675	270	West	
9.5	950	4.975	360	North again	Antenna 360 degrees CW limit switch
10.0	1000	5.000	380	Antenna 380 degrees	Antenna 380 degrees Don't Go there

Degrees (or millivolts digital panel meter reading) = divisions × 0.4 – 20 mV
or
Divisions (on 10 turn dial) = digital panel meter reading (mV) × 2.5 + 50

Larry D. Wolfgang, WR1B ♦ Senior Assistant Technical Editor ♦ tc@arrl.org

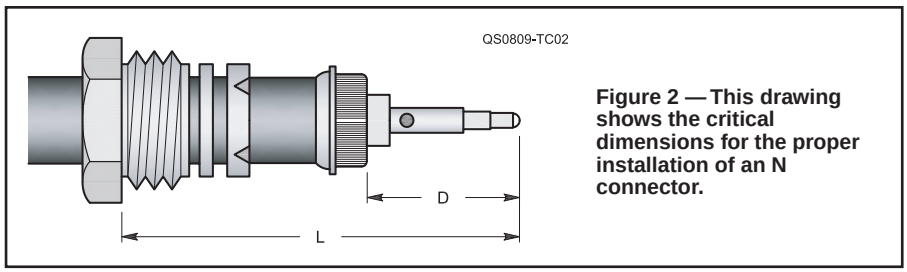


Figure 2 — This drawing shows the critical dimensions for the proper installation of an N connector.

nection and adjust R2 until the digital panel meter reads 400 mV. Then measure the rheostat resistance with an ohmmeter and replace R2 with a fixed resistor closest in value to the ohmmeter reading.

Now reconnect the 10-turn potentiometer and R4. The R3-R4 voltage divider puts the negative terminal of the digital panel meter 20 mV above ground. If you want to squeeze the last drop of accuracy out of the system, measure the voltage across R4 and put a resistor in parallel across either R3 or R4. This will set the voltage across R4 to exactly 20 mV if you parallel an additional resistor across R3 or R4 as needed. Check the performance using the potentiometer with the 10-turn dial. Digital panel meter readings should match the values in Table 1 to the desired accuracy. Now finalize the circuit by installing the potentiometer at the antenna. Diodes D1 and D2 clamp the input voltage to protect against lightning and static discharge damage.

The antenna direction can match the compass as suggested in Table 1 if you set the antenna to compass North and adjust the potentiometer to ½ turn (0 mV.) If you need to reverse the direction of the potentiometer, it may be easier to swap the connections to the potentiometer than to reverse the gears or potentiometer. That is, put the CW connection at ground and the CCW connection at 5 V.

To verify performance, I breadboarded and tested the circuit, using a 10-turn potentiometer from 1960 with a digital voltmeter constructed in 1972 and a power supply box constructed sometime in the 1980s. I was able to calibrate the circuit to work within an accuracy of 1° over most of the range. Maximum error occurred at near 5 turns due to loading of the potentiometer by R1. *— Harold C. Hoyt Jr, 404 Attucks Dr, DeSoto, MO 63020;* **hhoytjr@yahoo.com**

THOSE TYPE N COAX CONNECTORS

♢Thanks for Joel Hallas's article pointing out the benefits of N connectors in the April 2008 issue of *QST*.

In the spirit of helping my fellow hams, I would like to take issue with two of your suggestions. Installing N connectors is challenging at best, but your advice, I think, will increase frustration rather than reduce it.

I had a handful of N connectors to install today, on two different sizes of cable. Unfortunately, I don't do N connectors often enough to stay in practice, so I find myself painfully traversing the learning curve every time I attempt one. Eagerly, I twice tried the trick you illustrated in Figure 3 of your article, by pushing the pieces together to check the fit before soldering the center pin. Both times, the pin ended up recessed too far inside the body, and I had to start over. After two successive failures, I looked more closely at your suggestion and figured out the problem.

With N connectors, the goal is to tightly compress the braid between the shoulder of the clamp and the inside face of the connector body. At the same time, you want the tip of the center pin to be flush with the front of the connector, and the clamp to be seated snugly against the outer jacket of the coax. The critical dimension is the distance between the top of the braid, where it rests on the shoulder of the clamp, and the tip of the pin. (See the dimension "D" in Figure 2 here.) That distance has to be equal to the distance from the inside face to the front of the connector body.

Figure 3 of your article assumes that dimension "L" corresponds to the overall length of the connector body. The problem is that the gasket and braid aren't compressed in that Figure. If you line up the tip of the pin with the front of the connector under these conditions, the front of the braid is actually positioned a millimeter or two beyond the plane of the inside face of the connector body, so you end up making "D" too short by the same amount. When the connector is assembled and everything compresses, the tip will be recessed into the connector body.

I have always found that trimming the cable to the dimensions recommended by the connector manufacturer yields the best results. If you are dealing with a junkbox connector, you can easily use the depth gauge of your caliper (at today's prices, every ham can afford an electronic caliper) to measure the depth of the inside face, and subtract that from the overall length of the connector body to find the critical dimension "D." If in doubt, you can cut the center conductor a little long and then trim it back to fit after dressing the braid over the clamp. The way I test-fit the center pin is to assemble the body before soldering and press it tight against the braid to check that the center pin projects the right amount. If you get "D" right, "L" will adjust itself when you tighten the nut.

It really helps to tin the center conductor before trimming and/or soldering. Spin your cutters around the wire to score it all the way around before cutting. This helps to maintain a round shape. A small file can be used to remove any burrs and excess solder.

That brings me to the other thing you said that raised my eyebrows — your suggestion to hold the nut and turn the connector body. If you do that, you will twist and distort the braid where it is formed over the shoulder of the clamp. It is better to hold the connector body tight against the cable (so that it is "bottomed out" against the braid) while turning the nut into the body. (It helps to have three hands when attempting this.) The washer between the nut and gasket serves as a bearing to protect the gasket. There is more friction between the washer and gasket than between the nut and washer. This allows the nut to turn without damaging the gasket.

I realize that this was not intended to be a comprehensive guide to installing N connectors, and I'm also mindful that it's far easier to be a Monday morning quarterback than to actually write articles of this sort. I'm consistently impressed by the high quality of the writing in *QST* in general. Keep up the good work, and I'll try not to pick too many nits. *— 73, Al Taylor, KN3U, 910 Grandin Ave, Rockville, MD 20851;* **kn3u@arrl.net**

Hi Joel,

Having used "Type N" connectors for over 30 years I found your article long overdue. I doubt that 1 in 100 hams feel comfortable installing these great connectors.

Having said that I must take issue with one recommendation you made in the final assembly section. I learned a long time ago to hold the connector body wrench steady and turn the wrench on the nut. I offer the following for your consideration: the washer placed between the nut and the gasket is a slip surface to facilitate the nut turning without binding directly on the gasket.

The gasket is much like that on an oil filter and if you have ever changed these yourself you have probably learned the trick of putting a light film of oil on the gasket to keep it from binding when you tighten (hand tighten) it in place. The washer provides the slip surface between the nut and the gasket in this case.

More importantly, though, is the fact that as the assembly tightens, turning the connector body greatly increases the possibility of the braid strands starting to twist before the assembly is completely tightened (compressed). When that happens, it greatly increases the probability of the body being loose on the cable.

I came up with a rather foolproof way of completing the final assembly. As I am sure you are aware, finding a wrench of the right size — and more importantly the right thickness — is a big problem on N, BNC

and other coax connectors. The solution is a multi size open ended wrench stamped out of flat metal stock, usually ¼ inch thick or thereabouts. [These are available from welding supply dealers, often sold as "combination 10-way tank wrenches." — *Ed*.]

I place that wrench in the jaws of a vise with the appropriate size wrench opening exposed at the top of the vise. With the final assembly of cable and connector hand tight, I place the connector body wrench slots into the wrench and hold the body in that wrench as I tighten the nut (compression nut) with a standard wrench. That allows the gasket compression to take place without the possibility of gasket or braid distortion. Should the gasket distort rather than compressing evenly, the weatherproof feature of the connector is compromised.

Four years ago I moved from Massachusetts to Florida and in the process of dismantling my antenna farm I disconnected many N connectors. I found them all to be as pristine as the day I put them together. One in particular had been in place over 20 years. This was the result of a combination of installing N connectors this way and a virtually waterproof method of taping and sealing joints taught to me by a commercial tower installer. But that is another story. *— 73, Phil Medeiros, N1PM, 8146 SW Yachtsmans Dr, Stuart, FL 34997;* **medeirosp@comcast.net**

VHF PROPAGATION AND DOPPLER EFFECT

♢I was much interested in Alan Bloom's article VHF/UHF Mobile Propagation in the August 2006 issue of *QST*, but I was amazed that the Doppler effect would enter the picture, given the fact that any ordinary car speed is a tiny fraction of the speed of light. This brings up the whole theory of the Doppler effect, with which Mr Bloom is undoubtedly familiar but which might have some interest for *QST* readers.

The Doppler shift in observed frequency is interesting for many reasons, not the least of which is the fact that there is both a *classical* and a *relativistic* frequency shift, depending on whether an actual physical medium is involved in the propagation of the wave. Thus, the familiar sensation of standing beside a railroad track and hearing the pitch of the whistle on an approaching train change from a relatively high note to a lower note as the train passes you is an example of the classical Doppler effect for the case of you, the receiver, being at rest and the train, the transmitter, being in motion. At rest and in motion with respect to what? With respect to the surrounding air, which is the medium that engages in the propagation of the sound wave from the whistle to your ear. Okay, so you're standing on the Earth, but the air is the medium, and we're assuming no wind. Note that if the train were standing still and you were driving by it, you would also observe a Doppler shift in the pitch of the whistle, but the formula would be a little different for this case of the transmitter being at rest and the receiver moving *with respect to the medium*, air in this example.

In the case of radio waves, which, like light, X-rays, and γ-rays are all examples of electromagnetic radiation, there is no medium in the ordinary sense, hence no way of determining whether the transmitter is moving and the receiver is at rest or vice-versa. Thus, only the *relative* motion of the transmitter and receiver counts. Note the appearance of *relativity*. Slightly different formulas describe our three cases, and I simply state them as follows without going through their derivations.[1]

For the case of classical theory with the receiver at rest in medium:

$$f_D = f_C\left(\frac{1}{1+\frac{v}{s}}\right) \qquad \text{[Eq 1]}$$

For the case of classical theory with the transmitter at rest in medium:

$$f_D = f_C\left(1-\frac{v}{s}\right) \qquad \text{[Eq 2]}$$

For the case of relativistic theory with the transmitter and receiver separating:

$$f_D = f_C\left(\frac{1-\frac{v}{c}}{\sqrt{1-\left(\frac{v}{c}\right)^2}}\right) \qquad \text{[Eq 3]}$$

where

f_D is the received, Doppler shifted frequency

f_C is the unshifted transmitter frequency

v is the velocity at which the transmitter and receiver are separating

s is the wave propagation velocity (the speed of sound in Equations 1 and 2, and replaced by c, the usual notation for the speed of light, in Equation 3).

Note that all three equations have been written for the case of the transmitter and receiver separating. Thus Equation 1 applies when the train has passed you and is therefore moving away, Equation 2 is for you driving away from the stationary train, and for Equation 3 there is no benchmark, so that all we can say is that the transmitter and receiver are moving away from each other, the velocity with which they are separating being v.

Now these three equations look very different, but for the usual situation in which, even with a sound wave, the separation speed is much less than the velocity of propagation of the wave, it pays to expand each one in a power series using the binomial theorem. The results are:

$$f_D = f_C\left[1-\frac{v}{s}+\left(\frac{v}{s}\right)^2+\ldots\right] \qquad \text{[Eq 1A]}$$

$$f_D = f_C\left[1-\frac{v}{s}\right] \qquad \text{[Eq 2A]}$$

$$f_D = f_C\left[1-\frac{v}{c}+\frac{1}{2}\left(\frac{v}{c}\right)^2+\ldots\right] \qquad \text{[Eq 3A]}$$

Here we see that to a first order, that is, to the approximation that the $(v/s)^2$ and, in Equation 3A, the $(v/c)^2$ and higher terms are so small they can be neglected, the three equations become identical. Indeed, only for the most precise work are the higher order terms needed. If they are dropped in Equation 3A, the result shows a shift of $-f_C(v/c)$. This agrees with Note 2 in Alan Bloom's article. The minus sign, of course, shows the negative shift that takes place when the transmitter and receiver are separating. The shift would be positive if they were approaching.

I'm still amazed that the shift in a radio signal is noticeable. The speed of light, c, is approximately 186,000 miles per second, and assuming that we don't drive more than, say, 30 mph while making a contact, I note that this speed is 0.00833 miles per second, so that $v/c = 0.0000000448$. As noted above, that's a pretty small number. Nevertheless, if we multiply by 144 MHz to get the shift on the 2-meter band, we get 6.45 Hz, which is in the range mentioned in the article. As Alan says, however, "This shows up [only] as a slight distortion of an FM voice signal." I'm surprised it shows up at all, but then I'm not a mobile operator nor a repeater user. But I still found the article most interesting. *— Dean S. Edmonds Jr, formerly K1QCI, 1019 Spyglass Ln, Naples, FL 34102*

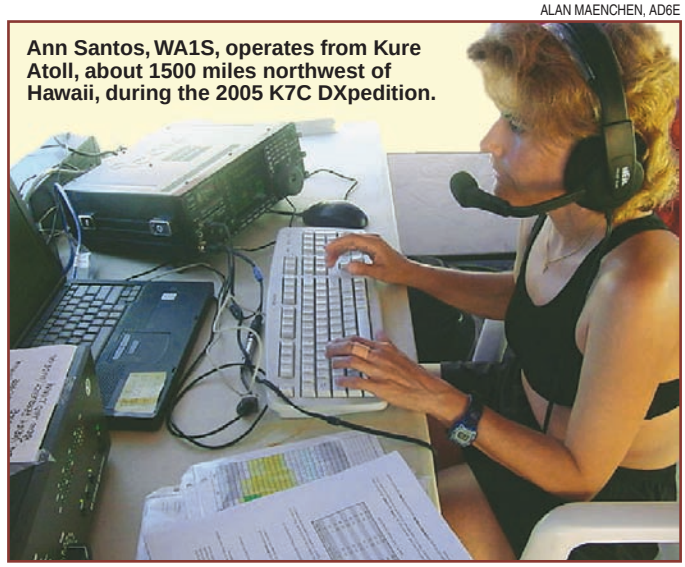
[1]Much of the following is taken from *Fundamentals of Physics* by David Halliday and Robert Resnick, John Wiley & Sons, Inc, New York, 1970, pp 661-662.

Some Tips for the New DXer

The DX pileup — how it works and how to work it.

Frank C. Getz, N3FG

ALAN MAENCHEN, AD6E



Ann Santos, WA1S, operates from Kure Atoll, about 1500 miles northwest of Hawaii, during the 2005 K7C DXpedition.

Judging from what I hear on the bands, there are a lot of upgraded hams who have gotten into chasing long distance contacts (DX) and are learning the intricacies as they go along. Since I haven't seen a good article on this subject in *QST* for some time, I thought that some basic pointers may be of help. I work mostly CW and my comments are from that perspective, but most of what I have to say can be applied to any mode. The goal is to make the DX contact without making enemies of your fellow hams. Working DX is a sport with rules and procedures like any other sport and if they are followed, your enjoyment and chances for success will be maximized.

Basically, you want the DX station to hear you, but you don't want to keep others from hearing the DX station. Following these DXing Tips will help maximize your chances of being heard without causing interference (QRM) to others.

If everyone in a pileup is playing by the rules, while the DX station is in QSO with his selected target, the frequency (or frequencies, if operating split) should get very quiet and you will only hear the DX station or his target station. As soon as the DX station signs, everyone again resumes calling. As long as no one is calling on the DX station's frequency, everyone can tell when the DX station has selected his next target and the calling will stop until the DX station signs again. During this lull in the calling is the time to select the frequency for your next attempt.

DXing Tips

1. Listen! Don't jump into the fray before you understand the dynamics of the DX operation. What is the DXer's call? Is he/she operating split — transmitting on one frequency, but listening for calls up or down the band? Are other hams in your area getting through?
2. In a large pileup, it is never a good idea to call the DX station on his frequency and never, ever tune up on the DX station's frequency. If he sends his call followed by "up," he is listening up the band and not on his transmit frequency; if he says "down" then he is listening down the band. If you call on the DX station's transmit frequency, no one else can hear him and he won't hear you.
3. Never transmit while the DX station is in contact (QSO) with another station. He can't hear you when he is transmitting and he doesn't want to hear you when the station he is listening for is replying.
4. Never transmit just because someone else is calling the DX station unless you are sure he is listening for a call.
5. Never let a computer select your transmitter's frequency and time of transmission. This is a sure recipe for causing QRM.
6. Keep your calls short. Once or twice is usually sufficient.
7. If you must tune up on the air, find a clear spot a little way up or down the band and be sure to identify. When you move back to the desired frequency, you won't normally have to retune.
8. A technique that often works is to set your transmit frequency to that of the station currently in QSO with the DX station and after you are sure the QSO is over, send your call. Hopefully the DX station hasn't had time to tune away and will hear you call. The only drawback is that others will often be doing the same thing. Sometimes you will need to set your frequency slightly higher or lower than that of the last station worked for you to have a chance of being heard.
9. Sometimes when you have been trying for a while and it seems that you will never get through, it is more productive to take a break and do something else, returning when the pile-up has thinned out a little. I have had this work more than once.
10. If you work CW, work at getting your code speed up to the point where you can reliably recognize your call. Don't depend on a computer to copy your call on a noisy band. Your best CW filter and decoder is still the one between your ears.
11. Do you really need the contact? If not, why not let people that do have first crack at the DX?

Frank Getz, N3FG, was first licensed in 1961 as K3PDW. He prefers to operate CW and occasionally RTTY and PSK31. He loves to work DX, but uses a casual approach to adding countries to his list. He is a Director of the Mobile Sixers Amateur Radio Club, former advisor and VE for the Delaware Technical and Community College radio club and a member of the ARRL. He has degrees in Electrical Engineering and Computer Science and has written several engineering books and Amateur Radio related magazine articles. Frank can be reached at 685 Farnum Rd, Media, PA 19063 **fcgetz@juno.com**.

An Open Letter to the Amateur Radio Community

After almost 10 years on the job, Riley Hollingsworth, K4ZDH — the first person in the FCC's Enforcement Bureau to focus on Amateur Radio — hung up his hat and closed the door for the last time on July 3. In this letter to Amateur Radio operators, Hollingsworth bids adieu to the FCC, but not to ham radio.

"For nearly 10 years, I have been privileged to help you restore the Amateur Radio Service to its rightful place in our country's communications infrastructure. I have enjoyed every day of my entire career at the FCC, but I will never forget this period of my life and I will never forget the privilege of working with you toward this common goal.

The North Carolina writer Thomas Wolfe once said, "We are the sum of all the moments of our lives, all that is ours is in them." It is because of such people as you that Amateur Radio is part of our American heritage.

I met you in every part of this great country — in California, in Texas and Florida and the Carolinas, in Georgia and Minnesota and in New England. I met leaders and volunteers in Amateur Radio who helped in forest fires, plane crashes and in tornadoes and hurricanes, gave exams, organized clubs and Field Days, recruited new licensees, sacrificing their own time and all the while realizing that with every right comes a responsibility.

I wish I could name every person who left a lasting impression on me over the past 10 years. All over the country I met people who take the high road, have a vision for the Amateur Radio Service and who devote hundreds of hours of personal time to make it succeed. I will never forget those of you who waited in long lines after a forum or seminar just to come up and say "thanks" to the FCC for its work in the amateur arena. You have no idea how much that meant to us.

All of the people that I met understand that one of the greatest rewards in doing anything is to experience joy in doing it. They care about life; they think about what they're doing on the air, even though they are having fun. And most of all, they have vision to help us restore America's lead in science and technology.

We stand on the shoulders of a lot of great people who gave us this incredible Service known as Amateur Radio. When I first heard ham radio operators on a breadboard shortwave radio at age 13, I knew my life would never be quite the same again. I've been around the block a few times since then. I'm older now — possibly wiser — but I can remember my first contact as if it were yesterday.

Do you suppose Joe Gault, W4WZ, knew what an impression he was making on a 13 year old taking the Novice class exam in the summer of 1960? I think so. I remember he made a special effort to encourage me and tell me what a great hobby/service this was and to help me in any way he could. He continues to do so to this very day!

You can thank the League for being the catalyst that returned Amateur enforcement to the Commission. Make no mistake about it — if it weren't for the ARRL's letter to the Commission in the summer of 1998, there would have been no FCC return to enforcement in this service.

S. KHRYSTYNE KEANE, K1SFA

Along with the FCC's Bill Cross, W3TN, Hollingsworth led the FCC Forum at the 2008 Dayton Hamvention. He was also the keynote speaker at the 2008 Contest Dinner in Dayton.

It was one of many letters imploring the FCC to get back into the enforcement arena, but that one hit at the right time and the right place. It shows the value of incremental, constant effort, never giving up, never relenting. It hit at a time that became a sea-change for FCC enforcement generally. Within a month of receiving that letter, the Commission beefed up Amateur enforcement efforts and the program has continued through three chairmen and several reorganizations. Your enforcement program has been wonderfully supported by the Enforcement Bureau and I can think of no finer group of people to work for.

The FCC's strong enforcement role returned with the Amateur Service and spread across the board — you can see that every day on the Commission's Web site. No longer does industry see us as an agency that simply writes rules, or as a rulemaking body that occasionally does enforcement work. Enforcement is now central to our mission.

During the first year that we got back into Amateur enforcement, you sent more than 5000 e-mails and letters thanking the Commission. They did not go unnoticed, and in fact, I am passing them on to my successor.

You must remain vigilant and never tolerate your Amateur Radio Service being neglected again. I see no reason that it will — this program is very important to the Commission and has 99.9 percent support within your own ranks, but you must never again let it go through years of neglect.

Use every resource you have to prevent that should you see it coming — your congressional delegation, the League, any pressure point you can find. Your support has been the

key to whatever success we've had, and your peer pressure on those who don't comply with the rules has been the force multiplier, the tipping point that made this whole thing work. You must always respectfully demand the same enforcement attention that you have gotten for almost 10 years.

Your role in emergency communications is a vital link in our system. I recently attended an emergency communications conference in Reston, Virginia. NOAA, the National Weather Service, the National Hurricane Center, SHIPCOM and SKYWARN — all emphasized their dependence upon Amateur Radio and sought ways to strengthen it. The communications system in this country works wonderfully in normal conditions, but far too often in regional disasters, cell phones don't work because of overloading, satellite communications don't work because of dish lock-down or weather damage and public safety systems are limited by interoperability issues between jurisdictions. Our day-to-day system reminds me of a bumper sticker I recently saw on an exotic sports car: "But, oh…when it runs."

You provide the vital link time and time again, tirelessly, without fanfare, and you do so at your own expense. Your system is fail-safe because it involves individuals who have their own equipment and are dedicated to getting the job done and getting the messages through.

Overall rule compliance in your service is outstanding. Of course, as in any organization, group or activity, you still have some in your ranks who know all the answers and constantly cause trouble on the bands. I think that working together we have isolated that element, and remember this: They know all the answers only because they haven't thought of all the questions. They will fade into obscurity and won't leave much of a positive legacy to anyone. Ignore them and let them continue their bitterness — they are their own worst enemy.

How lucky we are to appreciate the magic of radio! As you participate in this wonderful activity that joyfully occupies your lives, I leave you with this thought:

In the wondrous time of your life, live so that you shall not add to the misery and sorrow of the world, but shall smile to the infinite delight and mystery of it. — William Saroyan

Every gift of lasting value comes with responsibility. We must never forget what we owe for our spectrum privileges. I will continue working with you in every way I can to ensure that Amateur Radio lasts a thousand years!

Enjoy radio, and I'll see you on the bands.

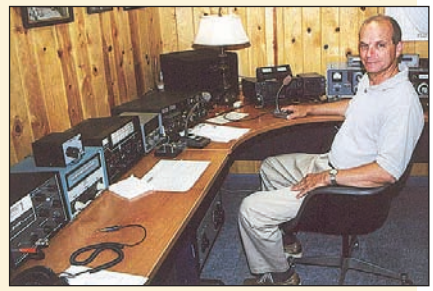
73,
Riley Hollingsworth, K4ZDH

Some Comments on the Life of Riley

■ Amateur Radio's reputation of being "self-policing" has remained intact for decades. Even so, there is always a need for the agency charged with regulation and enforcement of a licensed service to have a presence in the service. For several years, the FCC sadly failed to take its responsibility seriously, and a few unfortunate situations were far too much for our valiant Amateur Auxiliary to handle and resolve. Solely through the efforts of ARRL, the FCC initiated internal changes that resulted in Riley Hollingsworth being identified as their enforcement person tasked with handling Amateur Radio matters. That, of course, was just the first step. The most difficult hurdle was the acceptance of the "new FCC guy" by the Amateur Radio community. It didn't take long for Riley — with his friendly, warm personal attitude, along with his firm approach to strict adherence to the Part 97 Rules with a "common sense" approach — to earn the respect of the Amateur Radio Service. He restored confidence in our Amateur Auxiliary, rejuvenating a high respect for the Amateur Radio Service rules that in turn helped lay the groundwork for the growth and increased on-the-air activity that we enjoy today. *— ARRL President Joel Harrison, W5ZN*

■ I met Riley soon after I started working at the League. I had this image in my head of Riley as the toughest, meanest looking guy there ever was. I was pleasantly surprised to find one of the nicest (and not so mean or tough looking!) person I have had the good fortune to meet. His witticisms and dry sense of humor endeared him to me then and continue to do so today. I have had the pleasure of working with Riley for almost two years and he has always made time for me — patiently explaining little bits of minutiae to me, making it easier to do my job. Don't ever lose that sense of humor, the fun outlook you have on life. It's a side of you so rarely seen by the general public, and I feel so privileged to be let in on it. *— S. Khrystyne Keane, K1SFA, ARRL News Editor*

RICK LINDQUIST, WW3DE



Hollingsworth at home in his well-equipped basement ham shack. His gear includes several vintage operating positions.

■ Riley and I became friends long before I took over the Regulatory Information Manager's position at ARRL. His honest commitment to the Amateur Radio Service — not just as an FCC employee, but an active amateur — is going to be hard for the FCC to replace. He truly loves this hobby, and will remain a valuable asset to Amateur Radio for years to come. His role will be different and I look forward to working with him in new areas as time rolls along. *— Dan Henderson, N1ND, ARRL Regulatory Information Manager*

■ In life, there are those that lead, and those that follow. Then there are those that change the world. Riley changed the world of Amateur Radio in ways that will be remembered for decades to come. His work for the ARRL Lab extended into the RFI area. After he had been handling amateur cases for about a year, a group of hams on the West Coast approached him with something new — they wanted him to help them get a power company to clean up interference. Riley was interested in helping, but he knew he had a thin path to walk, as the FCC had not traditionally done much in that area. But in typical Riley tradition, he went forward anyway, writing what would be the first of many FCC advisory letters. Through all the political bumps and turns that are part of any government agency, he kept the program going and turned it into what he once characterized as a model of the best way to create a cooperative program that gets results. I consider it an honor to have worked with Riley. I consider it to be an honor to call him my friend. His employment at the FCC may be at an end, but all that set him on the road he walked is part of him, and cannot change. He will find ways to use that drive to continue to contribute to Amateur Radio and all that it means to him and all of us. *— Ed Hare, W1RFI, ARRL Laboratory Manager*

Riley Hollingsworth, K4ZDH, served as the Special Counsel for the Spectrum Enforcement Division of the FCC's Enforcement Bureau, dealing primarily with Amateur Radio enforcement. After nearly 10 years in that position, he retired on July 3 of this year. An Advanced class licensee and ARRL Member, Hollingsworth anticipates being much more active on the bands in his retirement, and confesses a special interest in radiosport and restoring vintage radios. He also enjoys power boating and running. A South Carolina native, he is a graduate of the University of South Carolina and holds a law degree from Wake Forest University. Married to Pat since 1998, they have two children and two dogs. Hollingsworth can be reached via e-mail at **k4zdh@arrl.net**.

WWII Emergency Radio — An Adventure in Homebrewing

A radio boy's memoir of the challenges of public service during WWII.

William D. McMurray, K4SG

As I reluctantly awoke and looked at the faint radium dial of my bedside clock, I saw that it was 2:10 AM. Then I saw what had awakened me — the east window, even with the curtain and shade creating a vague opaque shield, was glowing a faint orange-red color.

It was 1943 and I lived in a small rural farming area in eastern North Carolina, about 50 miles or so from the coast and I realized that another dreaded U-boat had snuffed out the life of a tanker or freighter headed to Europe with life-giving materials for the war effort.

As I lay there, now fully awake I suddenly felt a surge of sorrow for the men and their families at this latest disaster. It did, however, make me feel good about the plans and efforts that a group of my teenage friends and I had put into effect. Just the prior week Bill, Robert and I had returned from Wilmington, North Carolina, after having met with the City Council, Police Department and Civil Defense authorities to show them what we could do in an emergency situation with our communication ability — wireless, that is.

Igniting Our Enthusiasm

We were very fortunate to have had an excellent science teacher in high school. Dr Henry Jensen lit a blazing fire in our collective heads. He was a natural born teacher and he got our attention quickly. After building crystal sets and graduating to one-tube regenerative shortwave receivers, we were ready to tackle the more difficult task of becoming hams and following in his footsteps. We studied and copied W1AW during 1939 finally making the trip to the FCC office in Norfolk, Virginia, 150 miles away, to pass our exams.

We all made many contacts during 1940 and 1941; however, neither Bill nor Robert managed to snare the rarest of all DX, Reggie Fox, AC4YN, located in Tibet! I did hear him one time very weakly on 20 meters, but never got through the big guns.

Then — the infamous date of December 7, 1941. Everyone vacated the bands in a timely, patriotic manner with a minimum bit of grumbling, except for the few who wanted to be the one to make the last contact for the duration.

An Idea is Born

One day, Robert, Bill and I got together and decided we needed to do something to maintain our code proficiency. We really missed not being able to make a few QSOs now and then. We did give carrier current communications a try, using our oatmeal boxes for coil forms and managing to smoke a few 6L6G tubes, but we had no real success with it. We fretted for a while and then in 1942 the *big* break came! The formation of the War Emergency Radio Service, or WERS. We were absolutely elated — perhaps we can do some communicating now.

Prior to the "Day of Infamy" we had done a little experimenting with superregeneration on 2½ and 5 meters, but found those "ultra" frequencies quite cantankerous and un-predictable. After building transmitters and receivers for the lower bands, we found that the "ultras" required a different technique — direct wiring, short leads and not too much solder.

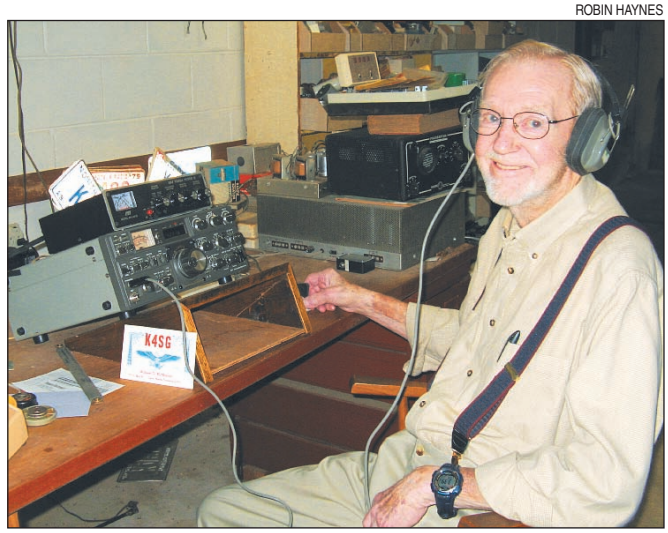
After that wonderful announcement, however, we really pored over the available information — scrub another worn-out *Radio Amateur's Handbook*. We were determined to be a part of the war effort. We did, but it took a lot of sweat and toil, and we began to learn our first real lessons in radio discipline.

In order to do some experimenting on 2½ meters in a semi-legal, manner, we approached the Police Chief of our small town to seek his approval for the experimenting. This approval, we hoped, would be helpful if the FCC really decided to hang us for

ROBIN HAYNES

William D. McMurray, K4SG, displays his 1942 copy of *The Radio Amateur's Handbook* and his ARRL 60 Year Certificate of Recognition.

ROBIN HAYNES



Bill, K4SG, on the air since 1944.

illegal operation. The Police Chief, who was also the Civil Defense Director, and his deputy, who worked at the local hardware store, were the entire Police Department.

We were lucky — we knew both of them very well and they knew our families as well. Permission was granted instantly. I think the Chief was grateful that he had some volunteers on "his side," which would look nice in the eyes of his superiors. But we were not through yet. No sooner had we been granted permission, when Robert brazenly asked: "Chief, since we just don't have any money for this civil defense project, and we are very anxious to help you with this undertaking, do you think it would be possible for the town to make a contribution of $40 for some much needed material?" Bill and I were flabbergasted to say the least and were even more dumbfounded when the chief agreed to check with the town clerk. The money was received the next day!

Tinker we did. Now that we had a little cash for some critical items, we began in earnest. Success did come, but ever so slowly. We could pretty well tell how things were doing inside the superregenerative receivers by listening to that welcomed hissing-rush noise. By now it was 1943 and parts were very hard to come by — even for those with plenty of money. For example, a 1Q5GT tube cost $1.05 and you had to sign a chit saying that it was for replacement purposes. Parts could not be purchased for new manufacturing. The junk box became our most valuable resource.

Cannibalization of radios of the period yielded many valuable components. Resistors then came in multiple values such as 50,000 Ω, 5000 Ω, etc and the coding was body, end and dot. Heaven knows what the tolerance was and I suspect the tolerance was equal to the ohmmeter reading that indicated it, since our meters were homemade, too. Sometimes it was very difficult to distinguish the dot, which, of course, is the most significant digit, especially when there is a green body and supposedly a green dot. For example, a 5 MΩ resistor would be coded green, black and an understood green dot. Sometimes the dot or another color would be faded or otherwise hard to distinguish and this lead to much grief many times.

A Plan of Action

Robert lived about 3 miles from both Bill and me and Bill lived less than a half mile from me. We all decided to build the same type station for both economy and trouble-shooting. We decided we would need a base station at each location and some type of portable unit.

We built the base stations first and then used them to help tune up the portable units. The base stations came right out of *QST* and consisted of two 6J5s, a 6V6 and a 6L6. A 6J5 was used as the superregenerative detector and another one as the microphone preamplifier. The 6L6 was used as the transmitter, with the 6V6 used as a modulator and audio amplifier. Bill and Robert were the first to get their units talking.

Problems — Problems

I had problems from the very beginning. First, a shorted coupling condenser in the audio blew the 6L6 and cathode resistor. Next, the receiver just would not rush or hiss. The tube did heat up, though, since it took about a week for the blisters on my fingers to subside. Finally, I had to display some humility and ask for help. Both Robert and Bill had their eyes and fingers all over the unit probing and looking for trouble. Robert suggested removing the 5 MΩ grid-leak resistor and measuring the value. Instant revelations — the meter showed something like 500 Ω instead of 5 MΩ. Upon very close examination of the resistor, a very faint, faded brown dot was discovered. Oh well, it is always something small! A correct resistor was installed and the welcomed rush issued from the speaker. Later that evening we established point-to-point contact with all three stations and signals were very good, even on the longer legs.

After enjoying the fruits of our labor for at least a day, we next got down to the problem of a portable unit. We fashioned the base antennas after the "J" models in the *Handbook*. Tinkering with the stub and connection point was a time consuming job since we had nothing but a crude field strength meter.

For this unit, we used an article in another publication that Bill had found. This unit was a one tube affair using a number 19 tube. Although the construction was for a 5 meter unit, I had a brainstorm that I thought would put the unit on 2½ meters. By removing the base from the tube, soldering the wires directly into the circuit and scaling the tank circuit for 2½ meters, I felt we could get it going. Of course, the cardinal rule is that you start with a good tube first. We did and it worked! It was not without its problems, though; if we had known about Murphy's Law back then, we could have added a number of corollaries.

Finally the day did arrive when we had communications from both base and portable units.

Then — just before graduation, we all received the infamous letter that began: "*GREETINGS.*"

Just prior to graduation we met with some Civil Defense officials from the capital, along with our local town group. We signed a release form that effectively loaned the communications equipment to the town for the duration. It was to be returned to us after the war, but alas, after the war we were living in an entirely different world and enjoying an entirely new era in electronics. Each of us received a very nice letter of commendation from the War Department and the town.

Epilogue

Each of us served in the military and have maintained contact all these years. It is now 2008 and it seems as if all these experiences happened in a period completely removed from current reality. Any time we get together now, we always reminisce about our "WERS" experiences, our innocence and energy and what a great learning experience it all was.

Bill received his Class B license in 1944. In 1946 he was issued his first call sign, W4JQO. In 1955 he upgraded to an Extra class license receiving the call K4SG, which is still current. Bill enjoyed handling traffic and didn't know what a microphone was for many years. In 1951 he joined the Air Force and served in Korea. He earned a BSEE and operated a two-way radio business until he retired in 1984. Bill recently received an ARRL 60 Year Certificate of Recognition. You can reach Bill at 1112 SE Maynard Rd, Cary, NC 27511, **wmcmurray@cs.com**. QST

Feedback

◊ In "Down Periscope" [Aug 2008, pp 41-42], the schematic, Figure 4, has a few errors. Connections 1 through 3 should be labeled TO ROTATOR and the wire originally labeled 3 should be relabeled 1. The wire originally labeled 1 should be relabeled 3. The capacitor should be between new terminals 1 and 2. The upper pair of connections, +12 and GND should be labeled TO INVERTER.

◊ In "Pocket dBm RF Power Meter" [Aug 2008, pp 65-67], C1 in Figure 2 is shown connected to the emitter of Q1 (at the junction of R13). It should instead be connected to the junction of the Q1 collector and R14. In addition, the listed vendor for thermistor R9 is a wholesale source with Electronic Goldmine (**www.goldmine-elec-products.com**), the retail outlet. They have a $10 minimum order. Possible alternate, but untested, substitutes include Digi-Key part number 317-1277-ND (**www.digikey.com**) or Jameco part number 20748 (**www.jameco.com**). If needed, R3 can be adjusted to compensate for any differences from the original.

◊ In "Microwavelengths" [Aug 2008, pp 93-94], polarity protecting diode D2 shown in Figure 4 is actually mounted with the battery connections and thus not shown in Figures 5 or 6. It should be included to protect the circuitry in case the battery is connected backward.

◊ In "Portable Two Element 15 Meter Yagi" [Jul 2008, pp 36-38], the part number of the EMT clamp (33940) is for the 100 pack of clamps. Many stores are likely to carry it only in the six pack container, and that part number is 33916. — *Mike Osterberg, KØVZ*

◊ The subscription rate for *Dubus* Magazine is $35 USD not $30 ["New Products," Jul 2008, p 32]. — *Janet Cole,* Dubus *North American Representative*

◊ The June 2008 cover photo of the Ole Virginia Hams Field Day GOTA station was taken by George Tarnovsky, K4GVT.

ARRL Tells Red Cross of Remaining Background Check Policy Concerns

ARRL President Joel Harrison, W5ZN, has written to Armond T. Mascelli, Vice President for Domestic Disaster Response for the American Red Cross (ARC) to identify the ARRL's remaining concerns over the background check policy for ARC partners. Harrison emphasized that the commencement of negotiation of a replacement *Statement of Understanding* (*SOU*) between the two organizations should not be further delayed while these concerns are resolved and that he looked forward to signing a new *SOU* once additional edits to the background check Disclosure Form and clarifications of the background check Authorization Form are in place for those radio amateurs who volunteer their service to the Red Cross.

Harrison first wrote to Mascelli on November 28, 2007, setting out the ARRL's concerns with the background check procedures recently implemented by the ARC. ARC now requires a background check for Amateur Radio volunteers seeking to support a Red Cross disaster relief response for more than a seven day period. In the ARRL's view, Amateur Radio volunteers were being asked to consent to a more intrusive background check than was necessary or appropriate.

Mascelli's reply on May 8, 2008, addressed some of the ARRL's concerns and Harrison's latest letter to the ARC — sent on June 30, 2008 — recognizes considerable improvement in the forms related to the background check procedures that are linked via the ARC's Web site; however, Harrison also states that analysis of the forms has revealed two continuing problems:

- The Authorization for Background Investigation consent form still contains "some highly equivocal and broad language which, because of its ambiguity, will inevitably discourage substantial numbers of radio amateurs from participating in the background check process." This form was not included with Mascelli's reply and was not seen by the ARRL until later.
- The "Disclosure Regarding Background Investigation" can still be construed as overly broad, although this can be corrected by fairly simple edits.

Harrison told Mascelli: "We do not want the implementation of these additional changes to further delay the negotiation of the terms of a replacement *SOU*. A new *SOU* is, in my view, a critical and urgent matter. Because the old *SOU* expired on September 16, 2007, the vacuum thereafter has served neither ARRL nor ARC well." ARRL and ARC staff are ready to work on a draft replacement *SOU*, the text of which will be reviewed by the ARRL's Programs and Services Committee and approved by either the Executive Committee or the Board prior to completion.

Harrison concluded: "We look forward to continuing to provide seamless disaster response communications by Amateur Radio and to enhancing and expanding ARRL's proud partnership with the American Red Cross. I look forward to meeting with you and executing the new *SOU* once additional edits to the Disclosure Form, and adequate clarifications are included in the Authorization Form that appears on your Web site for partner organizations are made, and when the new *SOU* terms are agreed upon."

KANSAS HAM, SON, ELECTROCUTED WHILE ERECTING ANTENNAS

While putting up backyard antennas on the afternoon of July 13, Edward Thomas, KCØTIG, of Kansas City, Kansas, and his son Jacob were electrocuted. Edward, 65, was pronounced dead at the scene. Jacob, 27, was rushed to the hospital but died later that day. Initial reports suggest that the antenna they were installing came in contact with 7620 V power lines. Neighbors reported a "loud popping sound" and the electricity went out on the block.

Jacob's 7 year old daughter witnessed the tragedy and ran to the neighbor's yard, calling for help. Byron Kirkwood and another neighbor attempted to perform CPR on the men; the neighbor also called 911.

Robert Mullendore, a spokesman for the Kansas City Board of Public Utilities (KCBPU), was quoted by television station KSHB in Kansas City as saying it is rare to survive a shock as strong as the two men received: "There are people who will survive — they're lucky by the grace of God, it's high energy, it's dangerous, that's why it's up in the air — you just have to be careful. Even those who survive have pretty wicked wounds and they are lifelong wounds." In the power business for more than 30 years, Mullendore said these accidents are "really rare," saying that he only sees something like this "every two or three years. If you're doing any kind of work like this, you just really, really need to be aware of your surroundings."

Chuck Kraly, KØXM, used to work for KCBPU; he built and maintained the substation that fed the circuit going to the Thomas home: "This is nothing to take chances with. In my almost 30 years as a ham — and 27 years in the power utility field — I have seen way too many 'accidents.' Stop and look. If it is close or seems that way — don't. Find another place. High voltage lines are not forgiving. Your life depends on it. Please follow the warnings. Anywhere close is too close."

COURTESY THOMAS FAMILY

Edward Thomas, KCØTIG (SK)

The 2008 *ARRL Handbook* offers the following power line safety guidelines: Never install antennas, towers and masts near power lines. Towers and masts should be installed twice the height of the installation away from power lines. Every electrical wire must be considered dangerous. If the installation should contact power lines, you or those around you could be killed! If you have any questions about power lines, contact your electrical utility, city inspector or a qualified professional.

If, for some reason your tower starts to fall, get away from it immediately! If it contacts energized lines, it can become a lethal hazard if you are touching any

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

part of the conductive structure. If a coworker becomes energized, *do not touch the person*! The safest practice is to keep all others clear of the area, call 911 and just wait for the power company and the rescue team to arrive and assist the victim. At some greater risk, a well-insulated pole such as fiberglass or PVC pipe — as long as possible for safety — can be utilized in an attempt to dislodge the live wire or collapsed metal structure from the victim (with moisture, etc., wood can be a poor insulator — especially at high voltages!).

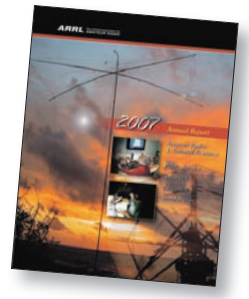
If the victim is well clear of the hazard and is not breathing, immediately start CPR procedures and seek emergency assistance. Remember, use caution and understand that during such an accident, the live conductor or live antenna structure can further move (lurch) suddenly and without warning. One accident is bad enough — there is no need to have two victims! It is best to just seek qualified emergency help if you are unsure of the situation-specific hazards.

2007 ARRL *ANNUAL REPORT* NOW AVAILABLE

The *ARRL Annual Report* for 2007, now available online (**www.arrl.org/announce/annualreport**) and in print, reviews the League's major events of the year and documents the renewed growth of both the ARRL and the activities of the Amateur Radio Service. Just 50 years ago, there were fewer than 90,000 ARRL members; in 2007, ARRL achieved its highest level of membership growth since 1993. By the end of 2007, there were 153,535 ARRL members — a single year increase of 3.3 percent. In this period of growth, ARRL has upheld its commitment and mission as the leading representative of active radio amateurs.

"As it played out, 2007 was a great year for ARRL and Amateur Radio," said ARRL President Joel Harrison, W5ZN. "We experienced growth in the Amateur Service, growth in ARRL membership, the League is in good fiscal shape and hams are excited about getting on the air. Our headquarters staff is more excited and pumped about our mission than I've ever seen and that enthusiasm is being reflected in our membership numbers."

ARRL Chief Executive Officer David Sumner, K1ZZ, concurred: "The mentoring of newcomers by a friendly, welcoming, and supportive community of experienced amateurs is an essential part of 'service after the sale.' It's what turns license-holders into active, lifelong radio amateurs. It's what will ensure our success as a radio service and as a national and community resource for public service communications. The ARRL and its 2100 affiliated clubs are working to meet the challenge."



According to ARRL Media and Public Relations Manager Allen Pitts, W1AGP: "The *Annual Report* is not only useful for showing members the strength of the organization, but it is also a valuable tool in presentations to major public officials. At times they may know little about Amateur Radio, but when they see the quality of the annual report, even before they open it up, they know this is an organization to be taken very seriously. We are indeed a national association and very active."

PHILADELPHIA AREA HAMS NAIL ROGUE RADIO SIGNALS

When residents of a Philadelphia suburb complained to an area television station about how their remote car door entry devices wouldn't work in the parking lot of a local department store, an investigative reporter for NBC-10 (WCAU) called everyone she

FCC News

♦**Enforcement Watchdog Retires from FCC**: Riley Hollingsworth, K4ZDH, the man who has come to embody Amateur Radio enforcement, retired after 35 years in the FCC — 10 of those years focused on enforcement of the amateur bands.

Hollingsworth said that he has "loved" working for the FCC and has "always had great jobs, but this one involving the Amateur Radio Service has been the most fun and I have enjoyed every day of it. I've worked with the best group of licensees on earth, enjoyed your support and tremendous FCC support and looked forward every day to coming to work. The Amateur Radio Enforcement program will continue without missing a beat, and after retirement I look forward to being involved with Amateur Radio every way I can. I thank all of you for being so dedicated and conscientious, and for the encouragement you give us every day."

RICK LINDQUIST, WW3DE (EX-N1RL)

Riley Hollingsworth, K4ZDH, holds both the Wouff Hong and Rettysnitch — instruments discovered by Hiram Percy Maxim, W1AW, to be used on those amateurs who choose to not follow the rules — on a visit to ARRL HQ in 1999.

Calling the Amateur Radio Service a part of the American heritage, Hollingsworth explained that he is "going to stay as actively involved in it as I possibly can. Thank you all for working tirelessly to provide the only fail safe communications system on Earth and for helping this country keep its lead in science and technology. What an incredible gift it has been to work with you every day, and how fortunate we are to love the magic of radio! Every gift of lasting value comes with responsibility. We must never forget what we owe for our spectrum privileges. I will continue working with you in every way I can to ensure that Amateur Radio lasts a thousand years."

For more about Hollingsworth, please see the article on page 48.

♦**New Jersey Ham Hit with *Warning Notice***: Special Counsel in the FCC Spectrum Enforcement Division Riley Hollingsworth sent a *Warning Notice* to William G. Aber Sr, N2JAI, of Green Creek, New Jersey, alerting him that "[t]he control operator of the KC2JPP repeater, operating on 449.875 MHz, has requested in writing that [Aber] refrain from use of the repeater." These requests, the Commission, noted, were due to Aber's "failure to follow operational rules set forth by the licensee/control operators of the repeater system for its users." Aber had been issued verbal requests to refrain from using the repeaters in the past, but he has, according to the *Warning Notice*, "apparently ignored both verbal and written requests." Saying that Aber "refused delivery of the letter," Hollingsworth reminded him of that "[c]ontrol operators may take whatever steps are appropriate to ensure compliance with the repeater rules, including limiting the repeater use to certain users, converting the repeater to a closed repeater or taking it off the air entirely." Aber was warned to stay off the KC2JPP system and any other such request by a repeater licensee, control operator or trustee. If he chose to ignore this request, the FCC would initiate enforcement action against his license — which can include revocation, monetary forfeiture or a "modification proceeding to restrict the frequencies on which [he] may operate N2JAI." Fines normally range from $7500-$10,000.

COURTESY REGGIE LEISTER, N3KAS

Reggie Leister, N3KAS (left), and Bob Rex, K3DBD (right) — both members of the Pottstown Area Amateur Radio Club — helped Philadelphia news reporter Lu Ann Cahn find out just why remote car door entry devices wouldn't work in the parking lot of a local department store.

could to help her discover why. No one knew anything — until she called on some local ham radio operators.

"Many people lock and unlock a car by remote and don't even give it a second thought unless it doesn't work," said NBC10 reporter Lu Ann Cahn. "The mystery problem repeatedly occurs outside the Kohl's store in Royersford. When I went into Kohl's [to ask about this], they told me they had no idea [about this]."

Cahn said that shoppers told her that this has been going on for more than a year. Shoppers theorized that it was the local power plant causing the interference, but Cahn said that officials at the plant said it wasn't them. Others thought that cellular telephone towers might be the culprit, but there are no cell towers in the area. "Police tell us that they can't figure it out either," Cahn said.

So after calling numerous places to help her out with this mystery, Cahn happened upon Reggie Leister, N3KAS, and Bob Rex, K3DBD, of the Pottstown Area Amateur Radio Club; Rex is Vice President and Leister is Public Information Officer (PIO). And as hams do, they were quick to volunteer to help out.

Leister and Rex accompanied Cahn to the parking lot in question. Rex built an antenna out of aluminum tubing and hooked it up to a spectrum analyzer. "Somewhere in the vicinity of this parking lot," Leister said, "there is a big source of radiation, some sort of signal." When Leister aimed the antenna in the direction of the Kohl's store, he hit pay dirt. "There are actually two signals there. It looks like [they're] coming from the building," Rex said when he read the analyzer.

Leister and Rex moved in closer to the building and pinpointed that one signal was coming from one set of doors, while the other signal emitted from another set of doors. Rex, an engineer, said that the thing that bothers him about this is that the signals "are running constantly." When Cahn approached Kohl's management with their findings, she was told that "they will look into it."

"The FCC licenses radio signals and these ham radio operators say the fact that some signal is interfering with remote locks isn't good," Cahn said in her report. Rex concurred, saying, "The FCC rules are pretty clear on that. It might be something that's broken." Leister and Rex agreed that the store security sensors located at each set of doors might be the culprit.

Three days after Leister and Rex located the source of the interference, remote car door devices worked again. "Kohl's will only say that they're working on it," Cahn said. "The FCC says it does sound like something malfunctioned and they have had reports of similar incidents in New York City and Tampa, Florida."

A few days after they found the signals, Leister explained that he and Rex did not think the anti-shoplifting detectors were the problem: "What we are guessing here is that they are probably connected to some kind of device that triggers a security camera to come on if there is a breach. Except instead of just sending out a quick 2-5 second (Part 15) blip, these seem to be on continuously *and* exceeding the permissible signal levels."

Cahn was quick to give credit to the local hams who stepped up to the plate and helped crack this mystery: "We here at NBC-10 were so curious as to why these remote car locks would just stop working, so we thought we should really try to solve this mystery. I have to give kudos to Reggie Leister and Bob Rex with the Pottstown Area Amateur Radio Club. They were so great and so excited. You don't know how many people we called — police, Triple A, car dealerships — we called so many people trying to figure this out and nobody knew anything until we talked to these ham radio operators. They were so wonderful and they knew all about radio signals. They created their own gadgets to help us figure this out. We really want to thank them for their help with this."

KANSAS TEEN NAMED 2008 YOUNG HAM OF THE YEAR

Emily Stewart, KCØPTL, a 17 year old from Leavenworth, Kansas, has been named the 2008 Young Ham of the Year (YHOTY), announced YHOTY Award Administrator Bill Pasternak, WA6ITF. Emily was selected based on her commitment to Amateur Radio, along with leadership, outreach, and her technical and public service achievements of the Amateur Radio Service to others. She will receive her award as part of the Huntsville Hamfest. More than two dozen young people were nominated for this award, now in its 22nd year.

The daughter of Mike, KØMDS, and Sharon Stewart, Emily was first licensed in August of 2003 when she was 12; she holds a General class license. She said she was "so excited" when she got her ticket that she wanted to share Amateur Radio and made presentations while in middle school about ham radio. That led to getting active in her local radio club and contributing articles to the club newsletter. Through her local activities, Emily was appointed in 2006 as the first Assistant Section Manager for Youth in the ARRL Kansas Section.

Emily has lived in Kansas for eight years. Prior to that, home was in Germany, where her father was serving in the US military. She credits her dad for sparking interest in Amateur Radio when they moved back to the United States: "I thought it was really cool when he started talking to people overseas in Europe. And Germany was still kind of home to me, so when he started talking to people in Germany, I said I wanted to do that, too."

Last August, while attending the ARRL Kansas State Convention, Emily conducted a survey of attendees, asking how many had persuaded their children or grandchildren to get involved in Amateur Radio. The slim response led her and Brian Short, KCØBS, to develop the Kansas Legacy Project. This project has three prongs: Pass the spirit and knowledge of the Amateur Radio Service to a new generation; build ties between family members using ham radio activities, and increase youth participation in ham radio. Through her efforts, Emily hopes to encourage hams to get the younger members of their families to get their ham licenses and get involved.

COURTESY EMILY STEWART, KCØPTL

2008 YHOTY Emily Stewart, KCØPTL

Emily is also interested in the public service and storm spotting side of Amateur Radio: "My dad would sometimes take me out with him to go storm spotting. I decided that I wanted to have some training, so I took a couple of online courses in emergency communications. I will either go out with my dad when we get called out to do some storm chasing, or I will stay at home and do spotting from home — just in case something really nasty does happen. Then that way I'm home with my mom."

Emily also has a deep interest in spaceflight and astronomy. One of her cousins, US Astronaut Robert L. Stewart, was a crewmember onboard the space shuttles *Challenger* and *Atlantis*. She has been attending Spacecamp since she was in the 6th grade. "I'm also into astronomy," said Emily. "My dad and I volunteer on public access nights at an observatory about an hour away from Leavenworth."

This fall, Emily heads into her senior

year at Leavenworth High School where she is a member of the National Honor Society, Vice President of the Fellowship of Christian Athletes and is a copy editor for the school yearbook. Already a Registered Pharmacy Technician with the state of Kansas, she is considering making pharmacy her career.

Emily is a member of the ARRL and the Kickapoo QRP Amateur Radio Club. She's also a regular participant in Field Day, Kids Days and QRP events.

The 2008 Amateur Radio Newsline! Young Ham of the Year Award will be presented on Saturday, August 16, 2008 at the Huntsville Hamfest in Huntsville, Alabama. As the 2007 Young Ham of the Year, Emily will receive a trip to the Huntsville Hamfest, ham radio equipment, various books and magazines and an all-expense-paid week at Spacecamp in Huntsville. Amateur Radio Newsline will award her with a commemorative plaque at the ceremony.

The presentation of the YHOTY award is a regular feature of the Huntsville Hamfest and has been made possible through the generosity and kindness of the event's Planning Committee. This year's YHOTY award ceremony will be hosted by Don Wilbanks, AE5DW, of Amateur Radio Newsline, along with representatives of corporate underwriters Vertex-Standard and CQ Communications, Inc.

The Amateur Radio Newsline Young Ham of the Year award program (formerly the Westlink Report Young Ham of the Year Award), has been presented annually since 1986 to a licensed radio Amateur Radio operator who is 18 years of age or younger and who has provided outstanding service to the nation, his/her community or the betterment of the state of the art in communications through the Amateur Radio hobby/service.

In Brief

● **FCC Must Reimburse Fees Stemming from BPL Challenge, Says Appeals Court**: The United States Court of Appeals for the District of Columbia Circuit has ordered that the Federal Communications Commission (FCC) reimburse ARRL for the docketing fee and the cost of reproducing copies of briefs and appendices in the ARRL's successful challenge of the FCC's broadband over power line (BPL) rules. The *Order*, issued on July 9 following review of an opposition from the FCC and a reply from the ARRL, awarded the ARRL's full claim of $6,096.18. Commenting on the *Order*, ARRL Chief Executive Officer David Sumner, K1ZZ, observed: "While this is just a small fraction of the cost of our judicial appeal, the *Order* is significant because the Court did not buy the FCC's arguments that the ARRL had only achieved 'partial success' in its appeal and that our claim of costs was excessive. In addition, the FCC falsely claimed that the ARRL 'was unsuccessful in persuading the Court to vacate the rules it challenged.' In fact, the ARRL never sought to do so since the BPL rules adopted by the FCC, inadequate as they are, were still better than nothing. The award of these fees affirms that, contrary to the 'spin' the FCC has tried to put on the Court's remand, the ARRL substantially prevailed in its appeal."

● **Two New Coordinators Appointed in IARU Region 2**: IARU Region 2 President Reinaldo Leandro, YV5AMH, has appointed Dr César Pio Santos A., HR2P, of San Pedro Sula, Honduras, as IARU Region 2 Emergency Communications Coordinator; Santos will be taking over from Rick Palm, K1CE. According to Leandro, Santos is a well-known emergency expert in the region who helped to provide emergency communications and medical relief in Honduras in the wake of Hurricane Mitch. He remains active as a volunteer in his country's governmental emergency communications institution and as a member of the Emergency Communications Advisory Group (ECAG) for Area D (Central America) in IARU Region 2. Leandro also appointed Juan Muñoz, TG9AJR, of Puerta Parada, Guatemala, to succeed Bill Zellers, WA4FKI (SK) as the Region 2 Monitoring System Coordinator. Muñoz started as a shortwave listener in 1984 and obtained his current license in 1989. Leandro said Muñoz is an active amateur on nearly all bands and modes; as an avid contester, he was a referee during WRTC 2002 in Helsinki, Finland and has participated in the IARU Monitoring System with Martin Potter, VE3OAT, since 2001.

● **Howard Shepherd, W6US (ex-W6QJW), SK**: Former Southwestern Division Director Howard Shepherd, W6US, passed away on June 13. He was 87. Shepherd, who served as Southwestern Division Director from 1965-1967, when he held the call sign W6QJW, was active and accomplished in many facets of Amateur Radio. According to current Southwestern Division Director Dick Norton, N6AA, Shepherd was a record-setting contester, an Elmer to countless up-and-coming young hams, a volunteer leader and, and in his professional capacity as an attorney, an adviser on antenna zoning issues and club incorporations. Shepherd was an Honorary Member of the Southern California DX Club with 352 countries confirmed, member of the San Diego DX Club, past chairman of the 50 Club and prime mover in the Leisure World Radio Club of Seal Beach. An ARRL member for over 70 years, "Howard gave back to Amateur Radio, his community and his country in many ways. We will miss him greatly." Norton said.

● **Robert Dickinson, W3HJ (SK)**: Robert Van Cleft Dickinson, W3HJ, of Zionsville, Pennsylvania, passed away May 28. He was 79. A Fellow of the Society of Cable Telecommunications Engineers and a member of the IEEE, Dickinson, a long-time ARRL Technical Advisor, wrote the chapter on cable television interference in the second edition of *The ARRL RFI Book*. ARRL Lab Manager Ed Hare, W1RFI, remembered Dickinson, saying, "In the early 1980s, as the cable industry was developing, the relationship between the cable industry and Amateur Radio was not good. Early systems were leaky and interference problems — especially on 2 meters — were common. Dickinson helped change that; he agreed to serve as a liaison between the ARRL and the National Cable Television Association, now the National Cable and Telecommunications Association (NCTA). It took years, but over time — as improvements in the construction of cable plants and firm guidance from NCTA to cable operators who did not promptly correct interference problems — his work helped the cable industry flourish with good coexistence with licensed radio services. This has served as a model for ARRL's relationship with other industries." ARRL Chief Development Officer Mary Hobart, K1MMH, echoed Hare's thoughts: "We are saddened by the loss of Bob Dickinson, W3HJ, a good friend of ARRL and Amateur Radio. Bob's keen interest in League activities on behalf of our Service was evidenced by his generosity as part of the ARRL Diamond Club for five years, as well as his financial support of the Spectrum Defense Fund and the Education & Technology Fund."

● **US Government Recalls RadioShack Power Supplies**: On July 2, the US Consumer Product Safety Commission (CPSC), in cooperation with RadioShack, announced a voluntary recall of 13.8 V dc power supplies. The CPSC said that consumers should stop using these power supplies immediately, as the "power supplies are wired incorrectly, posing electrocution and fire hazards." No injuries have been reported in conjunction with the power supplies that were sold in RadioShack stores nationwide from October 2004-January 2008 for between $50 and $85. Manufactured in China, the CPSC said that the recall involves RadioShack 13.8 V dc Power Supplies, catalog numbers 22-507 and 22-508 with date codes from 08A04 through 01A08. Date code format is MMAYY where MM is the month and YY is the year. The catalog number and date code are located on the back of the power supply. Power supplies with a green dot on the product and the product's packaging have already been repaired and are not included in the recall. The CPSC recommends that consumers unplug the recalled power supply immediately and take it to any RadioShack store for a free repair. Registered owners of the recalled power supplies will be mailed a notice. For additional information, contact RadioShack at 800-843-7422 anytime, or visit their Web site. QST

Amateur Radio Supports Urban Search and Rescue

Jim Carr, KC4MHH
kc4mhh@arrl.net

"She just walked away from our campsite." "My father has Alzheimer's, and he has been gone since this morning." These are the stories we usually hear from relatives concerned about the location and well-being of their loved ones.

Even with the best intentions and the use of four wheelers and aircraft, law enforcement has a very difficult task, and the odds are not on their side. This is where volunteer Urban Search and Rescue (USAR) teams throughout the United States provide a service that does not exist anywhere else.

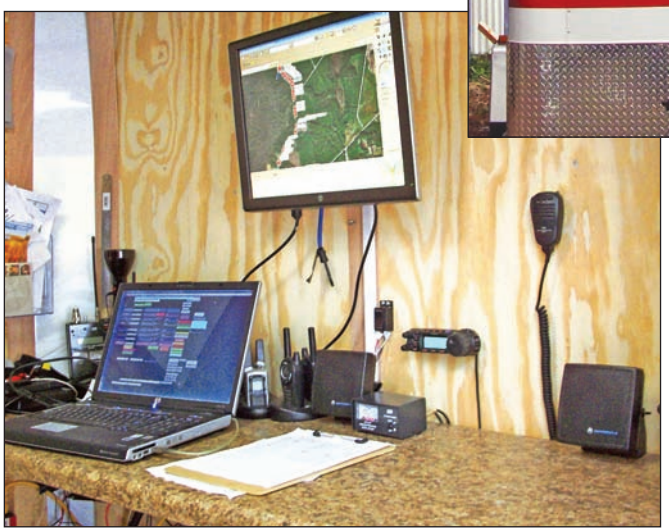
Using specially trained and certified dogs, these teams will many times find, in under two hours, a person whom other search teams have been seeking for several days. These canines come in two main categories — ground tracking and air scent — and each one has its own advantages.

But just like any other organization, these teams need a support system behind them, part of which includes a complete communications team including GMRS/FRS, local law enforcement, Fire Rescue, and Amateur Radio. Many of these Search and Rescue organizations even recommend or require members to be licensed radio amateurs.

Here, in Alachua County (Florida), some members of Alachua County Fire Rescue Reserves, Alachua County Community Emergency Response Team (CERT), Gainesville Amateur Radio Society, and others came together to form the local Urban Search and Rescue team to cover local counties in the Northern Florida area. Initially, command was simply operated from the front seat of my Chevy Suburban, but there had to be a better way and with more capability.

The first step was listing the systems that would support a search team in the best way. We wanted reliable communications including the use of repeaters when necessary, a communications link with law enforcement and Fire Rescue, and Automated Position Reporting System (APRS) to track the location of the teams. Also, we had to remember that we are volunteers, and the cost is out of our pocket!

Front view of the trailer showing the antenna mast and assembly. For purposes of the photo, the mast is only 20 feet high. The mast is capable of extending 10 feet higher.



The operating console at the front of the trailer with laptop and dual monitors. The Kenwood THD-700 and Yaesu FT-857 are also visible.

Side view of the USAR Search and Rescue support trailer.

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

This shows a military style backpack (with metal frame) with a ⅝ wave mobile antenna installed. This solved the communication problem in the woods by extending the radio's transmission range about four times!

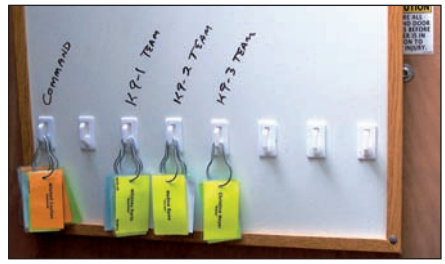
The Trailer

I found a local trailer dealer that made us a great deal. The dealer offered us $2000 for a new 6 foot by 12 foot box trailer with side and front doors. Here was our package, and now we just had to make it happen!

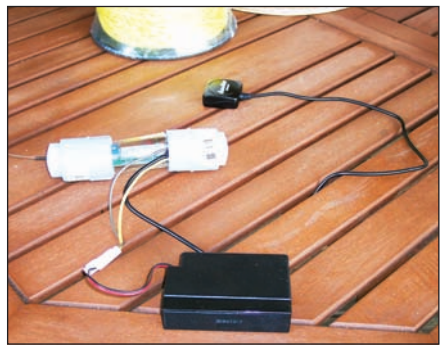
After building a desk area at the front of the trailer, I installed a 12 V marine battery (in a carrier) along with a 700 W inverter. A 110 V ac shore plug and automatic transfer switch (found at a local RV dealer) was installed that would automatically disconnect the inverter and transfer to the shore plug (mounted on the front of the trailer) whenever local utilities or the 2 kW generator we carry on board was used. The internal 12 V ceiling light was rewired to operate from this battery and a 110 V ac fluorescent light was installed over the desk area. A small 12 V trickle charger was added to charge the battery when we are on shore or generator power.

For Amateur Radio voice (144 or 440 MHz) and APRS, a Kenwood TM-D700A was installed and a laptop computer capable of dual monitor output feeding a 20 inch LCD monitor on an adjustable wall mounted bracket. A commercial Kenwood radio to cover fire and forestry channels and a portable 800 MHz trunk radio for law enforcement and Fire Rescue coordinations completed the physical equipment.

Knowing that the roof mounted antenna was not going to be sufficient for simplex APRS operation, I began looking for portable, lightweight, telescoping masts. After looking at several ranging from $500 to over $1000 for 30 to 40 feet, a local Amateur Radio operator gave me a much less expensive alternative. I purchased a 10 foot piece of 1½ inch EMT (cut to 7 feet) and inserted into it a 20 foot telescoping mast used for cleaning swimming pools. A simple bolt with wing nut inserted into the top of the EMT and the bottom of the telescoping mast, gave me approximately 28 feet above the ground. The twin dual band J-Pole antennas were custom made for us by Bluestar Antennas (**bluestarantennas.com**). These antennas and coax cut to length to the front mounted firewall connector completed an excellent working antenna arrangement. The antenna can be installed and erected by one person in less than 10 minutes.



The PAT (Personnel Accountability Tag) board is mounted to the inside of the front door of the trailer. This provides accountability of everyone on the scene, and it increases the proper use of resources and personal safety.



This shows the Byonics Micro-Trak 8000 installed in PVC tube with GPS and 12 V battery.

The Software

After researching the best software available for our purpose in Urban Search and Rescue, I settled on DMAPPER from Doodlebug Software (**www.dmapper.com**). At under $40, this software will interface between your TNC or data radio and several mapping programs and overlay your tracking data on them. DMAPPER was designed specifically for search and rescue tracking. It will allow tactical names and even display directly whether the station is moving or stationary.

After trying several mapping programs, we finally settled on DeLorme Topo USA (**www.delorme.com**). Not only does this software have good street and topographic maps, but it also allows one to download aerial views. Both the topo and aerial views can be displayed split-view on a single monitor, both with your track overlays.

The Field Units

Now that we have the trailer up and working, what about the field units? The conventional way of placing APRS in the field involved a handheld radio, TNC (the least expensive of which is the Tiny Trak), and a GPS. With a cost around $300 and up, this is a very cumbersome package to carry.

Along came Byonics (**www.byonics.com**) with its addition to the cause: the Micro-Trak 8000. At $150, this unit is a complete package consisting of an 8 W, 2 meter transmitter on 144.390 MHz (also available on 144.800 MHz for European use) and a built-in

A New Look for "Public Service"

Hopefully as you started reading this column, you noticed something different. A slightly new look, but most importantly, some new areas listed. While we are remaining "Public Service," we've added "Readiness, Response and Resilience" to our focus.

We will continue to have pertinent examples of activities from the field as in past columns as space permits, but will now concentrate on developing topics applicable to the extensive field of emergency preparedness and Amateur Radio. These future columns will allow us to address individual and organizational issues surrounding our ability to serve. Our intention is to tackle issues that could be controversial, may question current practices, offer best practices from the Amateur Radio world, and allow you-the reader, to consider options in the processes you follow or techniques you employ.

You are part of this process and are invited to send ideas for future topics to me.

We plan to cover individual topics in one monthly issue, but for more detailed subjects we will spread them across multiple months as needed.

So stay tuned for this to evolve over the next few issues. — *Dennis Dura, K2DCD, Manager, Emergency Preparedness and Response,* **k2dcd@arrl.org**

TinyTrak 3. Just add the GPS2 at $70 and the Micro-Trak VHF antenna at $9, and you have a complete package. I was able to install the Micro-Trak in a 1½ inch piece of PVC with end caps just by drilling a hole through one cap for the antenna and the other end for the power and APRS wiring. I found a 12 V, 7 A battery with a Molex connector that was perfect for this application. Chargers are on board the trailer for these and all of the various handheld radios used by the teams.

Backpacks for Carrying Equipment

Even the backpacks were modified. Operation in dense woods with a handheld is marginal at times. I modified two backpacks using truck mirror mounts and ⅝ wave antennas with coax and adapters for the Yaesu VX-170 handhelds and hand mics used for voice communications. This made a tremendous difference with an antenna that doesn't mind being beat by the brush and tree limbs. We recently added to one of the backpacks an Alinco DR-135T mobile radio using an Argent T2-135 digipeater board. This gave us a portable digipeater in the field that could insure that even a low powered 300 mW Micro-Trak 200 APRS transmitter on a search dog could be received at command.

Personal Accountability Tags

To assure additional safety to our teams, we also follow the incident command procedures and use the personnel accountability tags (PAT Tags).

I have colored coded these tags according to their assigned duty and using inexpensive shower curtain hooks on a dry erase board. I have colored coded them as "orange" for command and operations, "yellow" for canine handlers, "blue" for EMT's and Paramedics, "green" for communicators (all are hams), and "white" for all others.

Members of the teams may have several different colors on their rings, such as Whitney Hartz, KI4NYD, our chief canine handler, who along with her canine, Amaretto, is also a medic and a communicator. Our coordinator, Mitch Coulton, KI4JYH, acts as the commander of the operation and is also a medic and communicator. Using the shower curtain hooks, it is simple to rotate the cards to display the "daily assignment" of each member, which is placed on the board with their assigned duty or team.

Photos by the author.

Jim Carr, KC4MHH, has been an Amateur Extra class amateur for over 40 years. Jim formed the communications division of Alachua County Fire Rescue Reserves and then created and built the communications center for the Alachua County Emergency Management. An ARRL member, Jim is also a volunteer examiner. His duties with the team are operations, communications support, and EMS coordinator, and he assists with training new recruits. He has recently obtained a Lab puppy that will be trained as one of the search and rescue canines. For more information and photos of the Canine Search and Rescue Team, visit **www.acfr.net.**

ARRL Field Organization Reports Have Moved

The monthly ARRL Field Organization reports — including the list of Public Service Honor Roll and Brass Pounders League honorees — will no longer appear with the Public Service column. This month's reports appear on page 101.

SEPTEMBER IS NATIONAL PREPAREDNESS MONTH

The ARRL is a national coalition member of National Preparedness Month in September. What is National Preparedness Month (NPM)? Let's refer to the *Ready* Campaign to find out (**www.ready.gov**):

"Sponsored by DHS' *Ready* Campaign, and with support from Coalition Members across the nation, NPM is held each September to increase public awareness about emergency preparedness. During the month, Americans are encouraged to participate by hosting activities and initiatives. In 2007, more than 1800 organizations joined the *Ready* Campaign as Coalition Members, making it the most successful year to date."

"*Ready* is a national public service advertising campaign designed to educate and empower Americans to prepare for and respond to emergencies including natural disasters and potential terrorist attacks. The goal of the campaign is to get the public involved and ultimately to increase the level of basic preparedness across the nation.

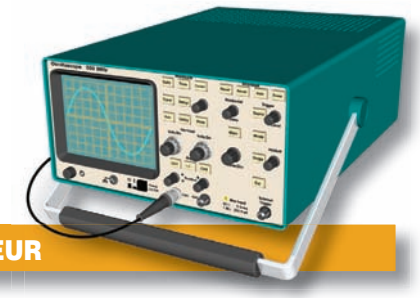
"*Ready* asks individuals to do three key things: get an emergency supply kit, make a family emergency plan and be informed about the different types of emergencies that could occur and their appropriate responses. Individuals can visit **ready.gov** or call 1–800–BE–READY for information about emergency preparedness."

ARRL and Citizen Corps

The ARRL first became acquainted with National Preparedness Month through its relationship with Citizen Corps. Since June 2003, ARRL has been affiliated with Citizen Corps, an initiative within the Department of Homeland Security, to enhance public awareness and safety. Visit **citizencorps.gov** for more information.

According to the *Ready* Campaign, Citizen Corps works with five national Partner Programs through partnerships with other federal agencies and national organizations. The five programs — Community Emergency Response Teams (CERT), Medical Reserve Corps (MRC), Fire Corps, USA On Watch/ Neighborhood Watch (NWP), and Volunteers in Police Service (VIPS) — provide national resources for training and exercising citizens at the state and local levels. In addition, 25 Citizen Corps Affiliate Programs and Organizations offer community resources for public education, outreach, and training; represent volunteers interested in helping to make their community safer; or offer volunteer service opportunities to support first responders, disaster relief activities, and community safety efforts.

The Doctor is IN



PROJECTS AND INFORMATION FOR THE ACTIVE AMATEUR

Q Stewart, KD5LBE, asks: What should I do with the extra antenna coax in the car and at the shack? I have been told to bury it, coil it, cut it off and to leave it in an uneven pile. I haven't been able to find a good answer.

A The nice thing about coax, unlike window or ladder line, is that you can roll it up without causing problems. In fact, it is pretty forgiving. I would avoid:

- Making very tight turns, especially with foam insulated coax. If it is coiled too tightly, the center conductor can migrate through the foam, shorting in an extreme case, but certainly reducing the voltage breakdown rating.
- Some coax has an outer jacket rated for direct burial. If you are not sure it does, don't bury it.
- Coax lying on the ground is very susceptible to power lawn mowers.
- Coiling can actually be beneficial. A 6 inch diameter coil of 6 to 8 turns can act as a choke and reduce any currents on the outside of the coax.

On the other hand, coax has attenuation. Look at any recent *ARRL Antenna Book* and you can find the attenuation of most coax as a function of frequency.[1] This attenuation represents wasted power on transmit and reduced sensitivity on receive. If it is more than just a bit with your coax and band of operation, it argues for cutting it off and using the excess elsewhere.

Q Larry, KØLWV, asks: I have seen a couple of references that said old-timers used to wax their ladder line. Do you know why?

A My understanding is that hams using twin lead transmission line (picture window line, without the windows) would wax it to keep water from standing on the insulating surface. It may also help keep crud from accumulating. Whether or not it made a difference in performance is open to speculation. It might reduce loss just a little — especially on rainy days.

Our current window line (I use "ladder line" to mean what we used to call "open wire line" — looks more like a ladder, as shown in Figure 1) is spaced farther apart and has less insulation coverage, so it has less loss to start with and would have less, but perhaps some, improvement. Window line is about halfway between twin lead and open wire, in terms of loss.

Another change that might be a bit more work, but would for sure make a difference and move you closer to open wire performance, would be to remove some of the web from between the wires. If you can get a cutter that can remove some, without nicking into the copper, you should end up with less surface for crud to collect on.

I'm not sure how much difference this will make, but I predict it would be at least as much as waxing, and you wouldn't need to repeat every month! You just need to leave enough web to hold the wires apart, which probably takes a lot less than they leave.

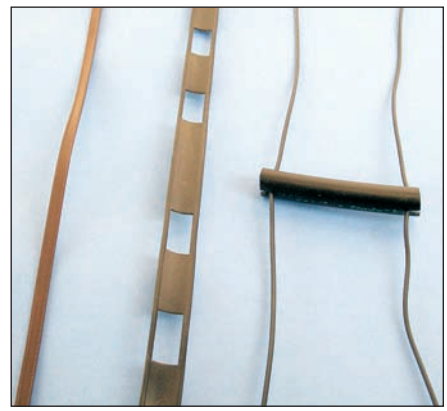


Figure 1 — Comparison of (left to right) TV type 300 Ω twin lead, 450 Ω window line and 600 Ω open-wire line (from W7FG at www.w7fg.net).

Q Clay, WA5VSZ, asks a related question. I had been using 450 Ω window line for 4½ years and suspected that the weather was having an effect on my tuner settings. I believe it was the reason I had to change my tuner sittings drastically in the mornings when the humidity was high. I recently changed from 450 Ω window line to 600 Ω open wire line I purchased from Gary, W7FG. My tuner changes in wet weather or high humidity are gone. I have had very good results since and wonder if there are any problems with this arrangement.

A The 450 Ω window line has worked quite well for me for many years, but I must admit I don't make note of small changes in tuner settings, or perhaps just wonder if I've made an error in recording them!

I think the problem is due to the web material between the wires. It is in the field between the conductors and any conductive or especially lossy material that accumulates on the web will change its characteristics, both impedance and loss. I believe that the effects will be different in different areas depending on the levels and nature of airborne contaminants that are floating around.

One could probably recover the original performance characteristics by scrubbing the line periodically, and perhaps extend the time between washings by waxing the dielectric as described above. On the other hand, even at low points of the sunspot cycle, I think there are other more interesting things to do!

Open wire, or true ladder line (on the right in Figure 1), suffers less from these effects simply because there is less material between the wires for contaminants and rain to accumulate on. I don't know of many downsides to the open wire unless its larger physical size causes mechanical problems. Open wire line can be beneficial almost anywhere window line could be used. Because of the wider spacing, there will be somewhat more line radiation, but that should be negligible on the HF bands.

Q Sam, N3CPO, writes that he has one of the popular 100 W class HF transceivers and that it only indicates 50 W output on its power meter in SSB mode. Sam confirmed this with a commercial dummy load and wattmeter. He contacted the manufacturer and they asked him to whistle into the mic. With a

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

steady whistle the meter went to 100 W. Sam laments that he doesn't whistle, but talks, on the air. He wonders if a different mic would work better.

A It sounds like your radio is operating just as it should. Sam, the problem isn't the mic, it's the meter; or more precisely the nature of human speech. Both your internal and external meters are trying to follow your voice peaks while you are talking. Neither meter's pointer can respond quickly enough to reach 100 W before your audio signal drops back down with the fluctuations of your voice. If you were to use an oscilloscope to look at your whistle and your speech envelope as you talked, I'd wager they both peak at 100 W, even though the average power of your speech waveform is much lower, perhaps 10 W or less. The response to the steady amplitude of your whistle indicates that your mic and radio are capable of putting out 100 W PEP. Note that for a SSB with a steady tone, CW or FM waveforms, average and peak powers have the same value.

There are power meters that can measure true PEP directly using circuitry to force the needle or display to stay at the peak value even after the input drops down. A better way is to just follow the manufacturer's instructions on setting the audio gain until the ALC indicator is displaying as indicated in your manual with normal speech. If you desire a higher average power (same peak power), follow the manufacturer's instructions on setting the compressor level. Don't make the mistake of turning things up any higher — you will have the same peak power, but your speech will be distorted and unnatural sounding. Once you have set the transmit audio controls per the instructions, you can believe that you are hitting close to those 100 W peaks.

Q Dave, KY4C, asks: I have an old Heathkit linear amplifier and want to use it with my new solid state transceiver. My concern is that the keying voltage of the amplifier is around 100 V, too high a value for the transceiver amplifier keying circuit. What is the best way to key the amplifier without putting my transceiver at risk?

A You are wise to be concerned here. Radios from the Heathkit era typically used relay contacts to key a linear amplifier while newer radios generally use solid state switching.

To verify the amplifier switching requirements, measure the open circuit voltage across the amplifier keying line with the amplifier disconnected from the radio. Then switch the meter to read current. It should then complete the keying circuit and show you the actual current requirement. These should be compared to the safe values in the transceiver's manual.

I looked at the specifications of the Orion II transceiver on the Ten-Tec Web site, as one example. It indicates that it can safely switch 100 V at 0.25 A. That may work with many amplifiers, but check your transceiver specifications to be sure. If the amplifier requirements are too close, or beyond the transceiver specification for either voltage or current, you have a few choices:

Using an intermediate relay or solid-state switch is the usual fix. This is a pretty easy one weekend job. If you use a 12 V relay, you may be able to obtain power from the radio's accessory socket. Figure 2 shows the connection arrangements for an electromechanical relay arrangement.

Another approach that is even simpler is to use a footswitch such as the Heil FS-2 (**www.heilsound.com/amateur/products/footswitch/**). It has two contacts, one for switching the amplifier and one to go to the PTT line of the transceiver. They have a mechanical delay so that the amplifier is switched on before the transceiver to avoid the possibility of having amplifier relays toggle with RF applied. If you operate CW, make sure that your transceiver can be switched to transmit in that mode with external contacts. I have used that footswitch and found it easy to get used to.

Of course, neither of these solutions will get you to full break-in on CW. If that's something you want there are a number of solutions, including one in a recent *QST* article.[2] There are also a number of commercial products designed to do that.

♦ *Bob, WB4AKA, had the following suggestion regarding KØLWW's question regarding radio interference in the Doctor column in the July 2008 issue of* QST.

I suggest that Larry check for branches that have grown too near power lines within half a mile of his home. When the wind blows, leaves can short a power line to ground, making a Geiger counter type noise that can be heard on the radio. If there are brown leaves right next to the highest lines on the utility pole, Larry may have found the source of the noise he is hearing.

A good way to motivate the power company to send a crew out to clear those branches away is to express concern of a fire being started. Larry could also mention that someone touching such a tree could receive a terrible shock. A fire and electrocution hazard will get the electric company to clear those branches a lot faster than a radio noise complaint.

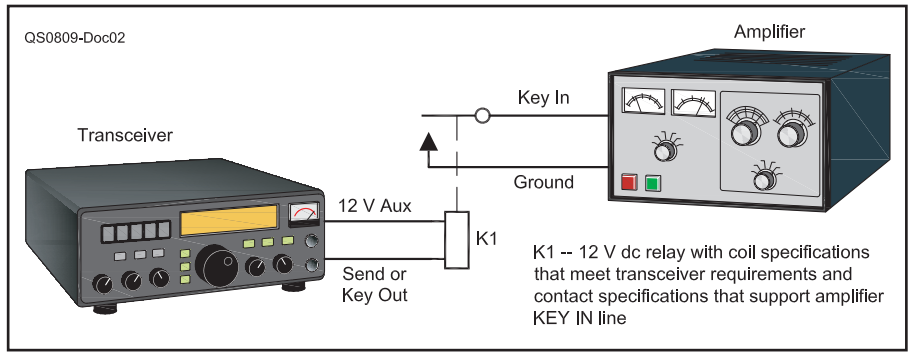


Figure 2 — Schematic of simple external keying relay used to switch a linear amplifier from a solid state transceiver.

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

QST congratulates…

♢ Kenny Bales, AC7ES; Jerry Fuge, KC6ILH, and Ron Daviau, KC7YMH, who were recognized by the Southern Nye County ARES® for having provided communications support for the Baker to Vegas Relay Race for 10 years. — *Carol Bird, KE7KHD*

I would like to get in touch with…

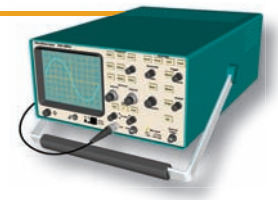
♢ anyone with an ET3USA QSL card. Many years ago I was stationed at a Navy Communications Station in Asmara, Ethiopia that was attached to the Army Security Agency Field Station called Kagnew Station. The station ham club had the call ET3USA. — *Irv McWherter, K3IRV,* **irv47mc@gmail.com**

KNIGHT KIT T50 DISCSSION GROUP

♢ I have started a discussion group about the vintage Allied Radio Knight-Kit T50 transmitter at **groups.yahoo.com/group/knight-T50group**. I am selling nothing, just helping dredge up fond memories. — *Todd Carpenter, N9YSQ, Maceo, Kentucky*

[2]P. Salas, AD5X, "External Full Break-In Transmit-Receive Switch for HF Amplifiers," *QST*, Feb 2008, pp 76-79.

SHORT TAKES



Byonics TinyTrak4 APRS Position Encoder

Most hams use the Automatic Position/Packet Reporting System, better known as *APRS*, as a means to track moving objects by radio. If you read the article by Bob Bruninga, WB4APR, elsewhere in this issue, you will see that the APRS network is capable of much more, including various forms of instant messaging, but tracking is by far the most popular application today.

You easily can make yourself APRS "trackable" with little more than a 2-meter FM transceiver, a Global Positioning System (GPS) receiver and a packet radio modem called a Terminal Node Controller, or *TNC*. Within minutes after firing up your equipment, your fellow hams will be able to see an icon that represents your location on their computer-generated maps.

But if all you want to do is beacon your ever-changing position to the wider world, a TNC is overkill. Instead, you can use a simpler device to transform the GPS position information into packet radio data: a *position encoder*. A basic position encoder is dedicated to the task of creating data packets and translating them into audio tones for transmission by your radio. Unlike a TNC, a position encoder only transmits; it doesn't receive. If a position encoder "listens" at all, it is only to detect activity on the frequency to avoid generating unnecessary interference.

The Byonics TinyTrak4 is one such position encoder, but it is also more — quite a bit more.

A Software Defined Device

Straight out of the box, the TinyTrak4 is an empty vessel, so to speak. The function of the device depends upon the software you load into it. You can load the Byonics software and create an advanced APRS encoder that does nifty things such as sending new position beacons when you turn a corner at a certain angle. You can even set the beacon rate to automatically increase or decrease according to how fast you are moving.

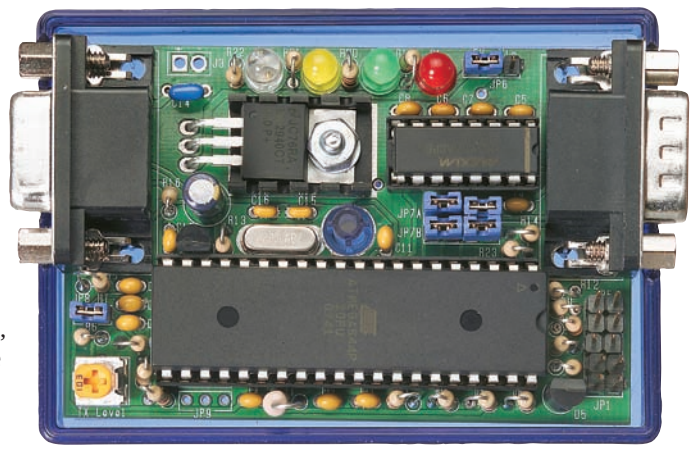
When you're ready to try something new, you can load the KISS software and turn the TinyTrak4 into a 2-way TNC that allows you to communicate on a packet network (APRS or otherwise) at 300, 1200 or 9600 baud. You can even load software that will allow the TinyTrak4 to decode DTMF (TouchTone) tones, or PSK31 transmissions.

In other words, the TinyTrak4 can become whatever you want it to be — it is just a matter of loading new instructions. The software offerings are constantly under development and the latest versions are available for free downloading on the Byonics Web site. When this review was written, the PSK31 decoding software was not yet ready, but I am particularly curious to give it a try.

Building and Testing the TinyTrak4

For this review we purchased the TinyTrak4 kit with its translucent blue case. (Built and tested units will be available soon.) The TinyTrak4 circuit board fits neatly into the case, creating a truly tiny 2 × 3 inch position encoder with DB-9 connectors at each end.

We also purchased a Byonics GPS2 receiver and a null modem adapter, which you must have to connect the TinyTrak4 to your computer for programming. Since my laptop lacked a serial port for the null modem adapter, I also had to purchase a USB-to-serial adapter.



An inside view of the TinyTrak4.

According to the instructions, it should take about an hour to build the TinyTrak4, but I required an hour and forty-five minutes. Perhaps I am just slower than normal. The components are all of the through-hole variety, but some are tiny nonetheless. A magnifying glass came in handy at times.

The "smoke test" was delightfully smoke free, but the four status LEDs were flashing in a strange left-to-right pattern. The instructions did not explain the meaning of the LED patterns, so I was left to assume the worst. Fortunately, there is an excellent TinyTrak group on Yahoo at **http://groups.yahoo.com/group/TinyTrak/**. I joined the group (it's free) and searched the messages. I quickly discovered that the TinyTrak4 ships pre-loaded with diagnostic software. Ah-hah! That explained the odd display; the TinyTrak4 was operating in diagnostic mode.

I loaded the proper firmware and was rewarded with a fully functioning position encoder — and LED activity that made sense. I immediately hooked up the Byonics GPS2 receiver and radio cable harness (also available from Byonics) to my handheld transceiver.

The TinyTrak4 worked like a champ, blasting my position data all over central Connecticut. Later I loaded the KISS TNC firmware and did a bit of two-way APRS using *UI-View* software, sending and receiving position data as well as a few text messages.

Flexible and Capable

The TinyTrak4 not only works well for APRS and other forms of packet networking, it has the potential to function in many other applications. The only caveat I can offer is that the documentation leaves a number of things unexplained, such as how to use the encoder configuration software, and this may be confusing to someone who is new to APRS in general and position encoders in particular. When in doubt, join the TinyTrak online group.

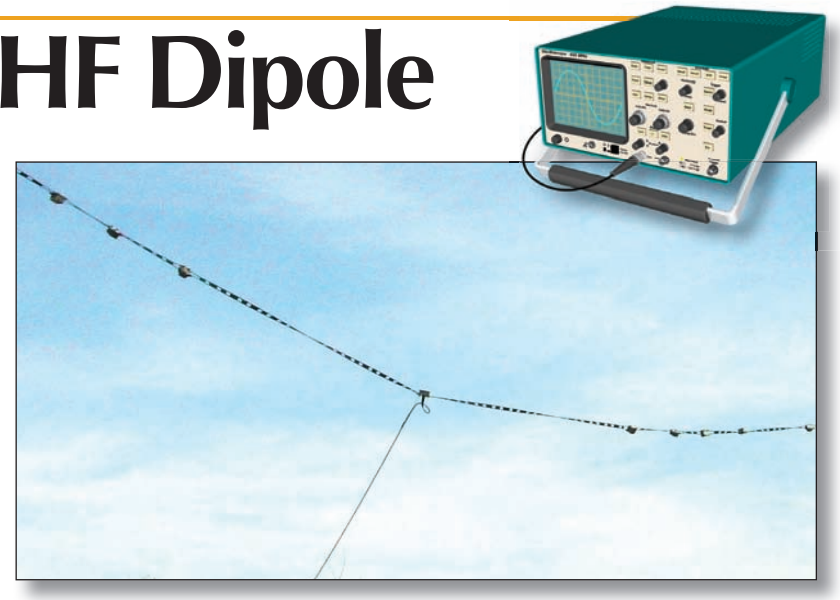
Manufacturer: Byonics, 8378 Granite Mountain Ln, Las Vegas, NV 89129; **www.byonics.com**. *TinyTrak4 kit and case: $65. Null modem adapter: $6. GPS2 receiver: $69. Radio/power cable: $19.* QST

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

An All Band HF Dipole Antenna

Use relays without extra wires to select your dipole length.

Jim Weit, KI8BV



If you are like many of the amateurs I know, you have wanted to try out many of the HF bands at one time or another. Here is an antenna that can cover any or all of the HF bands that you might want to operate on. This antenna does not have strange radiation patterns or narrow bandwidth as do some multi-band antennas.

[This antenna should provide similar performance to the pneumatically switched multiband dipole presented in August *QST*.[1] The control systems provide a strikingly different approach to the switching mechanism. — *Ed.*]

Over the years I have put up many dipole antennas in my yard. I am lucky in that my lot is large enough for a full size 160 meter dipole. There are lots of large trees to hang dipoles between. Even on a large lot it is hard to arrange eight or nine dipoles in such a way that minimizes the interaction between them. The cost of all the coax needed to feed such a large number of antennas can get expensive. Then there is also the problem of the visual clutter, at least in the eyes of the neighbors.

An Idea Emerges

One day while trying to figure out where to hang one more antenna, it occurred to me that the only difference between a 10 meter and a 12 meter dipole was 14 inches of wire added to each end. The addition of 19 inches of wire at each end of the 12 meter dipole makes it a dipole for 15 meters. If there were a way to increase or decrease the length of the dipole whenever I wanted, I would have three dipoles in the same place, using the same supports, and using a single coax feed line. There would be no interaction between them, and they would have all the same characteristics as a dipole, because each one is a dipole. Well, I am sure that you can see that we could cover any set of bands that we want by simply adding or removing lengths of wire to or from the ends of a basic dipole. The big question is, how can we do this from the comfort of the ham shack anytime that we want?

One way to do this is to place relay contacts along each leg of the antenna at the points at which each dipole would end. Energizing pairs of relays connects lengths of wire to each end of the antenna, and de-energizing pairs of relays disconnects the lengths of wire and shortens the antenna. By making each leg of the dipole from two parallel wires, it is possible to get power and control signals from the shack, through the coax feed line to the relays. Since a number of relays must be controlled, some electronic components are needed at each relay to decode the control signals that are carried along the parallel antenna conductors. The relays and their control circuits must be housed in weatherproof enclosures. I call these assemblies *relay modules*.

We also need an enclosure with circuitry to generate the control signals that are sent to the relay modules using the same coax feed line that carries RF between the station and the antenna. I call this unit the *antenna controller*.

Figure 1 is a block diagram of the complete multi-band antenna system. Only two pairs of relay modules are shown, but additional pairs can be added to cover as many bands as you would like. With just the two pairs of relay modules shown, this would be a three band antenna.

A module called a *splitter* is located at the center of the antenna. This module also acts as the center insulator. The splitter uses RF chokes and capacitors to separate (or split) the RF power from the dc power and control signals on the feed line.

Another part of the system is called the *injector*. The injector allows dc power and control signals to be injected onto the feed line at the operating position. The injector circuit is outlined on the controller schematic (Figure 2). The injector is shown in Figure 3.

The antenna controller provides dc power to the relay modules, and generates the control signals that turn pairs of relay modules on or off. The controller and injector are located in the shack. The only wires that run between the antenna and the ham shack is a single coax feed line, just like a regular dipole antenna.

Basic Operation

Refer to Figure 1. At power-on, +12 V is applied to the + terminal of relay module 1A through Q1, L1, L2 and up the center conductor of the feed line. It also passes through the inductor in the splitter module to relay module 1B. The negative side of the power supply is connected to relay module 1B through the outer braid of the feed line. It is also connected to relay module 1A through the splitter. The relay module operation is described below.

At this point dc power is applied to the control circuits in the first pair of relay modules (1A and 1B). Initially the relays in these modules are not energized so the relay contacts are open and no power gets to the next pair of relay modules. The antenna is now set for the highest frequency band, band 1. The dc power to the relay modules passes through the inductors, but RF does not. Injector capacitor C1 allows RF from the transceiver to flow to the antenna and prevents dc from the antenna controller from flowing to the transceiver. The capacitors in the splitter keep both of the parallel antenna conductors at the same RF potential.

Making it Work

The control circuits in modules 1A and 1B look for a momentary zero voltage condition between the parallel antenna conductors (Q1 turns off and Q2 turns on for 100 µs). This action causes the control circuit to

[1]Notes appear on page 66.

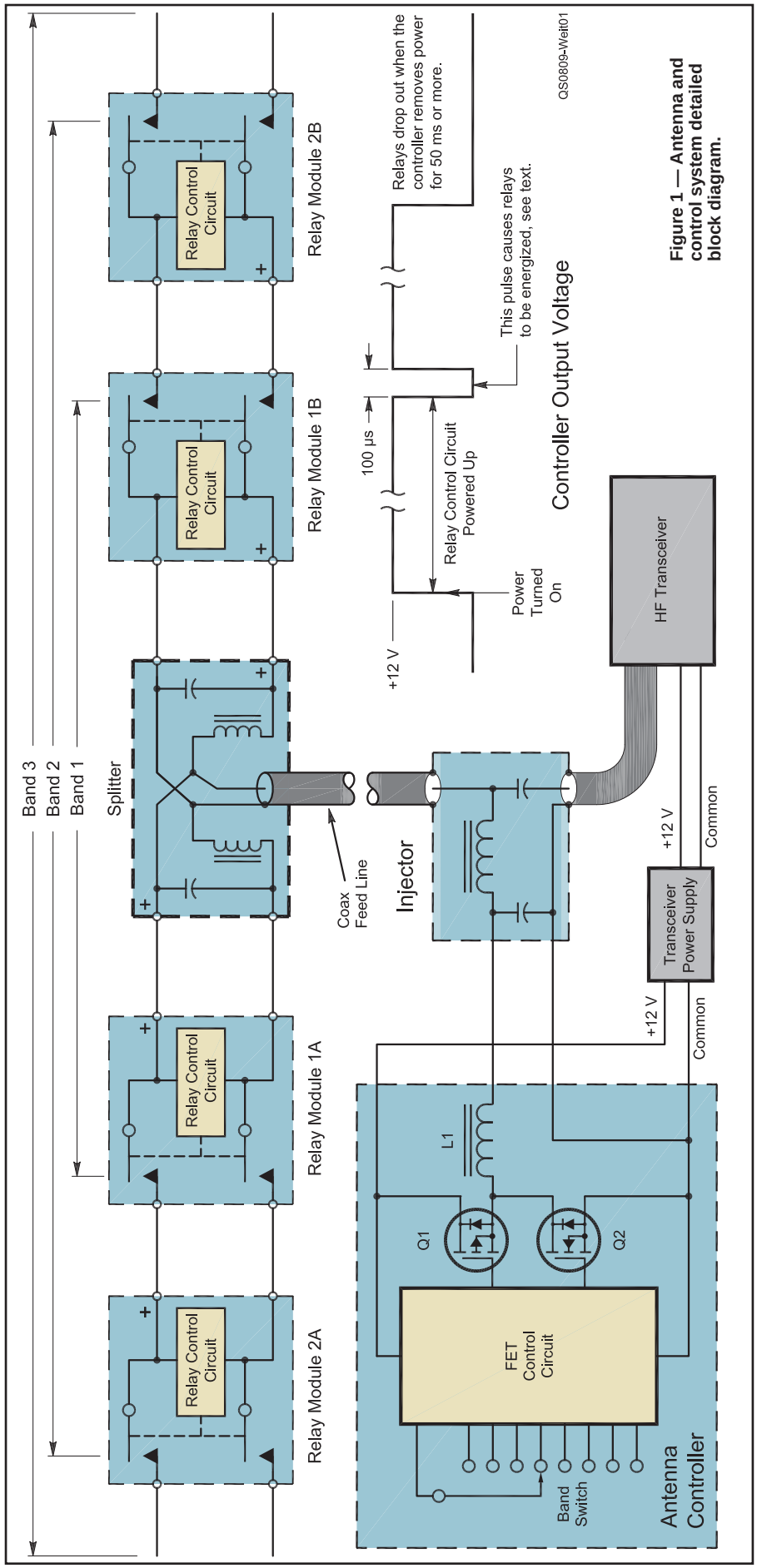


Figure 1 — Antenna and control system detailed block diagram.

energize the relays in the first pair of modules (refer to timing diagram on Figure 1). A 10 µF capacitor in each relay modules maintains power to the relay control circuit during the 100 µs that dc power is removed. Now the antenna is set for band 2, and power is applied to modules 2A and 2B through the relay contacts of modules 1A and 1B. On the next negative going pulse, the relays in the second pair of modules are energized, and the antenna is set to band 3. Any number of relay modules can be sequentially energized in this way. For practical reasons the 100 µs pulses must be about 40 ms apart. This means that eight pairs of relay modules (for a nine band antenna) can be turned on in about 320 ms, or less than a third of a second. By removing power to the relay modules (Q1 OFF and Q2 ON) for 50 ms, all relays will drop out, and the desired band can be selected with another string of 100 µs negative going pulses. With this control scheme, the circuits in all the relay modules can be identical regardless of their position along the antenna wires.

The Relay Module

Figure 3 is the schematic diagram of a relay module. The heart of the circuit is the PIC12F508 microcontroller. This chip is available in an 8-pin dual inline package (DIP). The industrial version is good for temperatures from –40 to 185°F. The basic function of the software is very simple. When power is first applied, the processor does nothing for 18 ms. This is enough time to make sure that any relay contact bounce from the module ahead of it is over. The processor then goes into the sleep mode. This shuts down the chip's internal 4 MHz oscillator and minimizes the current drawn by the processor. The next time the input (pin 7) goes low, the processor wakes up, energizes the relays, and goes back to sleep. It never does anything again unless it is reset by removing and reapplying power.

Two single contact relays are used. The contact rating of the relays is 10 A at 250 V ac. Since the relays don't interrupt RF power, it is the contact withstanding voltage rating of 750 V ac that is important. Simulations of the antenna using *EZNEC* predict that at 100 W of power to the antenna, the maximum RF voltage across any relay contact is 733 V.[2] This maximum occurs on the last relay module of an antenna that covers 160 meters while transmitting on 80 meters. I have measured the breakdown voltage across the contact of many of these relays and found that they can withstand a voltage of well over 1000 V ac. As long as your antenna is not built to cover 160 meters, the simulations indicate that you can use up to 200 W of RF power with these relays. My transceiver is rated for 100 W so I have not stressed the system beyond this power level.

The LED is not necessary, but it is very

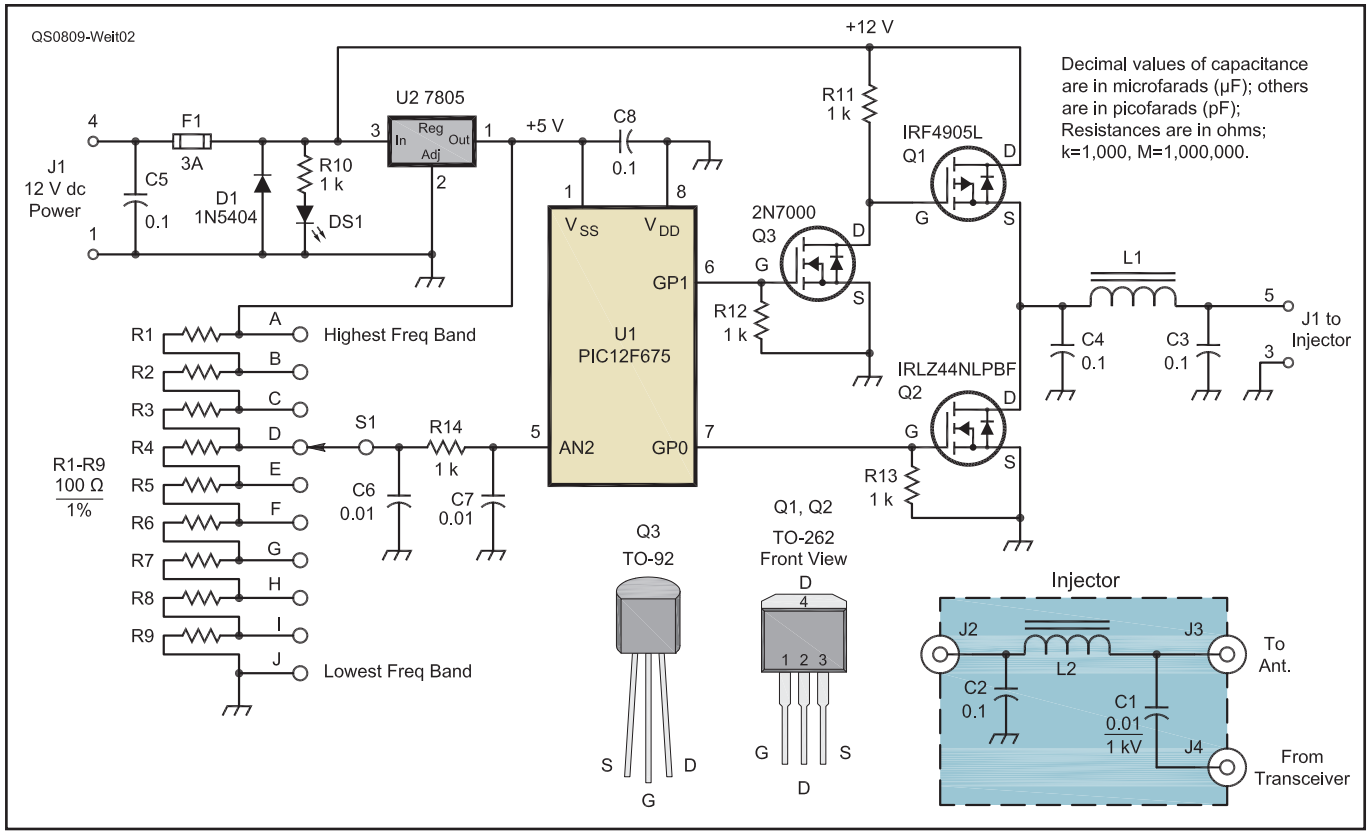


Figure 2 — Schematic and parts list for the controller and injector. Parts are available from distributors such as Allied Electronics at www.alliedelec.com, Digi-Key at www.digikey.com, McMaster Carr at www.mcmaster.com and Mouser at www.mouser.com.

C1 — 0.01 µF, 1 kV ceramic disk capacitor.
C2-C5, C8 — 0.1 µF, 50 V ceramic capacitor, type Z5U.
C6, C7 — 0.01 µF, ceramic capacitor, type Z5U.
D1 — 1N5404 silicon rectifier (Mouser 821-1N5404).
F1 — 3 A, 5 × 20 mm fuse.
Fuse clips for F1 (Digi-Key 283-2335).
J1 — DIN jack, 5 pin, (Mouser 161-0505).
J2 — Phono jack (Mouser 16PJ052).
J3, J4 — UHF jack (Mouser 523-83-878).
L1, L2 — 100 µH RF choke (Digi-Key M8271).
LED1 — Red LED (Mouser 638-333ID).
P1 — Plug to fit J1 (Mouser 171-0275).
P2 — Phono plug (Mouser 17PP052)
Q1 — P channel FET (Digi-Key IRF4905L).
Q2 — N channel FET (Digi-Key IRLZ44NLPBF).
Q3 — N channel FET (Mouser 2N7000D75Z).
R1-R9 — 100 Ω, ¼ W, 1% resistor.
R10-R14 — 1 kΩ, ½ W, 5% resistor.
S1 — 12 position rotary switch (Digi-Key CT2123).
U1 — Microprocessor (Digi-Key PIC12F675-I/P).
U2 — +5 V regulator (Digi-Key LM78L05ACZFS).
Controller enclosure, extruded aluminum (Mouser 546-1455N1201).
Injector enclosure, diecast aluminum (Mouser 546-1590A).
Knob, 1 inch (Allied 543-1105).

handy while testing modules. Even with the antenna in the air you can see if it is working properly by observing the LEDs, most effective at night.

Figure 4 shows a completed relay module circuit board as well as two completed modules. The enclosure is composed of three pieces. The base is made from ¼ inch thick PVC that is 2 inches wide by 3 inches long. The base has holes at the ends for antenna wire attachment. The sides of the module are made from 2 inch square PVC tubing that is cut into pieces 1 inch long and glued to the base plate using PVC cement. After the square tubing piece is cemented in place, the circuit board mounting holes can be located by dropping a blank PC board into the enclosure, and then using the PC board as a template to drill the holes. Note that the PC board is not a perfect square and must be oriented properly before drilling the holes.

The completed PC board is mounted in the enclosure using four #6-32 × 1 inch stainless steel screws. The screws are also used as terminals to connect the antenna wires to the modules. Before the outside nut is put on each screw, put a dab of PVC cement around each screw as it comes through the base, in order to make sure water can't get into the module through the screws. Another nut and two star lock washers are used to make the connection to the antenna wire as shown in Figure 5. After the PC board is installed, mark the plus input terminal (the one with the plus sign in Figure 3) by scratching a plus sign into the PVC base near that terminal. It is easy to get mixed up when connecting the antenna wire to the modules without this mark. The top cover is made from clear PVC sheet, so the LED can be viewed, and can be cemented in place after the module is tested.

The Splitter

The splitter assembly acts as the center insulator of the antenna, and the connection point for the coax. It houses the RF chokes (L3 and L4) and capacitors (C4 and C5) that split the RF power from the dc power. The construction of the splitter is similar to that of the relay modules. Drill an extra hole in the base to attach a nylon cord that will be taped to the coax to act as a strain relief for the coax connector. Be sure to waterproof the connector after the coax is connected to the splitter. Board and interior views along with a completed splitter is shown in Figure 6.

The Controller

Refer to Figure 2. The controller is powered from the 12 V transceiver power supply (typically 13.8 V). The FETs, Q1and Q2, are controlled by an eight pin 12F675 microprocessor. This processor has an analog input to a 10 bit analog to digital converter. The band selector switch connects to a voltage divider (R1 to R9) that produces a particular voltage level

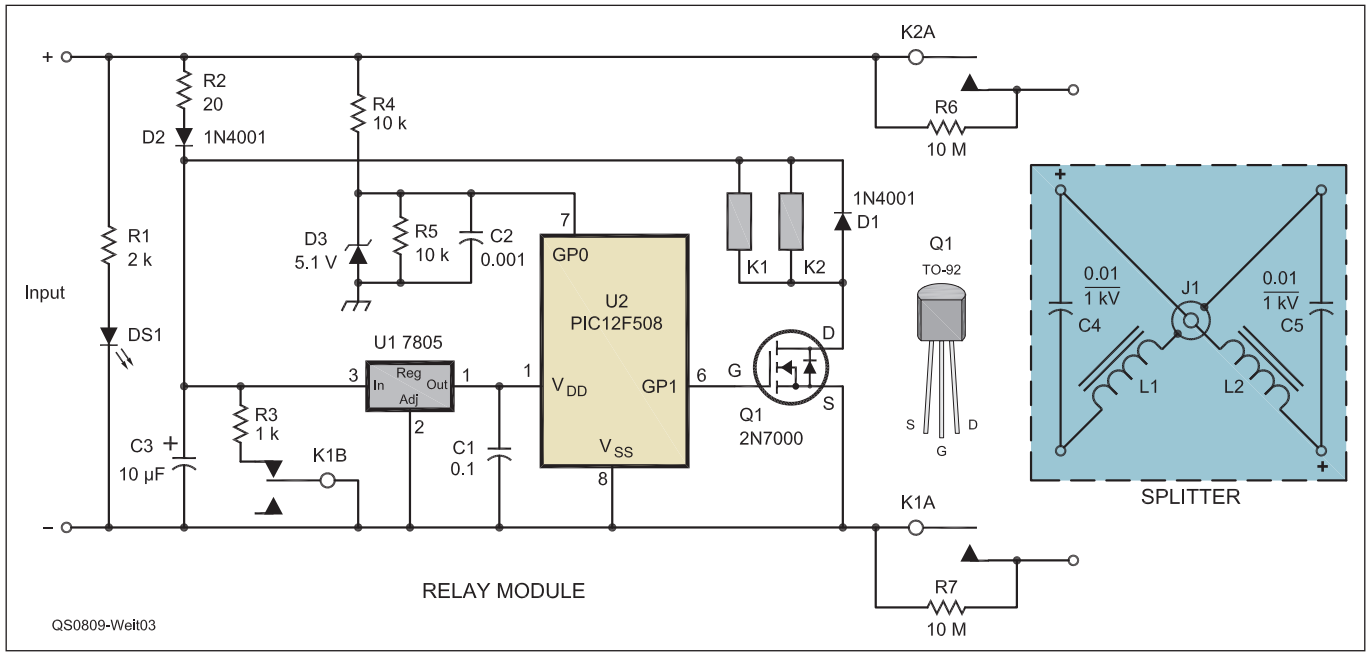


Figure 3 — Schematic and parts list for the relay module and splitter. The 10 MΩ resistors across the relay contacts prevent static buildup on unused antenna sections.

C1 — 0.1 µF, 50 V ceramic capacitor, type Z5U.
C2 — 0.001 µF, ceramic capacitor, type Z5U.
C3 — 10 µF, 50 V electrolytic capacitor (Digi-Key P10316).
C4, C5 — 0.01 µF, 1 kV ceramic disk capacitor (Digi-Key 399-4309).
D1-D2 — 1N4001 or equivalent silicon rectifier (Mouser 863-1N4001G).
D3 — 5.1 V Zener diode (Digi-Key 1N4733ACT).
DS1 — Red LED (Mouser 638-333 ID).
J1 — UHF jack, SO-239.
K1, K2 — Relay (Digi-Key Z1012).
L1,L2 — 100 µH RF choke (Digi-Key M8271).
Q1 — N channel FET (Digi-Key 2N7000D75Z).
R1 — 2 kΩ, ½ W, 5% resistor.
R2 — 20 Ω, ½ W, 5% resistor.
R3 — 1 kΩ, ½ W, 5% resistor.
R4, R5 — 10 kΩ, ½ W, 5% resistor.
R6, R7 — 10 MΩ, ½ W, 5% resistor.
U1 — +5 V regulator (Digi-Key LM78L05ACZFS).
U2 — Microprocessor (Digi-Key PIC12F508-I/P) with author's firmware.
Enclosures fabricated from type 1 PVC materials (McMaster Carr).
Stainless steel hardware (McMaster Carr).

for each band. The processor reads the voltage three times over a one second period to make sure you have finished turning the switch. If a band change is detected, the processor will kill power to all relay modules long enough for them to drop out. It then turns power to the relay modules back on and then generates the correct number of pulses to turn on the right number of relay modules for that band.

The controller does not know if you built your antenna without including a pair of relay modules for a particular band. For instance you might decide not to include relay modules for 30 or 60 meters. In this case, be sure to label the selector switch sequentially for the bands that you are using. Do not provide switch positions for bands that you are not using. When the switch is fully counterclockwise, the controller does not send any pulses to relay modules. Mark this position for the highest frequency band that your antenna is to cover. In the next switch position the controller will energize the first pair of relay modules. Be sure to mark this switch position for the band that is selected by the first pair of relay modules, and so on.

There is a 5-pin DIN connector on the back of the controller. Two of the pins are used to connect to the 12 V dc power supply. Two other pins are used to run the dc power and control signals to the injector. The control signal is connected to the injector using a standard phono connector. Controller and injector circuit boards are shown in Figure 7. The assembled controller is seen in Figure 8.

Assembling the antenna

After all the assemblies are built, everything can be tested by temporarily connecting the relay modules together using hookup wire. After all of the modules are built and tested, it is time to connect them together with antenna wire. I used 450 Ω ladder line with copper coated steel conductors for strength. You can use individual strands of wire as long as one conductor is insulated or spaced in such a way that the wires cannot short together. In one of the earliest versions of the antenna, I used 14 gauge hard drawn copper covered steel antenna wire, for one conductor, and 20 gauge insulated stranded hookup wire for the other conductor. I taped the two wires together every few feet. Having the conductors spread apart, as in the window line, actually increases the bandwidth of the antenna slightly.[3] A single conductor can be used for the run from the last relay module to the end insulator.

Because of the capacitive coupling across the relay contacts, each section of the antenna ends up a little shorter than the standard calculations indicate. It is best to make each

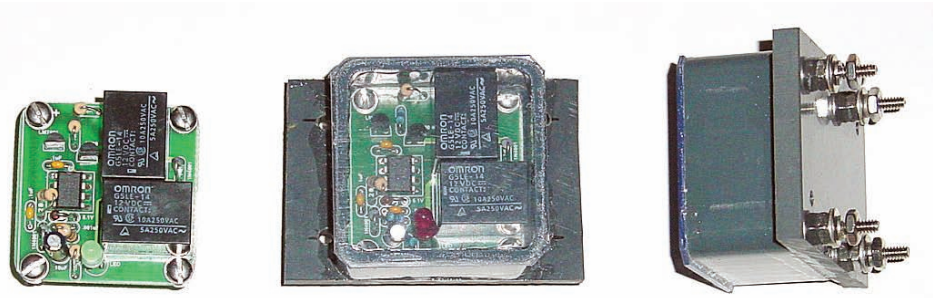


Figure 4 — Relay module. Shown is a completed PC board and front and side views of completed relay modules. The antenna wires will be connected to the studs on the back of the relay modules.

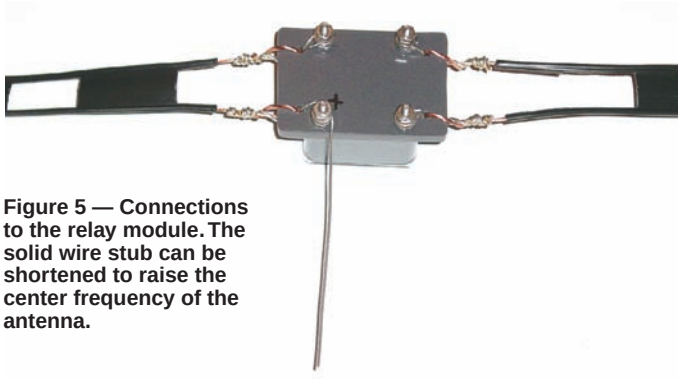


Figure 5 — Connections to the relay module. The solid wire stub can be shortened to raise the center frequency of the antenna.

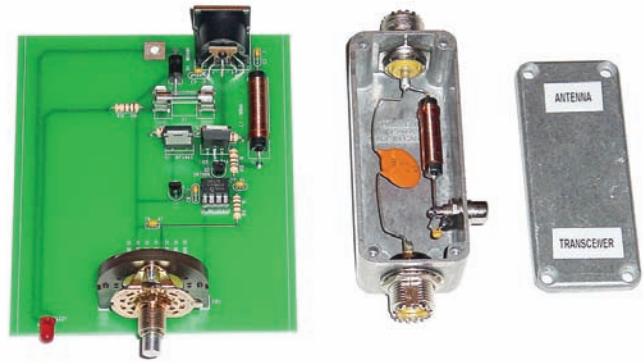


Figure 7 — Controller PC board and the injector with the covers removed.

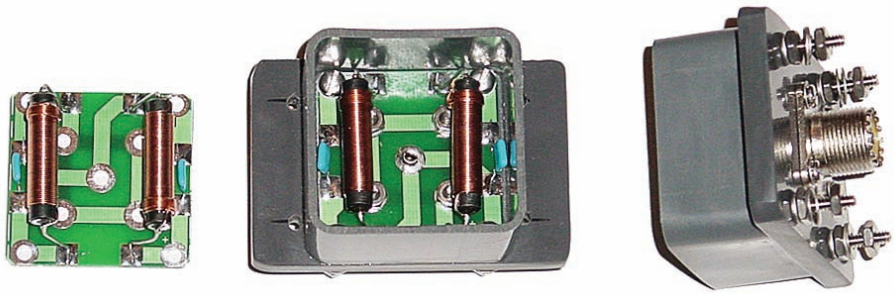


Figure 6 — Splitter module. The splitter acts as the center insulator of the antenna. The coax feed line and antenna wires connect to the back of the module.

Figure 8 — Completed antenna controller. This one is set up to cover all HF bands except 30 and 60 meters.

section shorter than the standard calculation. Each section can then be tuned by adding a length of stiff wire to one of the relay module screws on the input side of the module (refer to Figure 5). Keep in mind that shortening the length of a section also shortens the length of any lower frequency bands. The lowest band that your antenna is built for will be the normal length of a standard dipole. Table 1 shows the lengths that I ended up with for an antenna covering the bands listed.

After the antenna is raised, check the SWR on the lowest frequency band first and adjust the overall length to get the desired center frequency. Then go to the highest frequency band and adjust the length of the first pair of stubs for the desired center frequency. Then go to each higher frequency band in order, and adjust the stub lengths to get the center frequencies that you want.

Conclusion

Various versions of this antenna system have worked well for me for more than 5 years. I hope that this antenna system will make it possible for you to enjoy as many of the HF bands as you would like. Source code for the controller and relay module microprocessors are available from the ARRL Web or at the author's Web site, **www.mactenna.net**.[4] It also includes additional construction details, programmed processor chips and complete parts kits.

As with any antenna, make sure that it is disconnected from your transceiver and grounded when not in use.

Thanks to WA1FXT for his help with this article.

Notes

[1]G. Kath, N2OT, and C. Bishop, WB2EPQ, "A Pneumatically Switched Multiband Antenna," *QST*, Aug 2008, pp 30-32.

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

[3]J. Hallas, W1ZR, "The Fan Dipole as a Wideband and Multiband Antenna Element" *QST*, May 2005, pp 33-35.

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

Photos by the author.

Jim Weit, KI8BV, was first licensed as K3CMN in 1957 and currently holds an Amateur Extra class license. A member of the ARRL, Jim graduated from Cleveland State University with a BSEE degree in 1967 and has worked in development engineering for most of his career. He is presently CEO of a small corporation.

His ham radio interests include fox hunting and experimenting with antennas. He is a VE and an active member of the Sandusky Radio Experimental League. Jim can be reached at 3410 Tiffin Ave, Sandusky, OH 44870 or at **ki8bv@mactenna.net**. QST

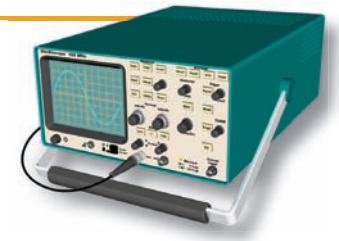
Table 1

Length Measurements for Seven Band Antenna at a Height of 50 Feet Over Average Earth

The antenna length is measured from center to center of the relay modules. The lengths for your antenna may be different depending on which bands are covered, antenna height, wire size and type of ground.

Band (Meters)	*Center Frequency (MHz)*	*Antenna Length (Feet)*	*Stub Length (Inches)*
10	28.85	14	4½
12	24.96	17.7	3¼
15	21.30	20	5¼
17	18.15	23.5	4¼
20	14.25	30	4½
40	7.225	62	7
80	3.85	121.8	

Power to the People with a DC Distribution System



Stomp out those pesky wall warts with a 13.8 V dc power system.

Joel R. Hallas, W1ZR

In the "old days," equipment and accessories for the amateur station just plugged into a standard 120 V ac wall socket. The typical station had a transmitter, receiver and perhaps an antenna rotator, if you were really serious. Today's station seems to be mostly dc powered, typically designed for nominal 12 V, really 13.8 V dc. Often an ac powered dc supply is dedicated to the transceiver while everything else is left to fend for itself.

So What's the Problem?

Modern shacks seem to have lots of little accessory boxes — sound card interfaces for digital modes, external DSP noise reduction units, CW keyers, power and SWR meters, antenna tuners, speech processors to name a few, and the list goes on. Most manufacturers of dc powered accessories solve the power supply problem with an external supply designed to mount right on an ac wall socket.

When they do, whether on a wall or on a power strip, they seem to cover the neighbor socket so you can only use half of them. So now all your sockets are filled up and there's no place left for other necessities such as computer, monitor and even lights. You either end up with extension cords or octopus-like power splitter fire hazards all over the floor.

There's a Better Way

Instead of dedicating a 15 A ac socket that could supply 1800 W to each dinky wall wart, which typically consumes less than 1 W, why not consolidate into a dc distribution system that fits the job? A number of manufacturers produce distribution panels with multiple dc outputs that can easily provide power to all your accessories — perhaps even your transceiver if you want everything in one place. We'll discuss why that may be a great idea in a bit.

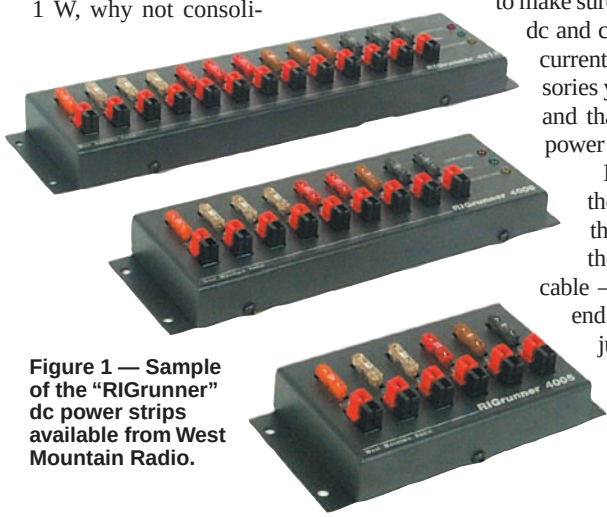


Figure 1 — Sample of the "RIGrunner" dc power strips available from West Mountain Radio.

Figure 2 — Selection of dc power strips available from MFJ.

A Little Matter of Connectors

Before you go much farther, you will have to decide on a connector type. The commercial units pretty much come down to two configurations: Anderson Powerpoles or universal screw terminals that can accept wires, spade lugs or banana plugs, including the handy dual type. West Mountain Radio, MFJ and PowerWerks sell Powerpole units (see Figure 1), while MFJ also has the universal type, including some strips that have some of each (see Figure 2).[1,2,3] It could also be an easy rainy day project to build your own out of the kind of connectors you like. You may want to check with your local radio club or ARES group to see if they have adopted a standard connector type for emergency use — many have gone to the Powerpoles.

What do You do Next?

You will need to check your accessories to make sure they have a jack labeled 12 V, or dc and check the manual for the required current. Add up all the currents of accessories you will have on at the same time, and that determines the minimum size power supply that you need.

Next, make up cables to go from the connectors on the accessories to the distribution strip. In many cases, the accessory will come with a dc cable — usually with bare ends on one end. If you can still find it, you will just need to add an appropriate connector. Hook the power supply to the strip — check for voltage and polarity and then add the accessories.

A better approach, if you have extra capacity in the power supply for your transceiver, is to use it to power the strip and then power the transceiver from the strip as well. This would be a natural, for example, if you had a supply that could deliver, say 25 A, and your transceiver peak load was around 20. Now all you need to do is find a place to stash all those surplus wall warts!

But Wait There's More!

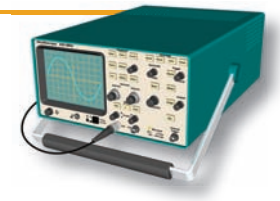
If you have your transceiver and all your accessories powered from a single dc strip, you are ready to set up your station for operation in an emergency. It can easily be powered from an independent dc source such as a storage battery. There are a number of ways this can be accomplished, including that described in an earlier article.[4] Since publication of that design, West Mountain has made available a line of devices (by the name of *PWRgate*) that keep a battery charged and automatically switch over whenever the ac power is lost. Be sure to read the cautions about storage battery operation in the earlier article.

[1]**www.westmountainradio.com**.
[2]**www.mfjenterprises.com**.
[3]**www.powerwerx.com**.
[4]J. Hallas, W1ZR, "Emergency Power at W1ZR," *QST*, Dec 2003, pp 41-44.

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

W1ZR

GETTING ON THE AIR



How About a Software Defined Radio?

In the May 2008 "Getting on the Air" column, we described some HF transceiver choices. One was identified as a "software defined radio" or SDR. Perhaps we should describe what that's all about to help you decide if that might be the radio for you.

What Do We Mean by SDR?

In a day in which even a toaster might include a processor (and perhaps its own IP address!), most transceivers have processors — so what's the big deal? I think we need to make a distinction between something I'll call a software *controlled* radio and a software *defined* radio.

Software Controlled Radio

Most radios — or toasters for that matter — fall into the controlled category. In this case the configuration is pretty much fixed. No matter how much you change the software, you can't make that toaster into a radio — or anything besides a toaster. The toaster is limited or constrained by its physical configuration to make toast. The processor, along with associated sensors and control features, may be able to make perfect toast — just don't try to get it to do too much else.

In a similar manner, the processor in a software controlled radio is used to sense control positions and cause logic elements to react in predictable ways. The processor may be used to count and display frequency, and form code characters at the speed you like. But no matter what you do to the software controlling it, it is limited by its physical architecture to do what the designers thought you'd want on the day they built it.

Software Defined Radio

As we'll discuss, there may be a range of definitions — subject to some controversy — on what constitutes an SDR in the Amateur Radio world. The FCC has defined the SDR concept in terms of their commercial certification process as:

"…a radio that includes a transmitter in which the operating parameters of the transmitter, including the frequency range, modulation type or conducted output power can be altered by making a change in software without making any hardware changes."

The FCC expects this to yield streamlined equipment authorization procedures by allowing "manufacturers to develop reconfigurable transceivers that can be multi-service, multi-standard, multi-mode and multi-band…."[1] In this context, they are envisioning radios that can be modified *at the factory* by using different software to meet different requirements. While they allow for field changes, their focus is different than ours.

SDR in the Amateur World

In the amateur environment, we are particularly interested in radios that can be changed through software by the end user or operator to meet their needs or to take advantage of newly developed capabilities.

The *ideal* SDR would thus have a minimum of physical constraints. On the receive side, the antenna would be connected to an analog to digital converter that would sample the entire radio spectrum. The digitized signal would enter a processor that could be programmed to analyze and decode any form of modulation or encoding and present the result as sights and sounds on the output side of the processor.

On the transmit side, the processor would accept any form of information content, convert to digital if needed, process it into a waveform for transmission and send out a complex waveform conveying the information as an RF signal on the appropriate frequency or frequencies, at the desired power level to transmit from the antenna.

So What's Wrong With This Picture?

Not surprisingly, our utopian SDR is much easier to imagine than to construct. As a practical matter, our usual PC has some constraints that don't allow us to do quite what we want. Still, for a few hundred dollars, it is possible to purchase a PC that gets us fairly close.

The key to amateur SDR operation with a PC is the sound card. This card, or sometimes an external interface device, can accept an analog signal and convert it to a digital one for processing. Advanced SDRs such as the FlexRadio Flex-5000 have the functionality built in. The software will determine the type of processing and the nature of the signals we can deal with. It can also take the results of processing and convert them into an analog signal. This sounds like just what we are looking for to make an SDR — and it is. Such an SDR in receive mode would consist of the blocks in Figure 1. We do have a few significant limitations, however:

The analog to digital converter has a rate at which it samples the analog signal.[2]

[1]FCC Report and Order 01-264, released Sep 14, 2001.

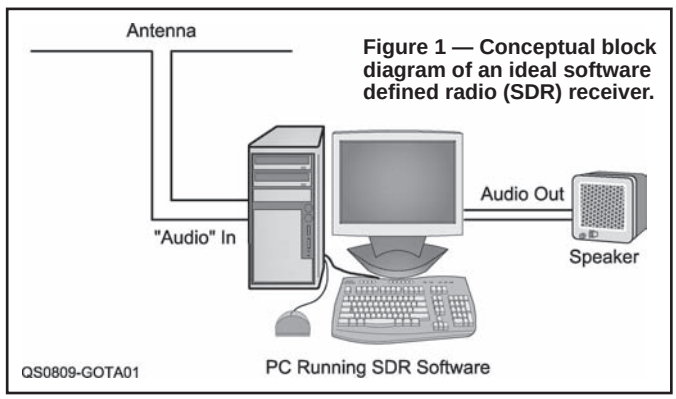


Figure 1 — Conceptual block diagram of an ideal software defined radio (SDR) receiver.

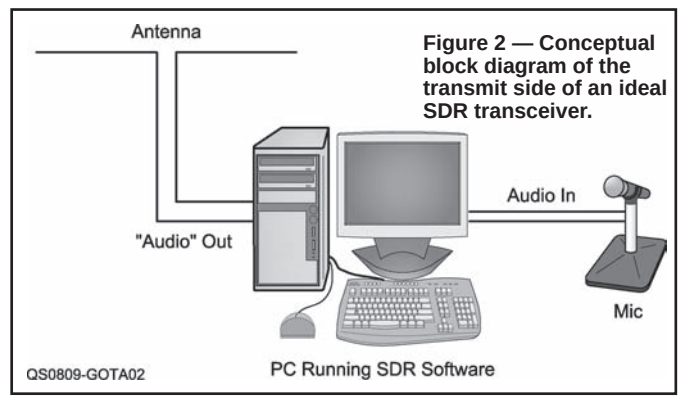


Figure 2 — Conceptual block diagram of the transmit side of an ideal SDR transceiver.

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

Figure 3 — The FlexRadio Flex-5000A "blank front panel" SDR.

The frequency response that it can deal with, without going to extraordinary means, is limited to no higher than half the sampling rate.[3] For most sound cards, actually designed for audio not RF, the sampling rate is around 192 kHz or less, limiting the received analog signal to a frequency of 96 kHz. Some kinds of dual channel processing allow a response as high as the sampling rate. Note that the "sound card" operates on an ac signal and can't tell the difference between audio and RF if it falls within its response range.

The available signal levels are not quite what we would want, even if we had amateur bands in that region of the spectrum. Most sound cards do not have the sensitivity we would want in a radio receiver, and on the transmit side (see Figure 2) could only put out perhaps 100 mW.

Thus we are faced with the need to insert some external processing functions outside the PC. These will be used, at a minimum, to translate the frequency range we wish to use to one that the sound card can deal with on the receive side. On the transmit side, we will need to translate the frequency range up to the desired portion of the radio spectrum and increase the signal to our desired transmit power level.

So How Does it All Come Together?

The SDR designer, as with all designers, is faced with a trade-off. The equipment external to the PC required to make it do what we want may also limit the choices we can make by software change in the PC. The more hardware features we build in, the fewer choices we may have. In addition to PC software, there is often *firmware*, hard wired instruction in the box outside the PC. This has resulted in two general approaches in SDR.

The "Blank Front Panel" Architecture

Radios marketed as SDRs tend to be of this type. The classic is the FlexRadio Flex-5000A, reviewed in *QST* for July 2008.[4] As shown in Figure 3, the front panel has no controls. All control functions are accessible via the soft buttons on the *PowerSDR* software's computer screen (Figure 4), or via computer connected pointing and knob devices.

There are a number of other radios using a similar configuration, and usable with the same open source *PowerSDR* software freely available from FlexRadio under the GNU Public License. These include the modular High Performance SDR system available from Tucson Amateur Packet Radio (TAPR), and some other very low cost, but no longer available SDRs such as the Firefly and Softrock 40.[5] Some firmware for these radios is generally called "open source," meaning that if you are a programmer, you can view and modify the source code and thus not only upgrade, but also make the radio do what you want.

The "Looks Like a Radio" Approach

Many current radios are actually built as SDRs. Some, such as the Elecraft K3 (see Figure 5), ICOM IC-7800, Kenwood TS-2000, Ten-Tec Orion and Yaesu FT-2000, for example, are provided with a mechanism to allow an easy end-user upgrade to new firmware revisions. These radios look like most any other pre-SDR radio in that they have front panels with knobs and dials. Unless you looked at all the revisions to the operating instructions you wouldn't know that they were field reconfigurable.

Another distinction between the groups is that most of the firmware for the radios in this group is proprietary with revisions available only from the manufacturer, at least as of this writing. That isn't to say that a solid programmer couldn't and perhaps hasn't developed her own software for one of these, but to my knowledge if it's happened, it hasn't happened often.

While all radios in this group are primarily designed to operate without an external computer, they all can be computer controlled using aftermarket software, available from multiple developers. While this software can make them feel a bit like the radios in the other group, the operating parameter ranges are all set by the radio's internal operating firmware.

So What's it All Mean?

The blank front panel type generally has the most flexibility in operation, since they are not constrained by the physical buttons and knobs on the front panel. The more traditional looking SDR versions may take advantage of the hardware constraints that limit some operating choices to gain improved performance, but a look at the specs will indicate that it isn't always the case. Some blank panel SDRs offer top shelf performance.

In my opinion, there will always be some folk who prefer the more traditional radios, and are happy to have it configured and let it stay the way they like it. Others, especially those who enjoy computers as well as radio, will prefer a transceiver that might get better with the next generation of computer, sound card or software. What's really nice is that we can go whichever direction we choose!

[2]J. Taylor, K1RFD, "Product Review — Computer Sound Cards for Amateur Radio," *QST*, May 2007, pp 63-70. Available at **www.arrl.org/members-only/prodrev/pdf/pr0705.pdf**.

[3]H. Nyquist, "Certain Topics in Telegraph Transmission Theory," *Transactions of the AIEE*, Vol 47, pp 617-644, Apr 1928. Reprinted as classic paper in *Proceedings of the IEEE,* Vol 90, No. 2, Feb 2002.

[4]R. Lindquist, N1RL, "Product Review — The FlexRadio Flex-5000A," *QST*, Jul 2008, pp 39-45. Available on the ARRLWeb at **www.arrl.org/members-only/prodrev/**.

[5]Contact Softrock developer Tony Parks, KB9YIG, at **raparks@ctcisp.com** to see if a new version is available.

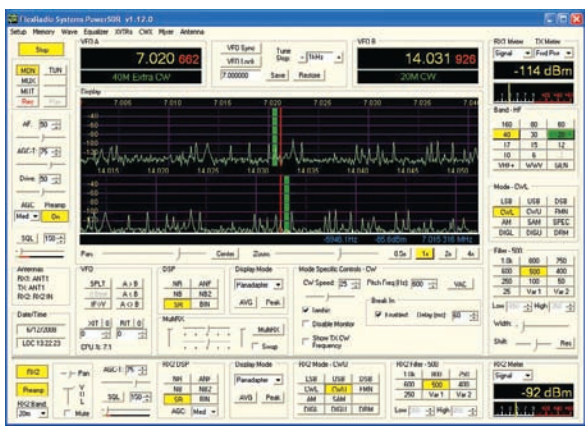
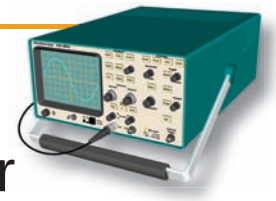


Figure 4 — One version of the main operating screen of *PowerSDR* operating software.

Figure 5 — The Elecraft K3. It looks like a traditional amateur transceiver, but is actually an SDR.

SHORT TAKES



MFJ-927 Remote Automatic Antenna Tuner

Last spring I was harangued into doing a long-postponed home renovation. My ham station was moved to a room more rightfully called an "office" while my teen daughter staked her claim to larger, more dignified quarters. The point of mentioning this is that the move provided an outstanding excuse to revamp my HF antenna system. After all, I had to run more coaxial cable to the office area so I might as well redo the antenna, too. (It made sense to me at the time.)

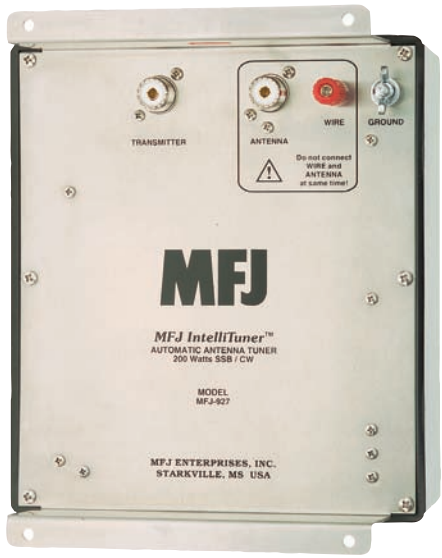
I strung a 140-foot inverted-V wire antenna through the trees and fed it in the center with 450-Ω ladder line. I didn't want to bring the ladder line all the way into the house — not when I had a nice 100-foot length of low-loss coax to do the job instead. So, for all-band operation with my shiny new antenna, I needed a remote automatic antenna tuner at the outdoor transition between the ladder line and the coax. With a remote tuner I could potentially use the dipole on every band. Yes, the SWR on the "antenna side" of the tuner would be sky high at times, but with ultra-low-loss ladder line between the tuner and the antenna, it would be of little consequence. The tuner would provide a 50-Ω match for the new coax back to the radio and all would be right with the world.

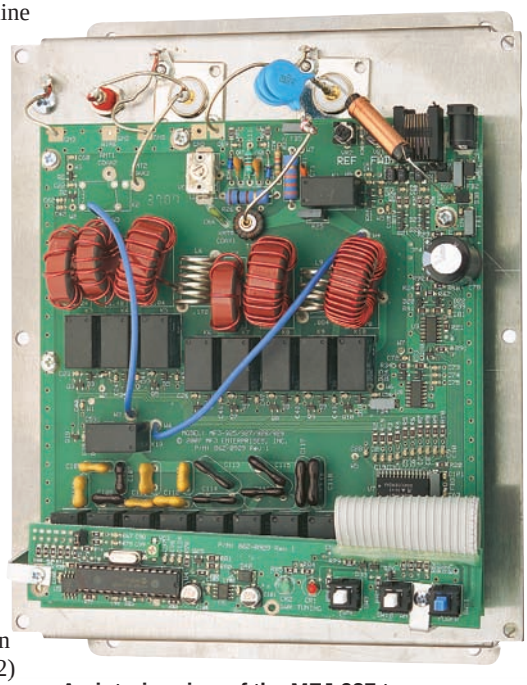
There are a number of remote antenna tuners on the market, but they tend to be expensive. In addition, many models require a separate control line, dc power line, or both. I wanted as few additional wires as possible; ideally *no wires* other than the coaxial feed line.

Enter the MFJ-927

The MFJ-927 is an automatic antenna tuner designed for remote installations. The '927 seemed attractive for my application because (1) it was affordable at $260 and (2) it required no additional wiring whatsoever.

The '927 is an RF-sensing antenna tuner, so control lines are not necessary. It senses the presence of RF on the feed line and starts tuning automatically. The MFJ-927 will begin tuning when it senses as little as 5 W output from the radio (the tuner is rated for a maximum of 200 W PEP). When you key your transceiver, the tuner's microprocessor rapidly switches through combinations of coils and capacitors as it searches for an acceptable impedance match. In my experience, the '927 found matches within about 10 seconds, often less. Once a match is found for a particular frequency, the '927 stores the coil/capacitor configuration in memory. Unless you make a large change in frequency, chances are the tuner will not have to retune when you transmit again.





An interior view of the MFJ-927 tuner.

The MFJ-927 doesn't require a dc power line, either. It gets its dc power through the same feed line that supplies the RF. It works this bit of legerdemain through the use of a dc power inserter at your operating desk. You attach the coaxial feed line to one side of the inserter and another length of coax between the inserter and your radio. (Another line snakes from the inserter to the nearest 13.8 V dc power supply.) Thanks to a choke/capacitor circuit in the inserter, dc power travels down the coax to the tuner, but is blocked from going "backward" to your transceiver.

The remote tuner can go just about anywhere and installs in seconds. For your antenna the '927 offers two ports: an SO-239 connector for a coaxial fed antenna and a binding post for long-wire antennas. There is also a ground connection with a wing nut. I attached the ladder line between the random-wire post and the ground connection.

A Problem—and a Solution

At first the MFJ-927 worked quite well. I was able to tune my antenna to less than a 1.6:1 SWR on any frequency from 160 through 10 meters. Soon, however, I noticed that the MFJ-927 didn't seem to be storing the match configurations in its frequency memory.

I contacted MFJ and they responded immediately, suggesting that I initiate a microprocessor "self test." The procedure is described in the manual and involves removing the tuner from its case so you can access the internal switches and see the test LEDs. I ran the self test and the '927 "passed" as far as I could tell. When I put the tuner back into service, it worked perfectly! Perhaps by running the diagnostic I erased a glitch in the memory. MFJ sent a replacement tuner anyway and it performed flawlessly.

Conclusion

The MFJ-927 is an elegant solution to a vexing problem. It places automatic impedance matching at the antenna, and it achieves this without the hassle of having to install additional wiring. If you are going to install the '927 outdoors, I'd strongly recommend that you run a bead of silicone caulk around the case edges. It wouldn't hurt to cover the screw heads as well (you can easily remove the caulk later if necessary).

Regardless of where you install the '927, a common-made choke on the tuner end of the coax will help prevent RF from running down the cable and into your station.

Manufacturer: MFJ Enterprises, PO Box 494, Mississippi State, MS 39762; tel 800-647-1800; **www.mfjenterprises.com**. *$259.95.*

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

NØAX

HANDS-ON RADIO

Experiment #68 — Phase Locked Loops, the Basics

Phase locked loops are found in many types of radio equipment. They can be used as modulators, demodulators, oscillators, synthesizers, clock signal recovery circuits and the list goes on. Are they mysterious and difficult to understand? Not really, once you get to know each piece and do a little experimentation.

Background

The phase locked loop (PLL) has its roots in receiver design. It was invented in 1932 as a technique for stabilizing an oscillator's frequency.[1] The PLL was then adapted for use in television receivers, synchronizing the vertical and horizontal sweep circuits to the incoming video signal. In the 1960s and '70s, integrated circuit PLL chips became available and the technique soon became even more widespread.

Let's start with the name itself. *Phase* refers to the relative phase difference between an input signal and the loop's internal oscillator. *Locked* means that the oscillator's phase maintains a constant relationship of that of the input signal. This also means the frequencies of the two signals are the same, otherwise the phase difference would change. *Loop* comes from the feedback loop that controls the internal oscillator's frequency to remain in sync with that of the input signal. Thus, a *phase locked loop*.

Feedback is key to the PLL's function. Think back to the description of how an op-amp amplifier circuit works in Hands-On Radio Experiment #3.[2] Amplifying the difference in voltage between its input terminals, the op-amp output voltage changes and the external circuitry is configured to make that change reduce the difference, bringing the circuit back into balance. That kind of feedback loop uses a signal's amplitude (voltage and current) instead of frequency and phase as does the PLL.

Loop Components

The PLL has three basic components, seen in Figure 1 — the phase detector, the loop filter and a voltage-controlled oscillator (VCO). The output from the phase detector (C in Figure 1) is a signal that contains the frequency and phase difference between the input signal and VCO output. The loop filter creates the VCO control voltage based on the difference signal. The VCO changes frequency in response to the control voltage until the two frequencies are the same. Simple, no? Maybe we should slow down a little bit and look at each piece.

The VCO is a special type of oscillator that has a frequency controlled by an applied voltage. The frequency of the VCO without any control signal applied is called the *free-running* frequency, f_0. Depending on the circuit design, the VCO may be designed so that f_0 occurs with zero dc voltage input and a bipolar control signal, or at some non-zero dc voltage so the circuit can operate from a single power supply voltage.

Next, you may be wondering why I used a mixer symbol for the phase detector. It's because the phase detector is just that — a type of mixer. Experiment #66 provided the equations describing a mixer's output products, but ignored differences in phase between the input signals. Taking phase into account, the mixing product at the difference of the two input signal frequencies, f_A and f_B, is $\cos(2\pi[f_A - f_B]t + \theta)$, with θ representing the difference in phase between the signals. If the two signals have the same frequency and the phase difference is constant, then $f_A - f_B = 0$, leaving $\cos(\theta)$, a dc voltage that makes a fine VCO control signal.

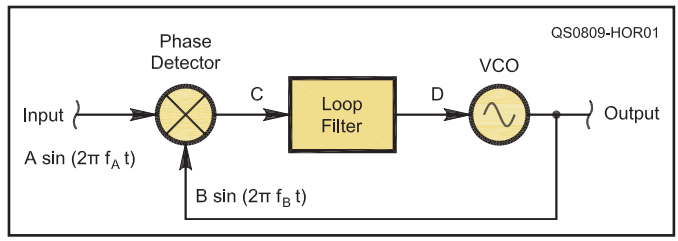


Figure 1 — The basic structure of a phase locked loop. The phase detector acts as a mixer, generating products at the sum and difference frequencies of its inputs. The filter extracts the dc component of the mixer output for the VCO to use as a control voltage.

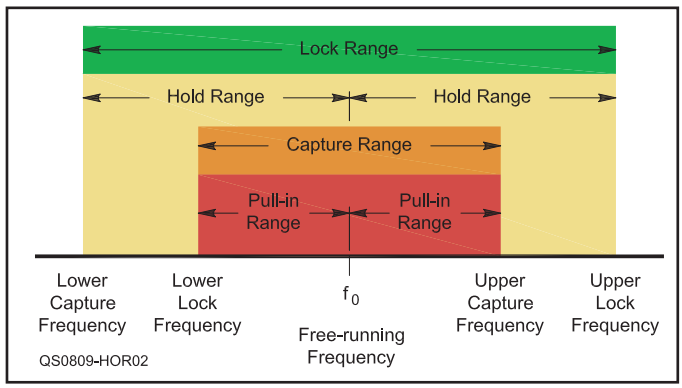


Figure 2 — The four frequency ranges that define a PLL's behavior. Lock range (and hold range) shows how far the PLL frequency can track an input signal. Capture range (and pull-in range) shows how far from the free running frequency the VCO will move to lock onto an input signal.

The high frequency of the sum product at $f_A + f_B$ is not suitable as a VCO control voltage and so must be removed. That is the job of the low-pass loop filter — to remove everything but the phase detector's $f_A - f_B$ product, along with the phase information. Depending on the design of the phase detector and the nature of the signals (sine, square, pulse), the loop filter may also need to convert short bursts of current into a smoothly varying voltage.

PLL Operation

After the PLL is turned on with no input signal, the VCO will oscillate at the free-

[1] **www.uoguelph.ca/~antoon/gadgets/pll/pll.html**.

[2] Hands-On Radio experiments are available online to ARRL members at **www.arrl.org/tis/info/HTML/Hands-On-Radio**. The first 61 experiments are also available as *ARRL Hands-On Radio Experiments* from the ARRL at **www.arrl.org/shop**.

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

running frequency, f_0, until an input signal is applied. The phase detector generates sum and difference products, the loop filter removes the sum product, and the VCO output frequency begins to change. Assuming the input and VCO frequencies are not the same, the output of the loop filter (D in Figure 1) will be an increasing or decreasing voltage depending on which signal has the higher frequency.

This changing voltage causes the VCO to respond very quickly, reducing the difference between the VCO and input frequencies. Consequently, the loop filter's output voltage is also reduced, making smaller and smaller changes in the VCO frequency. Within a short time (typically a few milliseconds for RF PLLs) the VCO frequency is equal to that of the input signal and the loop is "locked." Any change in either the PLL input or VCO frequencies is tracked by a change in the loop filter output, keeping the two frequencies the same.

This process of adjust and hold is called *capture*. The minimum and maximum input frequencies to which the loop can move the VCO as it captures an input signal is called the *capture range* as shown in Figure 2. The segments of the capture range above and below f_0 are called the *pull-in range*. The pull-in ranges are not necessarily symmetrical.

If the control signal is proportional to the cosine of the phase difference, it will be zero when the phase difference is 90° (cos 90° = 0). It will be a maximum when the two signals are in phase (cos 0° = 1) or out of phase (cos 180° = –1). This defines the range over which the PLL can keep the input and VCO frequencies locked together. As the input frequency moves farther and farther from f_0, the VCO's free-running frequency, the loop's control action will keep the VCO frequency the same as the input frequency, but with a phase difference that gets closer to 0 or 180°, depending on which direction the input frequency changes.

If the input frequency has moved so far that the phase difference between it and the VCO frequency is either 0 or 180°, any further change will cause the control signal to move back toward its 90° value and the VCO frequency away from the input signal. The loop is no longer locked and the input and VCO frequencies are no longer the same. The range of input frequencies between the value at which the loop is locked with a phase difference of 0° and 180° is called the loop's *lock* range. The lock range above and below f_0 are called the loop's *hold ranges*. The lock range is not always centered on f_0.

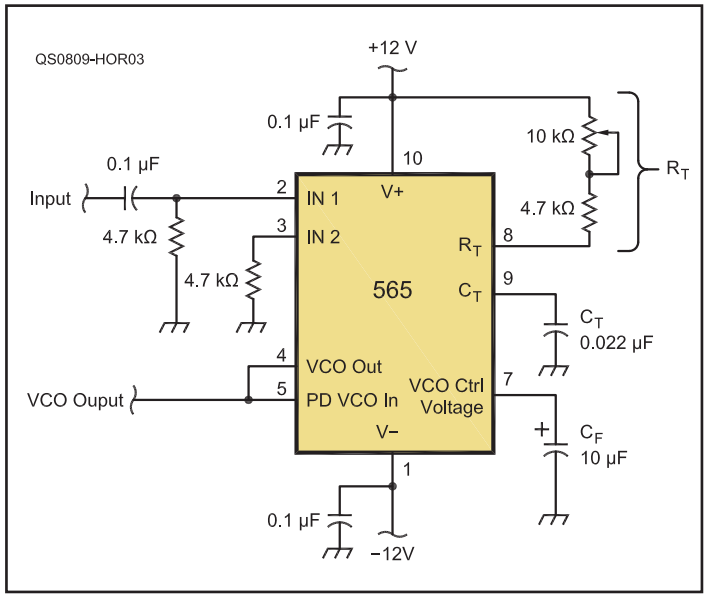


Figure 3 — The 565 integrated circuit PLL contains almost all of the circuitry necessary to build a PLL. Only a few discrete components are needed to set the VCO free-running frequency and loop filter time constant.

Building A PLL

The venerable 565 PLL IC, a fixture in electronics for nearly 40 years, is still widely used. Start by downloading the LM565 datasheet from **cache.national.com/ds/LM/LM565.pdf**. Familiarize yourself with the pin connections and browse some of the circuit examples.

Build the circuit shown in Figure 3. You'll need a bipolar power supply to do this experiment. Set the potentiometer to half-range, about 5 kΩ. Without connecting any input signal, apply power and use an oscilloscope or frequency counter to measure the free-running frequency at VCO out. It should be close to $f_0 = 1.2/4R_TC_T \approx 1360$ Hz.

Set your function generator to output a sine wave at the measured value of f_0. 0.5 to 1 V_{P-P} will be sufficient. Apply the sine wave to the PLL's input. Use a dual-channel oscilloscope to monitor both the function generator output and the VCO output. Use the function generator output to trigger the 'scope. The sine waves on both channels should be stable (because they are locked in frequency) but will be somewhat out of phase.

Slowly reduce the generator output frequency until the PLL loses lock — seen as one trace suddenly becoming unstable. That frequency is the lower limit of the PLL's lock range. Return the generator frequency to f_0 and then increase it until the PLL loses lock again at the upper limit of the lock range. Total lock range is the difference between these two frequencies.

Slowly reduce the generator frequency until the PLL suddenly captures the input signal and locks again — both traces will be stable. This frequency, the upper limit of the PLL capture range, will be somewhat lower than the upper lock range limit. Change the generator frequency to something below the lower limit of lock range you measured previously. Slowly increase frequency until the PLL captures the input signal at the lower limit of capture range. Total capture range is the difference between these two frequencies.

Capture range depends on the time constant of the loop filter, determined by C_F and a 3.6 kΩ resistor connected inside the IC. The time constant of the filter equals R × C = 3.6 kΩ × 10 µF = 36 ms. The larger the time constant, the smaller the capture range because the loop doesn't respond quickly enough. Replace C_F with smaller capacitors, down to 1 nF and see what happens to capture range as the loop reacts more quickly. Leave the circuit assembled for next month's follow-up experiments!

Parts List

- Capacitor — 0.1 µF ceramic, quantity 3.
- Capacitor — 0.022 µF ceramic or film.
- Capacitor — 10 µF, 25 V electrolytic.
- Phase locked loop IC — NE565.
- Potentiometer — 10 kΩ.
- Resistor — 4.7 kΩ, ¼ W, quantity 3.

Parts hint — the end of fishing season is a great time to find bargains on tackle boxes. They make terrific parts and tool organizers!

Recommended Reading

Many electronic experimenters have gotten their start in understanding PLLs by reading the classic tutorial Motorola application note AN535 "Phase Locked Loop Design Fundamentals." It's available at **www.datasheetcatalog.org/datasheet/motorola/AN535.pdf** and would make a good addition to your technical library.

Next Month

This month you manipulated the PLL by hand. Next month, we go live as we use a PLL to demodulate an FM signal. QST

HINTS & KINKS

POWERING YOUR RADIO IN AN EMERGENCY

◊ Is your emergency receiver/transceiver emergency power ready? Is there compatibility between the power requirements of your emergency radios and the power outputs of your emergency power sources?

There are a number of ways to make your radios and emergency power compatible:

- Only buy radios that require 6 or 12 V batteries.
- Build power converters to match the 6 or 12 V battery voltage to the radio.
- Convert the radios to 6 or 12 V.

There are advantages and disadvantages to each:

Advantages

- The radios are easy to power during an emergency.
- One power converter can be used for more than one radio.
- Converted radios can be used with any standard 6 or 12 V source.

Disadvantages

- It's not always possible to find a radio with this power requirement.
- The power converter may not be compatible with other people's power sources. More than one converter may be required.
- The power converter can't be used with other radios, since it's built-in.

Which method you select depends on what you're after and how you are set up to supply emergency power.

In my shack I use 12 V batteries almost exclusively. (I have a few small lead-acid, gel cell 6 V batteries for my two smaller 6 V AM/FM/TV and AM/FM/SW receivers.) So I needed to find a way for all my radios to be powered by the 12 V backup batteries I use. Most of my equipment is 12 V ready since most ham gear is designed that way. However, a few years ago I used a Sangean ATS-803A and was very impressed with the radio; so much so that I decided to buy two of them.

I managed to get both a Sangean ATS-803A (**www.sangean.com**) and a Radio Shack model DX-440 (**www.radioshack.com**), which Sangean made for RadioShack. The only problem with these radios is that they use 9 V, from 6 D-cells. Since I do not normally buy D-cells, and since I use mostly 12 V emergency power cells, I decided to build a 12 to 9 V converter into both radios. To do this I bought a number of the 1.5 A LM7809, 9 V regulators.

The first step was to measure the power requirements of the radios. They were mostly identical; at 9 V the current requirements were from 100 mA (audio all the way down) to about 125 mA at full audio. This was excellent because an LM7809 in a TO-220 case can handle those current levels indefinitely without heat sinking.

I took the Sangean and DX-440 apart to see what kind of modifications would be needed. I found that I could put the regulator inside the radio without any problems. The LM7809 is a three terminal regulator that requires only an input and output capacitor to function. There was more than enough room for this small circuit with plenty of room for air flow as well.

I pre-built the circuit using dead-bug construction, meaning that I simply soldered the two capacitors directly onto the LM7809 chip with no circuit board being used (see Figure 1). [Refer to your chosen regulator's application notes for a schematic. Mouser Electronics (**www.mouser.com**) has many application notes available online. — *Ed.*]

As can be seen in Figure 2, there is plenty of room inside the radio to install the regulator and its required capacitors just off the board with plenty of airflow room as well. You can also see that there is only one other solder connection to the B+ line. I traced this and found it went to the 5 V regulator for the microcontroller. Thus there was no need to cut the trace and supply 9 V to this part of the circuit; the 5 V regulator just runs a bit hotter when it is supplied with 12-14 V as opposed to 9 V.

PHILIP KARRAS KE3FL

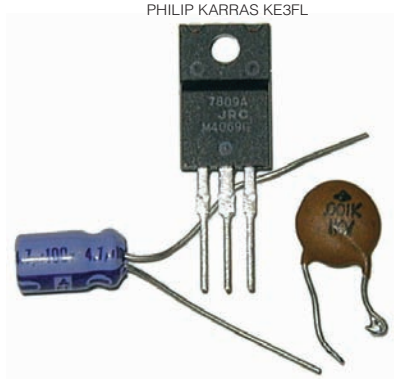


Figure 1 — All that's needed to adapt a 9 V radio to a 12 V battery.

PHILIP KARRAS KE3FL

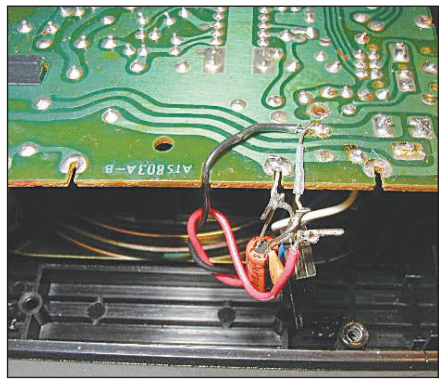


Figure 2 — The dead-bug installation of the power regulator directly onto the receiver's circuit board.

It is important that you either trace the power circuits or have a schematic for the radio so you know if your modification(s) will cause any problems to the existing power regulators. In most of today's radios, there are frequently more than one power regulators.

There will normally be at least two, one for the microprocessor, usually either 5 or 3.3 V, and another for the radio/audio sections, usually 6, 9 or 12 V. All of this is subject to change as the manufacturers go to more and more digital circuits. Still, I imagine that there will always be the need for higher voltages in the output stage. In these stages (the audio amplifier in receivers and the final amplifier in transmitters) we use higher voltages since the higher the voltage, the lower the current requirements for the same amount of power. (P = EI) For example: If we have a 24 W load; to drive it with 6 V would require 4 A, but with 12 V only 2 A are needed. While this would be little problem for today's switching power supplies, it is more difficult to provide the higher currents with some of today's consumer batteries.

To do the same thing for other radios we need to check the power and voltage requirements for all operating modes of the radio. Commonly this includes listening at a low volume, listening at the highest volume and transmitting at the lowest and highest output power settings. Once you have that information, you can figure out if a simple regulator, like the LM7809, will work for your radio. My rule of thumb is that if the highest current needed is ⅓ or less of the maximum current output of the regulator, then the regulator can be used without a heat sink. If the current required is more than that, use a heat sink or a larger regulator.

So, take a close look at what type of power your radios need and what kind of power your emergency power system can provide. If there is a mismatch, take steps to adapt the radios to the available power sources before the emergency arrives. — *Philip Karras, KE3FL, 3305 Hampton Ct, Mount Airy, MD 21771,* **ke3fl@arrl.net**

Steve Sant Andrea, WB2GYK ♦ Assistant Editor ♦ h&k@arrl.org

SOLAR QRP

♢ What could sound better to a ham than something for nothing? Well, solar power is free once you have the equipment to harness it. For those kindred spirits who enjoy operating low power portable, solar power may solve your battery power problems.

Solar panels meant to keep car batteries charged during periods of inactivity are available from auto parts stores and online for under $20. They are 12 V small capacity, 1.8 W or 125 mA units intended to trickle charge the vehicle battery by plugging it into the cigar lighter socket.

To modify one for my use, I first cut off the cigar lighter plug and replaced it with a dc barrel connector common to all my low power gear. I then made up a junction box with three plugs wired in parallel that I could plug the solar panel, radio and battery into, connecting all together.

Most large capacity solar systems use a charge controller to keep the batteries from being overcharged, but with a small capacity solar panel it is not necessary. I have been using this configuration for 2 years and have used gel cells, NiCd and NiMH batteries with good results. Be advised not to try to operate the radio using the solar panel alone; a battery must be connected. The battery acts as a buffer and voltage regulator and is a necessary part of the system. — *73, Richard Arnold, AF8X, 22901 Schafer, Clinton Twp, MI 48035,* **af8x@comcast.net**

PROTECTING LADDER LINE FROM ABRASION

♢ I like to use 450 Ω ladder line for wire antennas for its light weight and low loss, but a continuing problem has been abrasion of the plastic insulation where the feed line runs over the edge of the roof and moves up and down in the wind. This eventually bares the Copperweld conductor, abrades the copper coating and the steel core rusts. I have had to replace my feed line on two occasions due to this problem.

I have tried lengths of split garden hose with limited success. It is relatively heavy and two split lengths are needed, which are difficult to keep in place. Cable ties used to secure it tended to catch and hang up on projections.

After several attempts to find a simple and inexpensive solution I finally opted for split flexible tubing sold to contain wire harnesses. It may not last quite as long as garden hose, but it is neat, flexible and inexpensive, and can be replaced in a few minutes should the need arise.

I found the tubing at a local Lowes hardware store, but it should be available at most electrical and hardware outlets. The diameter is 1 inch and it comes in 5 foot lengths. The name is 1 inch Split Flex Tubing and it costs under $4.

JOHN WEATHERLEY, AB4ET

Figure 3 — The split tubing installed on the ladder-line with the plastic pen stop in place.

It is installed by inserting the ladder line through the longitudinal split. The tubing should then be rotated to bring the split perpendicular to the plane of the ladder line to prevent it from exiting the tubing.

To stop the tubing from sliding down the ladder line, I installed a piece of nonconductive material through the ladder line. In my case this was a piece of the barrel of a discarded ballpoint pen. It is held in place with waxed nylon string used for securing wire bundles. A couple of small black cable ties or weather resistant twine would work just as well. This has proven to be a satisfactory solution to the problem and has no effect on the performance of the feed line. On one occasion, the ladder line found its way out of the split tubing. I fixed this by adding three black cable ties around the tubing, one near each end and one in the middle. I also used another black cable tie around the tube and anchored it to a gutter bracket. This stopped an annoying rasping noise during the night when the wind caused the tubing to move up and down against the edge of the gutter. — *John Weatherley, AB4ET, 1575 Harlock Rd, Melbourne, FL 32934,* **ab4et@arrl.net**

USING POWERPOLE CONNECTORS TO GROUND LADDER LINE

♢ In looking for a simple way to ground the ladder line running between my shack and tower I have found Powerpole connectors to be an effective solution. Basically, I attached Powerpole connectors to the ladder line and have the ladder line coming down the tower to a grounded Powerpole connector. The line from the shack is stored about 6 feet from the tower. When I want to operate, I disconnect the ladder line from the grounded connector, unroll the shack side of the line and plug it into the antenna side of the ladder line. This setup allows me to disconnect the shack from the antenna when not in use, as well as ground the antenna. The Powerpole connectors do not seem to cause any appreciable issues with the feed line. — *Ron Wagner, WD8SBB, 5065 Kessler-Frederick Rd, Troy, OH 45373,* **wd8sbb@arrl.net**

SIX SCREW-STARTING TIPS

♢ Starting a screw in a tight place can be difficult. If you are lacking a screw-holding, split-blade screwdriver, here are five ways to do it:

- A dab of rubber cement or superglue on a screwdriver's blade.
- A piece of paper wedged in with the screwdriver's blade.
- A rubber band twisted around the shank of a screwdriver and then a screw.
- A bit of plastic or vinyl tape around the blade and screw.
- A stiff piece of plastic tubing with the screw head pressed into the end can reach into small openings.
- [Another method: Cut a small piece of double sided tape (about ¼ inch × ¼ inch) and stick it onto the end of a piece of dowel or the eraser end of a pencil. Stick the head of the screw onto the other side of the adhesive tape. As you twirl the dowel or pencil, you can thread the screw into the fastener. This also works for starting nuts onto threaded portions of screws that are not otherwise easily accessed. — *Ed.*] — 73, *Gene Cabot, WB4ZS, 225 N Cove Blvd, Panama City, FL 32401,* **gncabot@aol.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

A TRIP TO THE MAILBOX

I've been the Contest Branch Manager for almost a year now. I've had a chance to meet some of you at conventions and your visits to HQ, and interacted with even more of you via phone and e-mail. I thought I'd take this month to answer some of the more common questions I've received about ARRL Contests.

***Q:** I got on for the last contest and made just a few QSOs. Do I need to send in my log so the stations I contacted will earn points for my QSO?*

A: No. We are able to score a contest without you sending in your log. While I'd love to see everybody submit their logs, I know it's not going to happen in every case.

***Q:** I heard that the ARRL is going to stop accepting paper logs for contests. Is that true?*

A: While there is no question that sending your log in electronically has benefits for both you and us here at the Contest Branch, we recognize that there are some folks that simply do not use computers. While we encourage all contesters to embrace computer logging (it's really not that difficult), your paper log is still welcome here at HQ.

If you are going to submit a paper log, please be sure to include an official Summary Sheet for the contest you're entering. Please print legibly. Also be sure that the logging form you're using is recent; it's common to receive a photocopy of a log sheet that's several years old. In some cases, contest entry categories have changed and the old forms are out of date. Submitting a paper log with the most up-to-date official forms (available at **www.arrl.org/contests/forms**, or by mail with a business sized self-addressed stamped envelope and sufficient first-class postage) reduces the amount of time it takes to properly score your log. Help us help you!

***Q:** I just found out that I won first place in my ARRL Section in the ARRL Sweepstakes contest! The contest was in November, and the results just came out, but I haven't received my certificate yet.*

A. We normally try to send out certificates and plaques approximately one month before the next running of a contest. For example, if you entered the November Sweepstakes in 2007 and won a certificate, you should see your certificate around October 2008. This gives us time to properly score all logs, publish the results in *QST* and online, and allow a bit of a buffer in case there are errors in reporting. We strive for perfection in the reporting of results, but sometimes there are mistakes. We'd rather not have to send another certificate to correct an error, so the grace period allows us to correct any errors before the certificates and plaques are sent out.

***Q:** Why don't you publish a list of all plaque winners, instead of just the sponsored plaques?*

A: Space in *QST* is at a premium. We're only given so much space for a contest results article, and we have to make editorial decisions about what gets included in results articles all the time. We publish the list of sponsored plaques not only to congratulate the winners, but also to give recognition to the plaque sponsors. Without their generosity, many folks would have to forego a plaque they've won. If you've won a sponsored plaque, please take a moment and let the sponsor know you appreciate their efforts.

***Q:** Why does it take so long for my participation pin/Sweepstakes mug to arrive?*

A: We don't order the participation pins or Clean Sweep mugs until we know how many orders we have to fill. While this takes a little longer for your prize to get to your hands, it saves us money in the long run. As an organization that exists through membership dues, fiscal responsibility is critical.

***Q:** I'm planning my vacation for next year and want to participate in a contest while away. How can I tell when next year's [insert contest name here] will be?*

A: The rules for each contest give the official weekend on which the contest is held. For example, the CW Sweepstakes rules say it is always held on the first full weekend of November. Another great resource is the WA7BNM Perpetual Contest Calendar; you can find that online at **www.hornucopia.com/contestcal/perpetualcal.php**.

***Q:** You sure are busy. Do you ever get time to get on the air and have fun?*

A: Of course! I participate in many contests and have been enjoying the great conditions on 6 meters this summer. I'm also the president of the ARRL Employees Club, W1HQ, and have been acting as an Elmer for some of our newly-licensed staff. My job deals with Amateur Radio, but I love getting on the air. Most staffers are the same way; we're just a bunch of hams like you.

If you have a question about the Contest Branch or any of ARRL's contests, feel free to call or e-mail me any time. I try to make myself available to all contesters and I'm at your service.

Sean's Picks

- **State QSO Parties this month:** Arkansas, Colorado, Tennessee, Texas, South Carolina, Washington (State Salmon Run)
- **Labor Day Sprint (9/1-9/2):** A fun CW QRP event sponsored by the Michigan QRP Club. Everybody works everybody in 4 hours of frenetic QRP activity.
- **IARU Region 1 SSB Field Day (9/6-9/7):** Field Day from a European/African perspective. Get on the air and help them have as much fun as ARRL/RAC members did in June!
- **Second Class Operators Sprint (9/13):** CW contesting for the rest of us! Get on and have some fun in this low-pressure, 6 hour CW sprint. Bonus multipliers for QRP entries.
- **YLRL Howdy Days (9/18-9/20):** One for the ladies! Work as many female operators as you can all around the world.
- **CQ WW RTTY Contest (9/27-9/28):** Work the world in one of the largest RTTY contests on the planet! Everybody works everybody. *Tons* of fun.

Operating Tip of the Month

Take a vacation, fall out for a while. *Operate a contest away from home. Different parts of the country (and the world) experience the bands in different ways. 15 meters in Florida is different than 15 meters in Oregon. Experience those differences and you'll gain a better understanding of the bands in general.*

CONTEST CORRAL

in association with the *National Contest Journal*

SEPTEMBER 2008

Start & Finish	HF	VHF+	Contest Title	SSB	CW	Dig	Exchange	Sponsor's Web Site
1 Sep 2300Z - 2 Sep 0300Z	1.8-28	50	Labor Day Sprint		✘		RST, S/P/C, MI QRP nr or power	www.qsl.net/miqrpclub
6 Sep 0000Z - 7 Sep 2400Z	3.5-28		All Asia Contest	✘			RS and age ("00" for YL)	www.jarl.or.jp/English
6 Sep 0000Z - 6 Sep 2400Z	3.5-28		Russian Radio RTTY WW			✘	RST and oblast or WAZ zone	www.radio.ru/cq/contest/rule-results/index2.shtml
6 Sep 1300Z - 7 Sep 1300Z	1.8-28		IARU Region I Field Day	✘			RS and serial	See IARU Society Web pages
6 Sep 1600Z - 6 Sep 2400Z	3.5-28	50,144	Ohio State Parks On the Air	✘	✘	✘	RS(T), serial, "Ohio" or S/P/C, and park nr	parks.portcars.org
7 Sep 0000Z - 7 Sep 0400Z	3.5-14		North American Sprint		✘		Call signs, serial, name, and state	www.ncjweb.com
7 Sep 1100Z - 7 Sep 1300Z	28		DARC Digital 10m Corona			✘	RST and serial	www.darc.de/referate/dx/cqdlcont/fgdcc.htm
7 Sep 1800Z - 8 Sep 0300Z	1.8-28	50+	Tennessee QSO Party	✘	✘	✘	RS(T) and county or S/P/C	www.tnqp.org
12 Sep 8 PM - 13 Sep 2 AM	3.5		070 Club 80 Meter Autumn Sprint			✘	RST and S/P/C	www.podxs070.com
13 Sep 0000Z - 14 Sep 2400Z	3.5-28		WAE DX Contest	✘			RS and serial	waedc.de
13 Sep 0600Z - 14 Sep 2400Z	3.5-28		Arkansas QSO Party	✘	✘	✘	RS(T), county or S/P or "DX"	www.arkanhams.org
13 Sep 1800Z - 15 Sep 0300Z		50+	ARRL September VHF QSO Party	✘	✘	✘	Grid square	www.arrl.org/contests
13 Sep 1800Z - 13 Sep 2400Z	1.8-28		Second-Class Operators Sprint		✘		RST, S/P/C, SOC nr or power	www.qsl.net/soc
14 Sep 0000Z - 14 Sep 0400Z	3.5-14		North American Sprint	✘			Call signs, serial, name, and state	www.ncjweb.com
18 Sep 1400Z - 20 Sep 0200Z	7-28		YLRL Howdy Days	✘	✘		YLRL member or nonmember	www.ylrl.org/ylcontests.html
20 Sep 6 AM - 21 Sep 12 Mid		10G+	ARRL 10 GHz and Up Contest	✘	✘	✘	6-char grid locator	www.arrl.org/contests
20 Sep 0000Z - 21 Sep 2400Z		2.3G+	ARRL EME Contest	✘	✘	✘	Call signs, signal rpt, acknowledgment	www.arrl.org/contests
20 Sep 1000Z - 21 Sep 0400Z	1.8-28	50+	Colorado QSO Party	✘	✘	✘	Call sign, name, and county or S/P/C	www.ppraa.org/coqp
20 Sep 1200Z - 21 Sep 1200Z	3.5-28		Scandinavian Activity Contest		✘		RST and serial	www.sk3bg.se/contest/sacnsc.htm
20 Sep 1300Z - 21 Sep 2100Z	3.5-28	50+	South Carolina QSO Party	✘	✘	✘	RS(T) and county or S/P/C	carc.ham-radio-op.net
20 Sep 1600Z - 21 Sep 2400Z	3.5-28		Washington State Salmon Run	✘	✘	✘	RS(T) and county or S/P/C	www.wwdxc.org
20 Sep 1800Z - 21 Sep 0200Z	1.8-28	50	SE DX Club 50th Anniversary	✘	✘	✘	RS(T), name, serial (nonmember)	www.sedxc.org/50thcontest
20 Sep 1800Z - 21 Sep 1800Z	1.8-28	50+	QCWA Fall QSO Party	✘	✘	✘	Call sign, Year lic'd, name, chptr or S/P/C	www.qcwa.org/qso-party.htm
20 Sep 2200Z - 20 Sep 2400Z	1.8-28		Feld-Hell Monthly Sprint			✘	RST, S/P/C, Feld-Hell member number	www.feldhellclub.org
21 Sep 1300Z - 22 Sep 0700Z	1.8-28	50,144	Classic Exchange	✘			Name, RS, S/P/C, type of equipment	qsl.asti.com/CX/sept08announcement.html
22 Sep 7 PM - 22 Sep 11 PM		144	Fall VHF Sprint	✘	✘	✘	Grid square	www.svhfs.org
25 Sep 1700Z - 25 Sep 1900Z	1.8-7		BCC QSO Party	✘	✘		RS(T) and "BCC" (if member) or serial	www.bavarian-contest-club.de
27 Sep 0000Z - 28 Sep 2400Z	3.5-28		CQ WW RTTY Contest			✘	RST, CQ zone and State/VE area (US/VE)	www.cq-amateur-radio.com
27 Sep 1200Z - 28 Sep 1200Z	1.8-28		CIS DX Contest		✘	✘	RST and CIS area code or serial	www.cisdx.srars.org/cisdxc.pdf
27 Sep 1200Z - 28 Sep 1200Z	3.5-28		Scandinavian Activity Contest	✘			RS and serial	www.sk3bg.se/contest/sacnsc.htm
27 Sep 1400Z - 28 Sep 2000Z	1.8-28	50,144	Texas QSO Party	✘	✘	✘	RS(T), county or S/P/C	www.txqp.net
30 Sep 7 PM - 30 Sep 11 PM		222	Fall VHF Sprint	✘	✘	✘	Grid square	www.svhfs.org
30 Sep 0000Z - 30 Sep 0400Z	3.5-28		Fall QRP Homebrewer Sprint		✘		RST, S/P/C, and power	www.njqrp.org

All dates refer to UTC and may be different than calendar date in North America. No contest activity occurs on 30, 17, 12 meters.
Refer to the contest Web sites for full rules, scoring information, operating periods or time limits, and log submission information.
Serial — Sequential number of the contact. S/P/C — State, Province, DXCC Entity
Publication deadline for Contest Corral listings is the first of the second month prior to publication.

Check for updates and a downloadable PDF version online at www.arrl.org/contests

2008 ARRL DX Phone — One QSO at a Time

"I must be a contest masochist — high line noise, heavy splatter, tons of QRM, low sunspots and running low power — but always back for more!" — *K2MFY*

H. Ward Silver, NØAX

How does one make a winning score at the bottom of the cycle in quite-a-bit-less-than-optimum conditions? The same way that it's done at the top of the cycle — one QSO at a time! And let's face it; if you aren't "in the chair" then you won't make *any* QSOs. Simply by keeping those QSOs rolling, you will make the best score you can, wherever you live and whatever the propagation. Remember, DX Is and Contests Are!

Considering that there were probably a number of other things that could be done instead of operating, a lot of folks did warm up those chairs. A total of 2056 contesters sent in a log this year (1246 from the US and Canada and 810 from DX stations) — that's a 5% drop from 2007. Fewer unique calls were logged in 2008, as well: 1814 QSOs on 20 meters by K3LR and 2976 QSOs on 20 meters by PJ2T set the bar this year. That's down 33% and 20%, respectively. Interestingly, PJ2T had almost as many unique calls on 15 meters (2855) as they did on 20 meters.

The number of QSOs did drop, but not as precipitously as the number of unique call signs. 409,488 DX to US/VE QSOs were contained in the final database and that is only off by 6.7% from last year. Only 296,134 contacts were contained in the US/VE database, suggesting that a higher fraction of DX stations submit their logs than US and VE stations do for this contest.

Taking a look at the geomagnetic and solar indices over the few days before and after this year's contest, it's clear that Murphy paid us a visit in the form of disturbed conditions. Saturday was at the end of a disturbed period, with conditions improving a bit on Sunday. Even so, the high latitude conditions were definitely upset, rendering the all-important 20 and 15 meter polar paths nearly unusable for US stations outside districts 1 through 4 and 8 and VE stations in VE4 and west. Being able to eke out some European contacts made a lot of difference in the final score for stations with a high-latitude path to the Old World.

Table 1

Propagation Indices for ARRL DX Phone

Year	Flux		Planetary A_p		Estimated K	
	Sat	*Sun*	*Sat*	*Sun*	*Sat*	*Sun*
2002	191	183	5	10	1.6	2.5
2003	138	147	14.5	11	2.8	2.6
2004	105	106	5	6	1.8	1.8
2005	81	84	10	36	2.5	4.3
2006	75	74	2	1	0.9	0.5
2007	73	73	2	3	0.5	0.8
2008	69	69	19	8	3.3	2.0

Write-up Notes and Features

Look for these modifications and updates to the statistics in the Web version of this article at **www.arrl.org/contests/**.

- Category trends now include a total for comparison of activity from year to year.
- The domestic single-band trend graph now includes sunspot number (SSN).
- A new type of accuracy plot compares error rate with non-dupe QSOs
- Power is no longer part of the single-band comparisons.
- Every ARRL Division and all of the continents are once again graced with the attention of a resident (or nearly-resident) author to look at their results.

Records

"I came to 40m few minutes before the end and I was not expecting a lot of QSO with only 100W and a DX88 vertical antenna. And in fact yes!!! Great fun." — FY1FL

Take a close look at Table 2 for the list of records set by US and VE stations this year. That's right — there weren't *any* set this year! Not even on the low bands or on 20 meters, the most popular band, worldwide. So don't feel bad if you didn't exceed your score from last year — it was hard to do!

Outside the US and VE, things were a little better, particularly for stations with only salt water between them and the North American continent. The two 20 meter records were broken pretty convincingly by KH7B and AI6V operating as P4ØV. 40 meters turned out to be just right for AO8A from the Canary Islands, tapping into huge pools of US and VE stations frustrated by poor conditions on more northerly paths. The Caribbean Contest Consortium station, PJ2T, just keeps racking up the wins, this time far outdistancing the pack in SO-Assisted, displacing a record from near the last peak of sunspot activity and almost setting a World Record!

Exceptional Performances

"This was my first ARRL DX Contest effort since 1993. It was also my first full-bore Single-Op effort using Computer Logging. I try not to be more than one century behind." —HC8A (op N6KT)

Every contest has its standout performances, no matter what the conditions may have been. Here are a few noteworthy efforts

Table 2

New US/VE Records for 2008

Category	*Call District*	*Call*	*New Record*	*Old Record*	*Year Set*
All	Any	None	None	All	Any

New DX Records for 2008

Category	*Continent*	*Call*	*New Record*	*Old Record*	*Year Set*
SO-20	OC	KH7B	559,143	420,831	1989
SO-20	SA	P40V (AI6V, op)	670,299	607,290	2004
SO-40	AF	AO8A	293,436	179,550	1994
SO-Assisted	SA	PJ2T	6.177M	5.982M	1999

harvested from the database.

- VO1MP handed out the semi-rare NL (Newfoundland) multiplier in the SO-HP category to the tune of 1.384M points. Gus made 1721 QSOs, bagged 268 DX band-entities, and finished in the lucky number seventh spot. What's such a big deal? He did it with only 19 hours of operating time!
- As if he'd never been gone a day, Rich N6KT reappeared as HC8A after 15 years of inactivity. Slugging it out across all the bands, his equatorial QTH in the Galapagos Islands enabled him to make 810 QSOs on 10 meters and vault to the top of the SOAB-HP category.
- In the very competitive SOAB-LP category, KU1CW put together a very nice 568k score and finished second from MO, not traditionally a state that does well in DX contests. He did it with lots of multipliers — the most in the category.
- W8QZA didn't hear a single, workable European signal all weekend from San Diego, but that didn't stop him from putting W6QU in enough logs to qualify for second place in the SOAB-QRP standings. He leapfrogged several stations that should have had much better propagation and prevailed.
- Out west as well, W6YI walked away with the SOSB-40 competition, handily outdistancing a posse of pursuers from Back East. With the "Chinese Dragon" over-the-horizon radar putting a big dent in Asian low-band participation, plus the general difficulties of noise and bootleggers from ITU Region 3 on 40 phone, his 505 QSOs were no mean feat.
- In the multi-multi competition, K3LR's team held the high ground against all challengers again this year. Beaten or nearly tied on every other band, the new 20 meter tower (with lights and paint and everything!) proved its mettle and carried the day. Winning a major band by nearly 25% is hard to do at that level of competition.

The Top 10

Single Operator High Power (SOAB HP)

VY2ZM	2,929,977
NN3W (@N3HBX)	1,857,648
K4ZW	1,825,416
VE3EJ	1,750,248
VC3E (VE3AT, op)	1,560,978
AA1K	1,507,611
VO1MP	1,383,684
W3BGN	1,271,403
W9RE	1,196,460
K1RX	1,181,448

Single Operator Low Power (SOAB LP)

K1BX	767,808
KU1CW	568,452
W3LL	526,008
N5AW	472,320
N4TZ	403,680
N1PGA	390,852
K2PS	380,673
W1CTN	323,856
K7SV	302,382
N4XL	269,028

Single Operator QRP (SOAB QRP)

K4CIA	102,465
W6QU (W8QZA, op)	62,886
N1TM	45,318
VA3DF	32,625
K3TW	29,484
WA8WV	25,347
N8XA	24,948
KA5PVB	19,032
K5KLA	18,585
K5ZE	17,388

Single Operator 10 Meters (SOSB-10)

K4WI	3,672
NA4CW	2,301
W6GMT	1,692
K4JRB	1,089
KM6Z	1,020
KI4ETD	540
KE5SNJ	285
W5MK	180
WAØFQK	72
W4GRW	27

Single Operator 15 Meters (SOSB-15)

NR5M	57,288
KC7V	24,300
AC5O	21,432
N8PR	18,963
WØVX	14,706
W7UPF	12,540
KC6R	11,556
KE3WM	10,989
KØRH	9,078
W4SUL	7,560

Single Operator 20 Meters (SOSB-20)

K2XA	431,244
W7WA	317,349
N4PN	217,536
VO1HE	158,730
VO1KVT	113,610
W8TWA	94,536
W7BJN	90,936
W9NY	88,068
K2MFY	77,517
WR2G	76,050

Single Operator 40 Meters (SOSB-40)

W6YI	68,175
N4QV	29,568
WDØBGZ	21,021
AA4VV	16,218
K8DJC	16,215
AD8J	13,395
W3TMZ	9,912
K7AO	9,711
VA3XH	7,104
W8JMF	6,630

Single Operator 80 Meters (SOSB-80)

ND8DX	25,311
N3YD	19,824
K4KZZ	13,104
WA2AOG	11,376
K8OQL	4,851
KU4BP	2,430
NA4M	2,430
WI9H	1,932
WO9S	1,725
KI6PG	570

Single Operator 160 Meters (SOSB-160)

KT1V	12,282
W2MF	9,936
K5RX	5,967
WF2W	3,060
W4SVO	2,940
K1HAP	1,725
WJ9B	1,650
KK4SI	1,386
W3GH	1,254
W2VO	1,140

Single Operator Assisted (SOA)

KI1G	1,590,228
K3WW	1,282,272
N3KS	1,007,244
AA3B	1,000,518
K3PP	963,534
N8TR	938,304
N3AD	821,700
VE3UTT (W1AJT, op)	751,230
N4ZC	709,794
W1GD	650,925

Multioperator Single Transmitter (MS)

K9RS	1,734,768
N1MM	1,399,035
W1QA (@NC1I)	1,243,620
K5NA	1,120,038
W1ZA	1,093,869
W6WB	740,955
W3MF	688,848
N1FD	612,360
W3GQ	575,640
N7AP	539,760

Multioperator Two Transmitters (M2)

WE3C	3,005,298
N3RS	2,535,888
KB1H	1,657,710
W4RM	1,607,040
KØTV	1,324,929
K2AX	1,029,756
NE3F	901,740
W2ZQ	762,390
W2CG	651,210
VE3RM	648,870

Multioperator Unlimited Transmitters (MM)

K3LR	4,043,754
W3LPL	3,691,749
W1UE	2,591,016
K1CX	2,516,616
K1TTT	2,328,900
W4ML	1,601,613
W3PP	1,562,775
N6RO	1,106,040
K7ZSD	873,042
WØAIH	673,017

Note: The table of Regional Winners is available on the expanded version of this article at **www.arrl.org/contests**.

US and VE Overview

"What fun!!! Talk on the radio, silence the CO (carbon monoxide) detector; repeat, repeat..." — K9WN

20 meters, as expected, remains the money band for DX contesters, worldwide, for the fourth straight year. Even the HP stations couldn't bust through on 15 meters this year — multiplier totals were down for HP and LP stations. At the other end of the spectrum, both 80 and 40 meters show a steady, long-term increase in both QSO and multiplier totals for both HP and LP stations.

Figure 1 shows that as solar conditions change, so does the choice of category by the single operator station. Reversing a trend, total LP entries (the red bars) were up this year and HP entries down. In the face of poorer conditions, that was somewhat surprising.

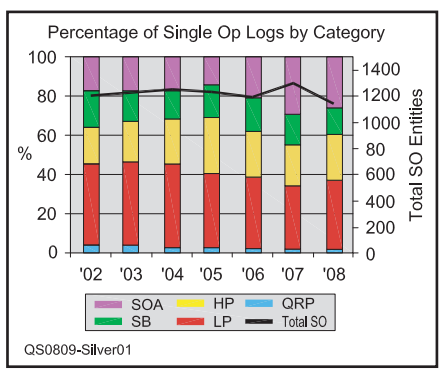


Figure 1 — Distribution of Single-Op logs by category and band, 2002-2008.

Close Finishes

As on any day at the races, there will be some close finishes. These are always fun to look for in the results and this year is no exception:

- 1.6% separates NN3W and K4ZW in the SOAB-HP category
- SOAB-HP competitors W9RE and K1RX were only 0.8% apart
- N3KS and AA3B in SO-Assisted finished with only 0.7% between their scores
- AA4VV and K8DJC in SO-40 were the closest Top Tenners in the entire competition — a paper-thin 0.018% determining the final place of finish!

The persnickety polar path moved the ionospheric lovelight south this year as K4CIA walked away with the top SOAB-QRP score from NC. Last year, three of the top five SOAB-QRP positions went to New Englanders and all of the top five were northeast of Tennessee. This year, the number two position swung way out west to W6QU (op W8QZA) before rocketing back across the continent to CT where N1TM finished third.

The Top Ten in SOAB-LP bounces all over the eastern half of the continent. K1BX was the top station this year with KU1CW putting together a big list of multipliers to take second from near Kansas City. W3LL was third from Maryland before N5AW yanked the fourth spot back to STX and N4TZ held the baton in the Midwest for fifth. The East Coast could not be denied and claimed all of the remaining spots; N1PGA in sixth from WMA, seventh-place K2PS down the coast in SNJ, and W1CTN in CT for eighth. The fourth district finally got a word in edge-wise as K7SV in VA and N4XL in SC finished ninth and tenth.

As in several other recent years, there is VY2ZM (op K1ZM) and then there is everybody else in SOAB-HP. It's not just a killer

location, either, as 'ZM's accuracy is excellent and he keeps the chair warm. One of the closer finishes was turned in by second-place station NN3W in MDC and K4ZW in VA. Only 1.6% separates these two! Two VE3 stations — VE3EJ and VC3E — slugged it out for fourth and fifth position. AA1K filled in the badly needed DE multiplier overseas and took sixth in the process. VO1MP, in rare NL, took advantage of good propagation opportunities to place seventh. Familiar call sign W3BGN appears in eighth spot, while W9RE's big IN signal earned the ninth seat. In another tight finish, K1RX was less than a single percentage point behind 'RE to claim the final Top Ten spot.

The domestic Assisted category remains a battle for stations in the northeast. The Top Ten extends as far west and south as OH and NC. Within those borders, the scores show that it is a competitive and tough category. The oft-needed RI multiplier helped pilot KI1G to the top of Single-Op Assisted this year. K3WW — a familiar call in Assisted categories — placed second in front of one of the tightest races between N3KS and AA3B for third and fourth, respectively. K3PP in fifth, N8TR in sixth, and N3AD in seventh were locked in another duel before the first Canadian, VE3UTT, appears in eighth place. N4ZC in NC and W1GD in NNJ round out this category's Top Ten list.

Sponsored Plaque Winners

Plaque Category	*Winner*	*Plaque Sponsor*
W/VE Single Operator High Power Phone	VY2ZM	Frankford Radio Club
W/VE Single Operator Low Power Phone	K1BX	Dauberville DX Association
W/VE Single Operator QRP Phone	K4CIA	Jeffrey Briggs, K1ZM
W/VE Single Operator Assisted Phone	KI1G	Pete Carter, K3VW Memorial
W/VE Multioperator Single Transmitter Phone	K9RS	Steve Adams, K4RF
W/VE Multioperator Unlimited Transmitter Phone	K3LR	Western New York DX Association
W/VE 1.8 MHz Phone	KT1V	Butch Greve, W9EWC Memorial
W/VE 3.5 MHz Phone	ND8DX	Jeffrey Briggs, VY2ZM
W/VE 14 MHz Phone	K2XA	Northern Illinois DX Association
W/VE 28 MHz Phone	K4WI	Ralph Fontaine AF7DX
World Single Operator Phone High Power	HC8A (N6KT, op)	North Jersey DX Association
World Single Operator Phone Low Power	P4ØA, (KK9A, op)	Andy Faber, AE6Y
World Multioperator Single Transmitter Phone	PJ4G	Carl Cook, AI6V/P49V
World Multioperator Two Transmitters Phone	6Y1V	W6NL and K6BL
World Multioperator Unlimited Phone	TI5ØDX	Stanley Cohen, W8QDQ
World 1.8 MHz Phone	KV4FZ	In Memory of ZL2BT
World 14 MHz Phone	P4ØV (AI6V, op)	Don Wallace, W6AM, Memorial Award
World 21 MHz Phone	ZX5J (PP5JR, op)	Long Island DX Association
World 28 MHz Phone	LU1HF	North Shenandoah DX Association NS4DX
Asia Multioperator Single Transmitter Phone	JA2ZJW	Yankee Clipper Contest Club
Europe Multioperator Unlimited Phone	9A1A	Operators at K1TTT
North America Multioperator Single Transmitter Phone	V26X	Nick Lash, K9KLR
Oceania Single Operator High Power Phone	KH6LC (N6GQ, op)	W7EW / W7AT
South America Multioperator Two Transmitter Phone	ZY7C	Operators at K1TTT
New England Division Single Operator Low Power Phone	K1BX	CTRI Contest Group
New England Division Single Operator Assisted	KI1G	Don Greenbaum
Canada Single Operator Low Power Phone	VE3AD	Contest Club Ontario
Japan Single Operator Low Power Phone	JH4UYB	Western Washington DX Club
W/VE Single Operator High Power Combined Score	AA1K	National Contest Journal
W/VE Single Operator Low Power Combined Score	K1BX	Rochester DX Association K2FR Memorial Plaque
World Multioperator Unlimited Combined Score	K3LR	W2PV Memorial - Schenectady ARA
World Single Operator Low Power Combined Score	VP9/W6PH	C. Sharp, K5DX Memorial by the Texas DX Society

US-VE Single-Band

It's hardly a surprise that there aren't many 10 meter and 15 meter logs or that 20 meters leads the parade (again). What is unexpected is the steep drop in both 40 and 80 meter submissions. The disturbed conditions probably discouraged operators that otherwise might have put in a serious effort.

Figure 2 illustrates how the single-band entries are distributed. It will be nice to see the effect of a solar uptick in a year or two. No, the bar for 2008's SSN is not missing. It's just that the SSN for the 2008 contest was –1. That's right...a –1 value.

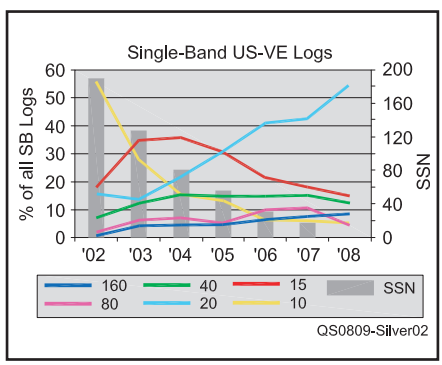


Figure 2 — Single-band US/VE logs, 2002-2008. SSN is an abbreviation for smoothed sunspot number.

Looking at 10 meter scores, distributed in an arc across the southern part of the US, W5MK in seventh place was the northernmost station to make more than a few QSOs. Third-place W6GMT (I wonder to what time zone his clock is set?) and KM6Z in fifth made sure the West Coast was represented and I'm sure that wasn't easy! Congratulations to K4WI with the winning score from AL, followed by NA4CW to his southeast in the SFL section.

The distribution of scores in the 15 meter Top Ten look an awful lot like the scores in the 10 meter Top Ten. No Canadian provinces found here, either, although KE3WM in seventh place from WPA extended the Top Ten farther north than the 10 meter group. Winner NR5M's big aluminum farm played a role in his being able to out-contact KC7V in second place from AZ and N8PR from SFL in third. Centrally located, NR5M was able to pick up counters to both east and west.

K2XA's winning SOAB-20 QSO total on the ENY-EU circuit held off the challenge from another 20 meter stalwart, W7WA's strong WWA score in second place. Third place is found in GA in the person of N4PN, before a pair of Newfoundlanders, VO1HE and VO1KVT, placed fourth and fifth from their perch on the North Atlantic. (Check out VO1KVT's QSL on **www.qrz.com**.) Moving west again, W8TWA placed sixth from MI and then the spotlight moved all the way back to EWA as W7BJN finished seventh. The final three spots are occupied by W9NY, K2MFY, and WR2G, all from the northeastern quadrant of the US.

Congratulations to W6YI for the highest single-band finish by any West Coast station this year, convincingly taking the top spot on 40 meters with one of the only two top scores that was higher than in 2007! 40 meters is another band that can be relatively eclectic in propagation, but Asian participation is crucial to stations west of Kansas City. As the high bands go, so do the Region III callers, so it is not surprising to see the remainder of the 40 meter scores from farther east, beginning with N4QV in second place from SFL. The exception is WDØBGZ in third place from CO again this year. The photo finish between AA4VV and K8DJC for fourth place came down to three points — the equivalent of a single QSO! OH was also a hot spot on 40 meters with K8DJC, and W8JMF in fifth and tenth place, respectively. AD8J, W3TMZ, K7AO, and VA3XH shouldered aside the Ohioans for sixth through ninth places, respectively.

The top three 80 meter stations from 2007 weren't on 80 meters in 2008, having moved to other bands or not participating. As a result, only seven SO-80 entries were made and the top score, by ND8DX in OH, was only 20% of last year's winning score! In what should have been a low-band year, competition was surprisingly light. Nevertheless, the top two stations, ND8DX pursued by N3YD, both found 59 multipliers and that's a good weekend's work, to be sure. K4KZZ was third from NC, beating WA2AOG in WNY.

160 meters was the other band on which

W8QZA

All smiles after pushing to a difficult 2nd-place finish in SOAB-QRP, Bill, W8QZA, operated at W6QU from San Diego.

scores improved. KT1V added almost 20% to last year's winning total to take home the winning score on this difficult band. Another score larger than the 2007 winner was submitted by second place finisher W2MF. K5RX moved up two places from last year to finish third as the only Top Ten finisher from west of the Mississippi River.

Multi-Operator

Teams from all across the US were represented in this M/S, from NH (N1FD) to EB (W6WB). The top three finishers (K9RS, N1MM, and W1QA in first through third) were all from the northeast, although K9RS in WPA finished substantially ahead of the challenging teams. K9RS had big numbers on 160 and 80 meters, while the higher bands were much tighter. The fourth-place K5NA team put in a strong showing from STX and finished just ahead of W1ZA in VA. W6WB placed sixth all the way across the country in the EB section by dint of good 40 meter and 15 meter (and even 10 meter) totals. The average number of operators in the Top Ten M/S entries was 3.1 this year. I don't know about you, but I could certainly use an extra 0.1 operator at times!

No station in the M/2 Top Ten was very far from the Atlantic this year, sprinkled from VA to NH, with VE3RM as the sole Canadian representative in any of the multioperator Top Ten. Last year, the muscular station of KC1XX dominated the M/2 category, but Matt's Marauders decided to take a year off from ARRL DX Phone. That threw the field open and some very motivated teams responded. WE3C prevailed over N3RS for the top spot, reversing the finishing order for these two stations last year. In third, KB1H appeared and edged W4RM right behind in fourth. Requiring a few more operators to keep all of those emitters emitting and filaments filamenting, the average M/2 team size was 6.

The K3LR machine in far-Western Pennsylvania kept their winning streak going at five this year. Tim's Team really makes the station play well, especially on 20 meters, and so outlasted their archrivals at W3LPL. Following K3LR and W3LPL were a pileup of New England stations with W1UE finishing third ahead of K1CX (4th) and K1TTT (5th). Each of those three took home the bacon on 160, 80, or 20 meters and virtually tying on 15 meters. W4ML (VA) and W3PP (DE) had a real mid-Atlantic donnybrook, with W4ML prevailing to take sixth place. Out on the West Coast, N6RO in the EB section and K7ZSD a little further north in OR duked it out for eighth and ninth places, respectively. Longtime multi-multi competitor WØAIH rounded out the Top Ten from WI.

Affiliated Club Competition

"ARRGGGGGH" — WB8JUI

This year's club totals were almost the same as last year — 56 entries — but total numbers of member scores are up again this year — 1464 as opposed to 1451 last year. The contest clubs, in the face of tough conditions, are doing a great job of getting more people on the air and submitting their logs. This will pay big dividends for all us when the solar cycle resumes its upwards journey. Why not make it a mission for your own contest club, to encourage participation not only in the contest, but in the club, too! Last year's shift of entries in favor of the Local category has somewhat reversed this year, with 19 Local and 28 Medium entries.

In the Unlimited category, the Frankford Radio Club (FRC) pushed aside the Yankee Clipper Contest Club (YCCC) to win the gavel. Even though the FRC had fewer logs than YCCC, the FRC's participation went up, while YCCC's went down. Getting all the club members on the air really helps! YCCC was followed by the Potomac Valley Radio Club (PVRC) in third place. Fourth and fifth places traded hands this year with the Northern California Contest Club (NCCC) ahead of the Society of Midwest Contesters (SMC).

In the Medium category, the Central Texas DX and Contest Club took a run at the North Coast Contest Club, but the results are the same as last year; The North Coasters retain their gavel with a strong turnout of members submitting their logs. The Carolina DX Association made a big jump up to third this year followed by a charging Mad River Radio Club, both clubs having increased the number of log submissions dramatically.

Changing from Medium to Local category, the Maritime Contest Club grabbed a gavel! They were followed by a new club, the Central Virginia Contest Club who found themselves second when the shooting stopped. The Southern California DX Club was present, too, holding onto third place.

Affiliated Club Competition

	Score	Entries
Unlimited Category		
Frankford Radio Club	129,067,251	158
Yankee Clipper Contest Club	121,365,369	181
Potomac Valley Radio Club	70,285,920	160
Northern California Contest Club	29,592,405	84
Society of Midwest Contesters	27,370,548	70
Contest Club Ontario	19,559,412	58
Florida Contest Group	14,368,032	75
Minnesota Wireless Assn	13,126,503	64
Tennessee Contest Group	9,343,602	56
Medium Category		
North Coast Contesters	21,736,962	24
Central Texas DX and Contest	14,121,693	14
Carolina DX Assn	11,293,344	43
Mad River Radio Club	10,012,443	27
Hudson Valley Contesters and DXers	9,871,614	38
South East Contest Club	9,469,722	25
Rochester (NY) DX Assn	9,351,762	8
Willamette Valley DX Club	7,176,978	19
Southern California Contest Club	5,540,436	34
Order of Boiled Owls of New York	4,950,528	13
Alabama Contest Group	3,908,805	22
Western Washington DX Club	3,870,183	22
Grand Mesa Contesters of Colorado	3,798,036	21
CTRI Contest Group	3,551,784	12
North Texas Contest Club	3,375,546	16
Central Arizona DX Assn	3,314,928	24
East Coast Canada Contest Club	2,647,044	7
Texas DX Society	2,491,317	3
Contest Club Du Quebec	1,551,993	9
Utah DX Assn	1,351,659	14
Western New York DX Assn	1,002,057	7
BC DX Club	954,882	4
Eastern Iowa DX Assn	598,506	9
Bergen ARA	492,717	13
Alberta Clippers	437,544	4
Redmond Top Key Contest Club	305,685	11
Oklahoma DX Assn	262,302	4
Saskatchewan Contest Club	238,764	4
Magnolia DX Assn	29,205	5
Local Category		
Maritime Contest Club	4,570,449	8
Central Virginia Contest Club	1,977,831	3
Southern California DX Club	622,377	5
Sterling Park ARC	555,042	4
North Hills Amateur Radio Contest	538,146	4
Low Country Contest Club	406,323	5
South Jersey DX Assn	405,735	8
Northern Illinois DX Assn	389,841	4
Spokane DX Association	378,117	7
Salt City DX Assn	362,616	3
West Park Radiops	336,960	9
Southeastern DX Club	174,204	7
Austin ARC	151,656	3
Mother Lode DX/Contest Club	144,573	7
Northern Rockies DX Association	119,457	3
Metro DX Club	102,540	10
10-70 Repeater Assn	93,636	3
Hazel Park ARC	43,308	3
Arrow Communications Assn	8,268	3
Portage County Amateur Radio	4,122	3

DX Overview

"Conditions were poor, and that explains why I didn't work a single CA on any band! I changed a few diapers, however. A first for me, HI." — CT1EAT

Just as in the US and VE logs, there are some very closely spaced scores to be found all through the various category Top Ten tables:

- HQ9R and VP9/W6PH were neck and neck in SOAB-LP, only 1.2% apart
- KP2BH and LU3CT, also SOAB-LP, were even closer at 0.3% separation
- In SO-Assisted, EA5KV and PY4OG finished just 0.5% apart
- On 20 meters, ZV5K and IT9STX almost finished in a dead heat, with 0.04% between them

Whenever I put a QRP DX station in the ARRL DX log, I have to smile, especially if they are running a pileup! The SOAB-QRP winner this year was CO6LP from nearby Cuba who used 40 and 20 meters to outdistance the competition. Moving up to second and third are F5BEG and IK5RUN from Europe. Switching to the other direction, three JA QRPers finished fourth (JA1CG), fifth (JA2DLM), and sixth (JR4DAH) — all familiar calls to contesters and DXers.

All of the SOAB-LP Top Ten could be found by pointing the beam south to the Caribbean and South America. P4ØA operated by KK9A ran his string of wins to four this year with a solid victory over HQ9R (op WQ7R). Only K3LR with five straight wins has a longer active streak in this contest. All of the first four scores were made by traveling operators. VP9/W6PH just missed out on second place on his annual visit to the Island of Shorts. G3TBK traveled to the Caribbean, piloting J88DR to fourth place. The resident operators then take over, with HK6P in fifth place, followed by 8P6EX, YV5EAH, and CE1KR. KP2BH and LU3CT finished close to a dead heat, with KP2BH's better multiplier total carrying the day.

In SOAB-HP, HC8A displaced 8P1A operated by W2SC from last year's top spot in the SOAB-HP category. Both ops generated an Imperial Ton of QSOs, but N6KT found some extra multipliers on every band and grabbed 10 meter openings unavailable in Barbados. Two more Caribbean calls, KP2M (op N2TK) and TO5A finished third and fourth before the Pacific made an appearance in KH6LC operated by N6GQ. The Caribbean and Central America divvied up sixth through eighth in the person of NP2I, HQ2W (op HR2DMR) and V31XX (op HP1WW), respectively. PY2NY was ninth from South America and Europe's sole Top Ten representative, EA4KR, was in tenth place.

Without a large team making the trip this year, WE9V decided to run PJ2T in the SO-Assisted category and ran away with the show, making almost 9 times the score of his nearest competitor and breaking a 9-year-old record in the process! The second and third places calls, PY2EX and PY5QW, are also new to the category, followed by a regular, EA7RU, in fourth. Europe's extensive spotting network also helped another repeating Top Tenner, DLØWW, to fifth place and EA5KV to sixth. The next four places bounced back and forth between Europe and South America as PY4OG, EF1W, LU7YZ, and YT6M complete the Top Ten.

DX Single-Band

There was nary a sign of a 10 meter signal from north of the equator this year — not even close. But yet, there were plenty of QSOs to be had from the South Americans, as always. LU1HF repeated as the top SOAB-10 score, breaking the 1000 QSO mark and even *improving* his score from last year! That would not have been my prediction, so extra credit is due for this fine score! One of the many PP5 and PY5 calls whose number has increased thanks to WRTC-2006, PP5NW finished second. A parade of Argentinians followed in third through seventh as LU9DAG, LQ5H, LU4DX, LU6FOV, and LU6DU plied the bands and giving us all a few 10 meter contacts. CX4DX's reliable signal was there for another multiplier and eighth place. LW1HR and PY2SRB completed the Top Ten in ninth and tenth places.

Only three 15 meter stations from north of the equator (YV1CTE, KH7Y, and HK3JJH) managed to break into the Top Ten and no Europeans were present in the Top Ten at all. PP5JR operated the big ZX5J station and won the category quite handily with a nice score. There was a real log jam of multipliers at 59, so all three of the top places were determined by QSO totals. LS1D (op LW9EOC) and ZX2B (op PY2MNL) placed second and third. Still in South America, but quite far north of the winners, YV1CTE came in fourth and PY5HOT (must be the weather?) was fifth. From Hawaii, KH7Y brought some 15 meter aloha to the airwaves to claim the sixth position and then the bands went back to Argentina and LU2QC in seventh. A35RK adjusted his lava-lava and topped 1000 QSOs to place a welcome eighth. South America finished out the table with HK3JJH and PY2DN.

On 20 meters, returning to the station that helped jump-start the many-membered Caribbean contest expeditions, AI6V not only won, but set a new record in the process from P4ØV. Right behind P4ØV, IV3IYH decided that if 20 meters would not come to Europe, then he would go to where 20 meters was hot and placed second from HT2N. Another record fell in third place, as KH7B displaced a long-time record set back in 1989. HI3TEJ drove the HI3T station to a nice score in fifth place. Finding two extra multipliers to make the highest total of any station in the SOSB category, HK1X placed fifth, while nearby, 4M5IR was running up enough points to place fifth. Passing the baton to Europe, TM1W (op F5HRY) placed sixth, following by South Americans, LS2D (op LU1DK) and ZV5K. We close out the Top Ten with a second European, IT9STX.

DX Multi-operator results and Top Ten tables are available in the expanded Web version of this article at www.arrl.org/contests.

Five active continents had a place in the 40 meter Top Ten! Africa, nearly shut out of Top Ten's entirely, led the charge with a winning score (and a record) from AO8A on the Canary Islands. Swinging all the way 'round, ZL3A's potent signal blanketed North America and put the Kiwi's in second place. Europe was next as F6CTT maneuvered TM5C to third place. Not content to stay in one region, the Top Ten list then jumped to South America where PR7AP is in fourth place. CT2ITR and S53S (op S52X) finished fifth and sixth. YV6BXN was sandwiched in between pairs of European scores for sixth place, with IR2C (op IK2NCJ) and EA3BOX in seventh and eighth. Our jaunt finishes in South America, where PY6KY and PY1NB were the ninth and tenth place scores.

The disturbed conditions and higher-than-usual absorption really hurt 80 meters. At a time of the solar cycle when this band should shine, it took a big hit right around the time of the contest. There were not nearly as many Europeans and northern stations, like KL7RA, represented this time around. Stations in or around the shores of the Caribbean and Gulf of Mexico filled up the top half the Top Ten list for 80 meters. ZF2AH took advantage of proximity to the US and VE to finish first, hotly pursued by KP4KE on another island. XE2K, last year's winner, was also on-hand in third, and Cuba was represented by CM6CAC. On the south shore, YV5LMW finished fifth. West Africa was close enough for CT3DZ to place sixth and HP3AK snagged the seventh spot. Two northern Europeans with good stations finished eighth and ninth; GM3PPG (op G4BYB) and SN3A. A far South American, LU1FDU, made enough long-haul contacts to finish tenth.

Down, but not out, 160 meters continues to attract a crowd. KV4FZ led all comers on this band with a score not far reduced from last year's first-place finish. CM6RCR was nearly NVIS to the southern US and so did quite well, finishing second. Out in the center of the Atlantic, CU2AF tapped into the big East Coast population and finished third. Somewhat hampered by tropical noise, LU2DVI/H was fourth. There was some joy in Mudville as the rest of the 160 meter Top Ten is populated by Europeans; DF2UU, ES5RW, F6KCP (op F5VHN), UA2FT, HA8BE, and EU3AR all made a few QSOs. You may think that the 1 QSO and 3 Mults of tenth-place finisher EU3AR is a typo, but the QSOs represent the total remaining after log checking removed QSO points for miscopied exchanges.

Concluding Remarks

Contesting in these low-flux times is a "character-building experience" and we all like to think of those "best of times", fuzzy around the edges in our memories, of contest weekends when the pileups were bottomless and DX answered every CQ. But the same excitement hits at the starting bell regardless of the level of flux, the boasts just as big, the triumphs even a bit sweeter in adversity, and the jests and ripostes just as sharp afterwards. Yet, if you need something to revitalize your contesting spirit, there is a guaranteed tonic — become a contesting Elmer. Take the opportunity to offer encouragement and guidance to newcomers. After all, these are their "best of times"!

Keep it ever so — see you next year!

QST

2008 Simulated Emergency Test

Emergency tests take center stage October 4-5.

Steve Ewald, WV1X

When an emergency or natural disaster strikes, Amateur Radio is often called into the limelight of public service to establish a line of communication to and from the stricken areas. Amateur Radio networks, once established, sustain communication during the emergency efforts by helping the disaster relief workers and public with point-to-point communications or health and welfare messages. During weather related threats or during the actual occurrence of severe weather, Amateur Radio networks are commonly on standby to gather information and report this data to the National Weather Service or other pertinent authorities.

You've read about and/or have heard about these important stages of Amateur Radio public service here in *QST* or on the Web or elsewhere. Make this the year that you take a role to learn more and become ready to serve in public service and emergency communications.

The ARRL sponsors a nationwide audition for Amateur Radio operators for a role in the Amateur Radio Emergency Service®, the Radio Amateur Civil Emergency Service, the National Traffic System, the National Weather Service's SKYWARN, the Salvation Army Team Emergency Radio Network (SATERN) or other groups as well. It's the ARRL's annual Simulated Emergency Test (SET), and you're invited to join on October 4-5, 2008, or whenever it is held in your area.

How to Join the SET

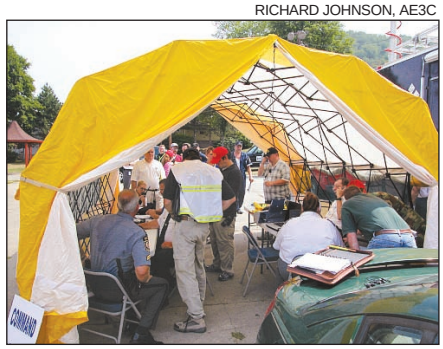
To participate in this year's emergency test, contact your local ARRL emergency coordinator or net manager to find out the details. Although October 4-5 is the focal point weekend, ARRL Sections, ARES teams and nets may conduct their exercises anytime during September through December. If you don't know who — to call, please touch base with your ARRL Section Manager for assistance. See page 16 of *QST* for contact information or consult the ARRL Web page. The URL to start with is **www.arrl.org/sections/**. From there, you'll find links to ARRL section home pages with names and contact information for your Section Leaders including the Section Emergency Coordinator and Section Traffic Manager. Whether you're a new licensee or an experienced radio amateur, the SET is a golden opportunity to learn or practice useful skills in traffic handling, net operation and emergency communications protocols and management.

ARRL Section Leaders and local or District Emergency Coordinators are encouraged to work closely with served agencies in planning these exercises. This not only helps to heighten awareness of Amateur Radio in the community, but also helps ensure that effective communication networks will be in place if an actual emergency occurs. ARRL maintains National Memoranda of Understanding with several organizations and entities, and the SET is a prime chance to put these agreements into action. More details may be found at **www.arrl.org/FandES/field/mou/**.

ALLAN KUONG, WA1SCS

Workshops and conferences are important components of training, and the Sagadahoc County (Maine) ARES held their annual emergency communications seminar this past February in Brunswick. "Interoperability and Amateur Radio," was the main topic of discussion. Shown (left to right): Al Corderman, WB1EFN; Dolph Holmes, WA2NTW; Marjorie Turner, KX1I; Allan Kuong, WA1SCS (EC Sagadahoc Co); Bill Woodhead, N1KAT (Maine Section Manager); a guest at seminar; Steve Kercel, AA4AK, and Harry McNelly, N1TTT.

RICHARD JOHNSON, AE3C



A temporary command post became a center of activity during an emergency exercise in West Newton, Pennsylvania.

National Preparedness Month

National Preparedness Month is an annual nationwide effort held each September to encourage Americans to take simple steps to prepare for emergencies in their homes, businesses and schools. Once again this year, ARRL is a coalition member. National Preparedness Month 2008 is sponsored by the US Department of Homeland Security. The goal of the month is to increase public awareness about the importance of preparing for emergencies and to encourage individuals to take action. Throughout September and the months surrounding it, Homeland Security will work together with a wide variety of organizations, including local, state and federal government agencies and the private sector, to highlight the importance of family and business emergency preparedness as well as to promote individual involvement through events and activities across the nation. More information can be found at **www.ready.gov**.

You are encouraged to consider this year's ARRL Simulated Emergency Test and all preparations as well as post exercise evaluations as a demonstration of your readiness and Amateur Radio's readiness. Be an active participant in SET, and join others nationwide in National Preparedness Month.

Additional background on the annual SET is presented in the article, 2007 Simulated Emergency Test Results. See July,2008 QST, pp 62-65. Also, guidelines and specific SET reporting forms for the ARRL Section and Field Leaders will be posted on the ARRLWeb at **www.arrl.org/FandES/field/forms**.

Jamboree On The Air 2008

Debra Johnson, K1DMJ

Get ready for another exciting Jamboree On The Air! This year, the annual operating event sponsored by the World Scout Bureau will be October 18 and October 19. JOTA will return to its traditional 48 hour format, and will begin at 0000 local time Saturday and continue through 2400 local time Sunday. Visit the World Scout Bureau Web site at **www.scout.org/jota/** for the details. On that site you'll find the latest information and you can register to participate in a Skedbook where you can pre-arrange contacts.

RACHEL SCHMOYER

W2KGY: **Cadet Mike Weigand, KB3PDB, assists a Girl Scout with making radio contact during Jamboree on the Air 2007 from the radio shack at the US Military Academy, West Point, New York.**

Suggested Worldwide JOTA Frequencies

Band	Phone (MHz)	CW (MHz)
80 meters	3.690 & 3.940	3.570
40 meters	7.090 & 7.190	7.030
20 meters	14.290	14.060
17 meters	18.140	18.080
15 meters	21.360	21.140
12 meters	24.960	24.910
10 meters	28.390	28.180
6 meters	50.160	50.160

ARRL also has some ideas and resources you can use to prepare for the event on our Scouting Web pages at **www.arrl.org/scouts**. You'll also find a special page dedicated to JOTA. You may want to use the JOTA event as an opportunity to instruct the Radio Merit Badge or conduct a foxhunt, build an antenna and provide other activities to explore Amateur Radio.

New last year was a JOTA storyboard on the ARRL Web site. It can be found at **www.arrl.org/scouts/jota/Stories/**. Visit the site to read about the activities and see the fun captured in photos last year. Here are some excerpts from some of the stories posted there. Plan to post your stories this year along with some photos of your experiences in 2008!

DON MEYER, KDØJBN

KDØJBN: **Don Meyer, KDØJBN, of the Greater St Louis Area Council, Boy Scouts of America, set up a JOTA station at the Camporee at Beaumont Scout Reservation. Fifty Boy Scouts and Webelos stopped by to see what was going on, and 13 got on the air.**

JAMES HUNT, KI5DQ

KI5DQ: **Cub Scout Troop 13 held their first ever JOTA at Lake Texoma Camp between Texas and Oklahoma. This special event station was operated in true fashion — portable in a makeshift field day during their weekend campout at the lake. The scouts were absolutely thrilled when they were able to talk to fellow scouts in South Carolina and Ontario, Canada. The JOTA event was the most fun activity at the campout from the responses I received from the children and their parents.**

2007 JOTA Stories

♦ "This was a great opportunity to give the kids some insight into the fun side of electronics and communications technology," said Nick Roscoe, N3NR, Cubmaster for Cub Scout Pack 260 of Glen Mills, Pennsylvania. "Since this was the 50th anniversary of the event we decided to try to do something special. Instead of just giving the scouts the chance to get on the air, we also wanted to give them a chance to build a kit, experiment, and just have some fun with radio. At the same time we wanted to give them the opportunity to meet the volunteers who will help provide communications in the event of an emergency in our area."

♦ Under the leadership of Oscar Meyer, AI4SS (Super Scout), the Trident Amateur Radio Club (TARC) and the Charleston Amateur Radio Society (CARS) joined forces to provide area Scouts with a unique learning experience. A total of 387 Scouts and adult leaders along with 26 Amateur Radio operators participated at five sites. One location was an overnight campout at Oscar's farm (Camp Oscar) on Johns Island, South Carolina. Merit badge classes were offered along with the chance to operate one of the several stations set up around the pond (fishing was encouraged). As an added incentive for participation, the Troop whose Scouts logged the most contacts and the individual Scout who logged the most contacts were given special awards. — *Dennis Zabawa, KG4RUI*

Debra Johnson, K1DMJ, is Manager of the ARRL Education Services Department. She can be reached at **djohnson@arrl.org**.

W3ZZ

THE WORLD ABOVE 50 MHz

The Quest for 70 cm DXCC

Last month's column announced that Jan Bruinier, DL9KR, had claimed the first 432 MHz DXCC by working his 100th country, Z3/OK1DFC, after a journey of 30 years. This truly amazing achievement dates from near the dawn of EME to the digital age and was accomplished completely on CW. I am pleased to present the story of that voyage in this column in Jan's own words. It tells the fascinating story of a premier EMEer (Figure 1). Here then is Jan Bruinier.

JAN BRUNIER, DL9KR

Figure 1 — Jan Brunier, DL9KR, ready to work some EME at his operating position.

In the Beginning

"It all started while Ray, VK3ATN, and I were discussing 160 meter DX matters during a 20 meter QSO. Ray transmitted a recording of K6MYC's 2 meter EME CW signals as received on his huge rhombic. Though I had followed the early EME developments of KH6UK, W4HHK, W3GKP, W1FZJ, et al in 'The World above 50 MHz,' this was my first inkling of a treasure still hidden in my future. Then there was a cover photo of K2UYH's stressed dish in *CQ* magazine, which gave me an idea that EME might be possible with 'small' antennas. While still plugging along on 160 meters, my eye caught the September 1976 *QST* cover story about K2UYH's first ever 70 cm WAC. This was the 'seed.'

Site and Antenna Evolution

"After the birth of our twins, my wife and I had started building a new home on a 1350 meter^2 lot in a semi-rural area where we moved in June 1976. Thanks to DJ3GL, we erected a sturdy 6 meter high mast, which hopefully would carry an EME array in the future and a 19 meter underground cable run from the mast to the future shack in the basement. At that point I never thought of the encroachment by trees and shrubs that could impair my moonrise and moonset windows. Since then tons of 'biomass' have had to be removed, not always to my spouse's pleasure.

"In 1972 I had begun to build transverters and small power amplifiers for 432 and 1296 tropo to use with my Drake 4-line. Since I had no help with my project, I resorted to *QST* and the ARRL *Handbooks*. W1HDQ had described open wire lines in feed harnesses and W1JR was using open wire in his collinear array. Given the horror stories of 'drowned' coaxial cables, open wire would be my choice: reliable and low cost.

"K6YNB's article on 'quagis' in April 1977 *QST* offered a simple and lightweight solution for the antennas. 16 × 10 element quagis would be spaced such that the transformation on the open wire lines resulted in the impedance of a single quagi appearing at the feed point of the array. I originally used fiberglass for the large H frame and wooden booms soaked in a protective fluid. The initial test array was a single 2 over 2 (1.5 λ high, 2 λ wide) with the quagi driven elements shaped into ellipses to match the surplus 60 Ω Flexwell (~2.2 cm) cable. The remaining 3 groups were fabricated on our porch in the summer of 1977 and had to be protected from our very active toddlers. A few weeks later the little monster was up and rotated by a KR500 in elevation and KR400 in azimuth. Moisture in the RX/TX relay box was eliminated only by using a pound bag of recyclable sodium stannate desiccant in the box after drain holes and heaters failed.

"While I lengthened the booms, the next big improvement came in summer 1983 when I set up a quasi antenna range to modify the DL6WU Yagi for a 240 Ω impedance. Five years later, metallic booms were introduced. 2.5 mm enameled copper directors, which miraculously showed no weathering up till now, were put through the booms and affixed with acrylic cement and the

This Month

September 13-15	ARRL September VHF QSO Party
September 14	Moderate EME Conditions*
September 20-21	ARRL International EME Competition
September 20-21	ARRL 10 GHz and Up Contest
September 21	Moderate EME Conditions*
September 22	144 MHz Fall Sprint
September 30	222 MHz Fall Sprint

*Moon data from W5LUU

Gene Zimmerman, W3ZZ ♦ 33 Brighton Dr, Gaithersburg, MD 20877 ♦ w3zz@arrl.org; (301-948-2594)

JAN BRUNIER, DL9KR

Figure 2 — The DL9KR 16-Yagi EME antenna system.

feed harness wire diameter was increased to 3 mm. PTFE (Teflon) spacers and supports were placed at the voltage nodes and Yagi spacing is now 2.5 λ. This elastic structure has since withstood 'century' storms with only minor damage. At the same time the transmit feedline was changed to 1⅝ inch Heliax under nitrogen pressure for moisture protection. Total transmitting line loss was and still is 0.4 dB (see Figure 2).

The Receiver

"In September 1977 I was happy to see 6.5 dB of sun noise with a BFT66 preamp in the shack. Soon the 'state of the art' advanced to the ubiquitous NE645 while K2UYH was experimenting with MSC GaAsFETs. Following JA1VDV's published circuit, I eventually obtained a V244 from a German source for approximately $200 US but inadvertently blew it up soon afterwards. I swore to myself I'd never experience such a disaster again and I haven't.

"Soon my friend DJ8QL and I began experimenting and measuring the multitude of MGF types that appeared in the 80s and later concentrated on new input circuit designs. We did not then know about the pitfalls of noise measurements and had no explanation for the *sometimes* negative noise figures using an HP 346B source. The late DJ9BV's *DUBUS* articles provided the key clarification. Rainer also described a relatively simple-to-build PANFI while DF7VX and DC3XY provided circuit boards and special items so my vintage G4COM device could now be replaced. Of course, these advances only make sense when losses ahead of the preamp are kept as low as possible. Here the winner was low loss open wire. Even this could be improved by exchanging the 3 mm copper wire with 10 mm aluminum tubing (DJ9BV again!). Achieving a low system temperature had become an obsession. Silver plating, solderless joints wherever possible, input cavities etc were and are on the agenda. My system temperature is in the 60 K range and lets me see a 7 dB noise increment when pointing from cold sky to ground (at –5° elevation). Echoes are audible with 7 W RF into the 28.4 dBd array thereby enabling QSOs with stations using a single long Yagi and 100 W. Naturally, I would have loved polarization switching to cope with Faraday effects but one can't have everything.

"The vintage and much modified R-4A (always using 400 Hz bandwidth) was replaced by a Kenwood TS-870 in 1998. I listen to signals with the 200 Hz BW setting at a pitch of 200 to 300 Hz. Digging for weak signals on 160 meters since 1963 probably helped train my ears for signals in the noise.

Transmitting

"Initially a German YD1332 was used in a stripline circuit but the tube didn't like me and flashed over every so often while producing a puny 400 W. After a long wait, Eimac supplied an 8938 plus socket. A new stripline amp now delivered a stable 750 W output. Later, a TV transmitter stage was acquired and is run way below its CCS ratings at 1500 W. I never used a sequencing circuit, opting instead for an auxiliary dc contact on the antenna relay that switches the dc supply to an early stage in the transverter. This aux contact closes only after the RF contact has already closed and vice versa, following the KISS principle.

Where's the Moon (and Stellar Sources)?

"In the early days, the Almanac and HO249 Height Reduction Tables (three of the latter for Moon, Sun and stellar sources!) made Az/El calculations possible. Half hour intervals and interpolation described the respective trajectory. The arrival of VK3UM's planning tool was a huge step forward. Its real-time tracking features are still used with manual control.

Keeping in Touch

"When I entered the scene, three important backbones were already in operation: K2UYH's newsletter in print, W1JR running the EME net on 14,345 kHz and VE7BBG as sked coordinator. Fortunately, K2UYH's NL (renamed *432 & Above*) persists, W4WD took over from VE7BBG in 1979 and K1RQG has been running the EME net since 1985. After W4WD's move to Utah, DL4EBY and K1RQG coordinated the skeds. Without the existence of the Internet, direct personal correspondence played an important role. My moonbounce column in *DUBUS* in 1981 and 1982 provided access to additional information. Of course, nowadays e-mail is a major factor but the importance of Al's NL and Joe as net control cannot be overestimated. Another important item was the establishment of biannual EME conferences and the papers resulting from them.

QSOs

"After hearing my own faint echoes early in February 1978, skeds were arranged and I5MSH was worked in one nerve-wracking session. The YD1332 was cooled by air from the 'back end' of a vacuum cleaner. Shortly it arced over and pulverized 3 fuses configured in series. But the fuse holders were carbonized and still provided some anode current, which resulted in big puffs of black smoke in the rhythm of the Morse code. Hours later when K2UYH's window had opened, he was worked for #2. People were after the 'new DL country' and WAC was completed in Nov 1978 due to the availability of YV5ZZ, ZE5JJ and KH6IHP.

"DXpeditioning had begun in the US (K2UYH, KL7WE, WØSD and others) and my WAS (#12, first outside the US) was completed in 1987. I had then worked 50 DX entities and never imagined that a DXCC would be feasible in my lifetime though chasing new stations, some of them in new grids, kept things interesting. Big signals such as K3NSS, W3IWI/K8HUH, VE3ONT and KP4I appeared from big dishes.

"One of the first European DXpeditions was G3YGF going to GM and GU. DF6NA presented OHØ, HBØ, EI and GI in a single-man show; the 'Five Bells Group' went to GD, TF and OY, and Russian travelers activated UC2 (EU) and UI8 (UK). NC1I led a group that did EME from UN HQ in New York. Lonesome GM6TKS aired ZB2, later repeated by DF2ZC. DG1PJ and DF5JJ were on from C6 and EA6, respectively, while ON5FF activated EA8. Another lone DXpeditioner, DJ5MN, used the lunar path from OM, 3A and ISØ. The 'Yota Sawe Group' took care of C3, TK, T7 and CU; a Spanish group gathered by EA3DXU, EA3UM and EA3EHQ put CN and EA9 on the moon, and the F6KSX group aired GJ. Ex-WB6NMT, now KG6UH, activated DU, HL and eventually HP. SMØERR made QSOs with 9M2 and 9M8 possible. SV1BTR was on briefly as SV9/SV1BTR. A Danish group put OX2K on the moon and SM2BYA produced a big signal from JW with a huge dish. DL8YHR was active from OJØ, 5A and D4. G4FRE and GØMRF joined the 'Five Star Group' and were active as 3B9C. DL9MS made CU available again. DL1YMK and Monika activated TF, CT3 and CX. K2UYH activated P43L. Eventually, the two Zdeneks, OK1DFC and OK3RM, gave me #99 and #100. All these expeditions 're-animated' the scene between the sometimes 2 year long intervals of 'nothing new DXCC-wise' and really deserve all our thanks!

What's Next?

"As a 'hunter/gatherer' I'm aiming at 1000 initials on 432 and 300 DXCC on 160 meters while enjoying any EME QSO with old friends. On CW, of course. And the fight for the last fraction of a dB goes on."

ON THE BANDS

There is much more to say than there is room to say it this month so please look also at next month's review of the summer season. Highlights are shared between 222 MHz E_s, the best summer to Japan in a long time on 6 meters, some outstanding conditions on 2 meters and a barnburner of a June VHF contest. I thank my readers for 175 e-mails covering conditions during June.

222 MHz E_s. Two reports of 222 MHz E_s during the VHF contest reached me. The key time was 1445-1455Z June 15. John, W5UWB (EL17ax) worked NØVZJ (EN35ge) at 1446Z and Paul, AA4ZZ (EM96) worked W5DDR (EM84) at 1455Z. Less than a handful of 222 MHz E_s contacts have ever been made.

6 meters. What a year for Japan on summer E_s this has been! Japan, which is rarely worked on E_s east of the Mississippi, has been a frequent visitor to all parts of the US. We find Han, JE1BMJ (QM05br) working into EN40 and EM00, 04, 09, 12, 13, 15, 23, 25, 42 on June 4-5 and into EN40, 41, 42, 52, 58, 61; EM12, 26, 27, 34, 35, 36, 48, 49, 50, 52, 54, 55, 58, 63, 64, 66, 68, 70; EL88; and DO61. The Weblog of Man, JL8GFB, (QN03) shows US contacts on June 9-13 and 28 throughout the country and in particular to the southeast and northeast. Lest you think that such contacts are common even via F2, Tac, JA7QVI (QM08) notes that prior to this June he had only worked three W3 stations on 6 meters ever. JAs were worked in the US at least on 11 days: June 4, 5, 6, 8, 9, 10, 11, 12, 13, 24 and 28. Of note are the first east coast E_s contacts to Japan by Al, K3TKJ (FM28) and Dave, N3DB (FM18) on June 20; first north Georgia E_s to JA by Neil, K4EA (EM74) on June 13; Lefty, K1TOL (FN44) and John, K1GUN (FN53) both Maine to Japan on June 28; Dan, NN7J (CN87) worked BG7WWF on the 28th, the first Chinese contact in the Northwest; and Charlie, VR1ØXMT, in Hong Kong worked SP8AWL, SP7CDG and SV2DCD, the first ever Hong Kong-Europe contacts on E_s (thanks W3EP). Large numbers of JAs were worked from non-west coast locations on many days particularly in Florida on the 13th by stations such as Terry, K4RX (EM70), Scott, W4SO (EL96) and Ken, AC4TO (EM60).

Europe was sketchy in the northeast but penetrated well into the south, southwest and midwest. The big days were June 27-28 with reports from K1HTV (FM18), W1JJ (FN41), K3CB (FM28), K3TKJ (FM28), N3DB (FM18), AA4H (EM86), K4QI (FM06), W4WRL (FM04), WB-4SLM (EM82), WZ8D (EM89), KØGU (DN70), KØTVD (EN21), KMØT (EN13), NØLL (EM09), WØWOI (EN22) and WAØKBZ (EM48). More than 28 DXCC entities were worked on the North Atlantic path including E77, EA, EA6, EA8, EI, DL, G, GI, GM, GU, GW, HBØ, I, ISØ, LA, LZ, PA, OE, OH, ON, OY, OZ, S5, SU, UR3, 4X, 5B and 9H. Highlights were the large number of northern Europeans, the unusual number of northwestern Midwestern stations (six noted here) and W1JJ working SU. Jay, KØGU (DN70) in CO worked 15 Europeans on 5 separate days: June 12, 23, 27, 28 and 30.

Transcontinental double hop or western US to the Caribbean occurred on at least 10 days: June 2, 4-10, 15, 25 and 27. Bob, K6QXY (CM88) reports KH6 into northern CA on 18 days in June; N3DB and K3TKJ report KH6 into the east coast US on more than half a dozen days.

2 meter E_s. Two meters was open via E_s on 5 separate days during June including both days of the ARRL VHF contest. I have dozens of reports that will appear next month from all parts of the country along with some maps. I will also introduce the possibility of tracking the results of such 2 meter openings so stay tuned.

Tropospheric Ducting. Tropo was not to be outdone by E_s in June. Several openings occurred particularly mixed with E_s during the VHF contest. Jim, K5YC (DM82) worked east into DM80, EM00, 10, 11, 20 and EL19 on June 1. Lee Ann, KD5HIZ (DM82) worked into EM11 the same day. Bill, WAØKBZ (EM48) worked widely from IA (EN32) to TN on the 13th. During the contest John, AA5JG (EM04) worked east to TN and north into IL, KS and MO on both 2 and 432. Paul, AA4ZZ (EM96) reports tropo west to EM29 and south to EM36 on June 15.

VHF Contest. More will appear next month and in the contest write-up later but suffice it to say 2008 far exceeded conditions ever seen in any ARRL VHF contest, even the excellent ones in 2006, 1996, 1987, etc. Six meters was open for E_s almost the whole contest in many places; 2 meters was open much of Sunday, June 15 for E_s and tropo with aurora the first day; all Q and multiplier records were broken on 6 meters. The exceptions were in the northeast and southern CA where conditions were relatively flat.

Aurora. Low solar activity or not, this is the first report of AU on 2 meters in a long time. Ron, KAØRYT (EN35ct) found DN86, 94; EN94, 50 and EM39 on June 14-15 during the contest.

HERE AND THERE

ARRL September VHF QSO Party. Tired of E-skip? This is the contest that could have some really good tropo conditions. The contest starts at 1800Z September 13 and ends 0300Z September 15. More details may be found in August 2008 *QST*, or at **www.arrl.org/contests/rules/2008/sepvhf.html**.

Water Grid DXpedition. Matthew, K2NUD, intends to operate as K2NUD/MM in water grid FM39 during the September VHF QSO Party on 6 and 2 meters and possibly 70 cm.

2007 ARRL International EME Competition. The first of three EME contest weekends is on 2304 MHz and above and starts September 20 at 0000Z and ends September 21 at 2359Z. Remember that there are awards for analog, digital and mixed mode operation; special rules for multioperator entries from separate locations within 50 km of each other, and specific rules for use of loggers and packet clusters. Rules are at **www.arrl.org/contests/rules/2008/eme.html**.

ARRL 10 GHz and Up Contest. The second weekend of this microwave contest begins at 0600 local time September 20 and ends at midnight local time Sunday, September 21. Operate no more than 24 hours total. Look at the August "World Above 50 MHz" column and **www.arrl.org/contests/rules/2008/10-ghz.html**.

Fall Sprints. The Southeastern VHF Society sponsors these popular short duration contests. 144 and 222 MHz Sprints are on September 22 and 30, respectively, from 7 to 11 PM local time. The other Sprints will appear in the October column. Scoring is now identical to the ARRL VHF QSO Parties except for rovers and there are new rules for introducing newcomers to VHF+ weak signal operation. Read the rules at **svhfs.org/fall_sprint_rules.htm**.

Pacific Northwest VHF Society Conference. The 15th Annual PNVHF Conference will be held at the Best Western Lake Front Hotel and Conference Center in Moses Lake, Washington, October 3-5, 2008. This is a good chance to meet your friends from the Northwest and enjoy an interesting conference. Further information is available at **www.pnwvhfs.org/administration/conference.htm**.

KB6KQ and W7JF SK. Norm Pedersen, KB6KQ, passed away on June 3, 2008. He was well known to the community for horizontal loop antennas [thanks N6ZE]. June *QST* noted the passing of Ken Erickson, W7JF (ex-W7JRG), a well known meteor scatter pioneer in the 1960s [thanks K7ICW]. We will miss them both. QST

W3UR

HOW'S DX?

UK DXpedition to Syria: YK9G — *Part 1*

Roger Western, G3SXW, and Nigel Cawthorne, G3TXF

How It All Started

It must be quite unusual for a major DXpedition to be started off by a random exchange of e-mails with a Royal Society of Great Britain (RSGB) President. But this is what happened with YK9G. Roger, G3SXW, was contacted by Angus, MM1CCR, following a holiday visit to Damascus, during which Angus had met Omar, YK1AO. Omar is Syria's best-known Amateur Radio operator. During the meeting Omar had put the idea to Angus: "Why doesn't the UK organize a DXpedition to Syria?" This was in late 2007.

Angus, MM1CCR, put Roger, G3SXW, in e-mail contact with Omar, YK1AO, and from there the YK9G project started. Given the potential significance of an operation from Syria (with it being in the top 20 most wanted countries on the West Coast) and after some prodding by G3TXF, it was decided that both G3SXW and G3TXF should both visit Damascus on a reconnaissance (recce) trip in order to find out if it indeed would be possible to mount a DXpedition to Syria.

G3SXW and G3TXF flew to Damascus in mid-January where we met both Omar, YK1AO, and Marwan, YK1AU. The two YKs were both most welcoming and helpful. During the short two day visit Omar and Marwan took us to see the YKØRJ club station, which would be the site of the operation. We were also shown hotels, which were near the station. The YKØRJ club station is housed in a Syrian Telecom Establishment (STE) building on the edge of Damascus. STE is the Syrian Post, Telephone and Telegraph (PTT) company. We were also able to inspect the roof of the building so that we could plan the antennas. There was already an HF tribander and 40 meter beam on the roof.

Most Wanted Countries

One of the main reasons we were excited to activate Syria was because it ranks so highly on the "'Most Wanted Country Survey."' This is conducted by *DX Magazine* (**www.dxpub.com/dx_mag.html**) each year and here we saw an extreme example of geographical differences. Of those three main concentrations of DXers, of course, YK was much less needed in Europe because it is so close. But in North America it is super-rare, especially on the West Coast.

Yes, it's the 16th "Most Needed Country" on the West Coast of North America! That is super-super-rare, mostly because it is a great distance from Syria, but also because mountains block low-angle take-off in that direction from Damascus, hampering not only previous DXpeditions but also ourselves. We would take advantage of any and every propagation opening to the West Coast whenever they occurred, but at this minimum of the sunspot cycle we were not too hopeful of being able to satisfy the demand — this is what transpired.

YKØRJ Club Station: SSTARS

Syria's first ever post-war Amateur Radio operator was Rasheed Jalal, YK1AA. The call of the Damascus club station (YKØRJ) is in his honor. The official International Amateur Radio Union (IARU) body in Syria is the Syrian Scientific and Technical Amateur Radio Society (SSTARS). It was SSTARS that would be the official host of the UK DXpedition. Later on during the operation we would meet many SSTARS members. All were keen on Amateur Radio but most were not active on the air. We were also to meet Hakmit, YK1AM, who is the son of Syria's original ham YK1AA.

The YKØRJ club station of the SSTARS is located within a Syrian Telecom Establishment (STE) building in Damascus.

From Two-man Team to UK DXpedition

The short "recce" visit to Damascus went well. There was, however, one significant change. G3SXW and G3TXF had gone to Damascus in order to plan what would have been a typical two-man operation. Omar, YK1AO, clearly had other ideas, however. Omar advised that given the nature of Amateur Radio in Syria, it would be better if there could be a "'group" of operators from the UK, rather than just two.

Omar assured us that the various permissions required would be obtained and that

In the shack at YK9G: **Roger, G3SXW; Nigel, G3TXF; Lionel, G5LP; Fred, G4BWP, and Rob, GM3YTS with the FT2000D station.**

Nigel, G3TXF, with Omar, YK1AO, and Marwan, YK1AU, who are hosting the YK9G team at the YKØRJ club station in Damascus.

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

Nigel, G3TXF; Fred, G4BWP, and Rob, GM3YTS, with hills toward the north visible behind.

we would receive an appropriate call sign for a DXpedition from the UK. This was originally to be YKØG, but in the event was changed to YK9G. We therefore returned home from our brief mid-January visit to Damascus with the objective of recruiting a small team for the UK CW DXpedition to Syria.

A detailed visit report was drafted, covering all the key issues of the planned DXpedition. Roger, G3SXW, got to work on the e-mails and within a couple of weeks three more top CW operators (Rob, GM3YTS; Fred, G4BWP, and Lionel, G5LP) had been recruited and had made a commitment to the YK9G operation.

Once the operators had been recruited, Omar was able to pass along the names and call signs of the operators that would be formally part of the YK9G operator group. By now it was early February. We were targeting being on the air in late March or early April.

Other YK DXpedition Operations

Although there is a small Amateur Radio population in Damascus, much of the YK activity is generated by the occasional DXpedition. In late 2007 there was a Greek DXpedition (YK9SV) to Syria's only island in the Mediterranean (Arwad AS-186; *QST*, Mar 2008). Several years earlier there had been DXpeditions to Damascus for some CQ World Wide Contests (YKØA in 1994 and YK9A in 2001). Omar, YK1AO, had been instrumental in every DXpedition operation from Syria.

Syria is not the sort of country where you can go and "do your own thing" for a DXpedition. Amateur Radio is alive and well in Syria but is only on a relatively small scale with Omar, YK1AO, being the driving force. Every visiting DXpedition has to operate from a designated STE location. Although we were to operate from the main club station in Damascus, the Greek DXpedition YK9SV operated from an STE facility on Arwad Island.

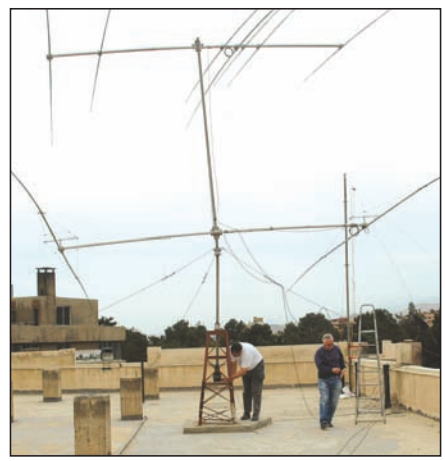
Trip Preparations

Once the team had been recruited, we had to agree on the dates for the operation. Omar advised us to avoid being in Damascus during an Arab Summit due to be held in late March. We therefore chose dates in early April and, once agreed, the four team members traveling from the UK each made bookings on the same Austrian Airlines flights via Vienna. Fred, G4BWP, would be traveling to Damascus from Dubai.

On the "recce" trip in January we had arrived, after some delays, at Damascus airport at 2 AM. This BMI flight via Ankara would be no good for the main trip if we were hoping to be met at Damascus airport at a sensible time of day. Other options included Syrian Arab Airlines, which also arrived in Damascus late in the day, and Austrian Airlines which has a daily service from London to Damascus, but via Vienna. All DXpeditioners know that changing planes en route can often lead to annoying delays with, or even loss of, luggage. However with Austrian Airlines the tight connection through Vienna worked fine in both directions.

Equipment Preparations and Packing

The antennas for the 30, 17 and 12 meter bands were assembled and checked before being finally packed. The ACOM1010 linear amplifiers were tested with the new Yaesu FT-2000D radio. Checklists were drawn up to ensure that nothing important was left behind. A Web site (**www.YK9G.com)** was set up for the trip and Marios, 5B4WN, provided help with setting up his *LogSearch* within the YK9G Web site.



Fred, G4BWP, and Roger, G3SXW, working on the roof-mounted antennas used by YK9G at the YKØRJ club station.

The YK9G team departing from London ended up taking some 14 pieces of heavy luggage. The two ACOM linears plus the FT-2000D with its accessories accounted for a good part of the weight. There were also two 30-17-12 meter antennas in a ski box. Fred, G4BWP, traveling from Dubai, brought a large heavy suitcase full of useful antenna mounting accessories, which proved valuable when setting up the antennas.

Early Morning Start from Heathrow

The meeting point for those traveling from the UK was Heathrow terminal 2 at 3:30 AM. Lionel, G5LP, drove down from Peterborough, Rob, GM3YTS, had stayed overnight *chez* G3TXF. Roger, G3SXW, arrived by taxi. It was an early start. Once we had checked in and paid for our not inconsiderable amount of excess baggage, however, the two-hop journey to Damascus on Austrian Airlines was problem free.

We were met in the customs hall in Damascus by one of Omar's contacts. Our 14 items of baggage were on trolleys and were wheeled past the customs officer who appeared to be expecting us. After a quick round of handshaking and smiles, we were whisked out of the customs hall where we also had met Omar, YK1AO, and Marwan, YK1AU.

Thanks to the highly efficient organization of Omar and Marwan we were then sped, together with all our luggage, in two large vehicles (one for us and one for our luggage) to the station where we unloaded the items which were to be left there and then we continued to the hotel.

Unlike on many other DXpeditions where it has been customary to try to get on the air as quickly as possible after arriving, on this occasion things were more orderly. After unloading the equipment at the station and our own stuff at the hotel, we agreed to call it a day. We arranged to meet Omar, YK1AO, at the station at 8 the following morning. The station set up and antenna work would then start in earnest. Meanwhile we all got a good night's sleep after what had been a pretty long day for everyone (except perhaps for Fred, G4BWP, from Dubai!).

In Part 2, the Syrian adventure continues with the set up of the station and the on-the-air operations. Until next month, see you in the pileups! — *Bernie, W3UR*

Photos courtesy of Nigel Cawthorne, G3TXF

SPECIAL EVENTS

Contact these stations and help commemorate history. Many provide a special QSL card or certificate!

Aug 9-Aug 10, 1600Z-1900Z, Plano, TX. Plano Amateur Radio Klub, K5PRK. PARK is celebrating their 35th anniversary as a club. 28.350 21.300 14.255 147.18. QSL. PARK, PO Box 860435, Plano, TX 75086. **www.k5prk.org**

Aug 14-Aug 17, 1300Z-2100Z, Sycamore, IL. Kishwaukee Amateur Radio Club, W9S. Commemorating Steam Power on the Farm. 7.043 CW 14.267 7.267 3.988. Certificate. Bob Yurs, W9ICU, 1107 Commercial St, Sycamore, IL 60178. **www.w9icu.com**

Aug 16-Aug 17, 1500Z-2100Z, Offutt AFB, NE. Strategic Air Command Memorial Amateur Radio Club, KØGRL. Air Force Week, Offutt air show, and Gen Lemay's call sign. 14.247 7.247. QSL. SACMARC, PO Box 1292, Bellevue, NE 68005-1292. **www.sacmarc.org**

Aug 29-Sep 1, 1500Z-2000Z, Edgerton, WI. TriCounty Amateur Radio Club, W9MQB. 52nd Annual Rock River Steam Thresheree. 14.275 7.280 3.900. QSL. TCARC - W9MQB, PO Box 411, Johnson Creek, WI 53038. **tcarc@w9mqb.org**

Aug 30-Sep 1, 1900Z-1900Z, Paradise, AZ. Cochise Amateur Radio Association, K7RDG. 29th Anniversary of our trek to Ghost Town of Paradise. 21.305 18.115 14.265 7.230. Certificate. Cochise ARA, PO Box 1855, Sierra Vista, AZ 85636-1855. **www.k7rdg.org**

Aug 31-Sep 1, 1330Z-2030Z, Prairie Grove, AR. KD5TLH. Labor Day Arts and Craft Fair. 146.955 14.260 7.260 7.275. QSL. Joe Dunn, 12358 West Ervan Beeks Rd, Farmington, AR 72730. **bjoedunn@hotmail.com**

Sep 1, 1200Z-2359Z, Nutley, NJ. Robert D. Grant United Labor Amateur Radio Association, N2UL. CQ Labor Day from N2UL. 28.420 21.360 14.260 449.975/ W2LI. Certificate. RDGULARA c/o WA2VJA, 112 Prospect St, Nutley, NJ 07110-0716.

Sep 1-Sep 7, 2300Z-0300Z, West Alexander, PA. Washington Amateur Communications, WA3COM. West Alexander Fair. 21.375 18.140 14.250 7.235. QSL. c/o Ed Oelschlager, N3ZNI, 60 Carl Ave B-2, Eighty Four, PA 15330. **n3tir@arrl.net**

Sep 4-Sep 8, 1300Z-0300Z, Hebron, CT. Newington Amateur Radio League, W1H. Promoting Amateur Radio and ARES. 28.355 21.355 18.155 14.255. QSL. Richard Lawrence, 335 Lloyd St, Newington, CT 06111. **kb1dmx@arrl.net** *or* **www.narl.net**

Sep 5, 1400Z-2359Z, Marion, OH. Marion Amateur Radio Club, WW8MRN. Marion Popcorn Festival. CW 14.043 7.043 SSB 14.240 7.240. Certificate. Richard Carey, 5211 Berry Rd, Marion, OH 43302. **www.marionhamradio.org**

Sep 6, 1400Z-2000Z, Corwin, OH. West Chester Amateur Radio Association, W8C. 120th anniversary of the circus train wreck in Corwin. 146.55 14.250 7.250. QSL. WCARA, PO Box 913, West Chester, OH 45071. **n8miq@yahoo.com**

Sep 6-Sep 7, 1200Z-1600Z, Bear Island Lake Winnipesaukee, NH. Merrimack Valley YMCA, W1Y. 100 years of Camping at Camp Lawrence and Camp Nokomis. 14.250 7.225 3.850. QSL. Michael Murphy, WA1VKO, Box 1024, East Hampstead, NH 03826. **wa1vko@arrl.net**

Sep 6-Sep 7, 1600Z-0000Z, West Chester, OH. West Chester Amateur Radio Association, WC8VOA. Ohio State Parks On the Air. 21.300 14.250 7.200 3.825. Certificate. WC8VOA, PO Box 913, West Chester, OH 45071. **parks.portcars.org** *or* **www.wc8voa.org**

Sep 6-Sep 8, 1400Z-0000Z, Devil's Tower, WY. Northeast Wyoming Amateur Radio Club, W7W. 102nd Anniversary of the dedication of Devils Tower. 28.326 21.326 14.326 7.226. Certificate. NE Amateur Radio Club, PMB 226-501 South Douglas Hwy Ste E, Gillette, WY 82716. **ne7wy@yahoogroups.com***

Sep 7, 1400Z-1900Z, Brooklyn, NY. Kings County Repeater Association, KC2RA. 9/11 Memorial Event from OWL's Head Park in Brooklyn. 28.430 14.295 7.250 3.900. QSL. Kings County Repeater Association, 9/11 Memorial Event, PO Box 280288, Brooklyn, NY 11228-0288. **www.kc2ra.com**

Sep 12-Sep 14, 1400Z-0100Z, Salida, CO. Hammin' Sams Amateur Radio Good Sam Chapter, KØA. Celebrating the 40th Anniversary of Colorado State Good Sam Samborees. 21.345 14.245 7.245 3.845. Certificate. Galen Steele, AGØA, 1620 Hathaway Dr, Colorado Springs, CO 80917. **www.coloradogoodsam.org/ColoradoSamboree2008.htm**

Sep 12-Sep 14, 1500Z-0300Z, Indianapolis, IN. Indianapolis Motor Speedway Amateur Radio Club, W9IMS. Inaugural running of the Indianapolis MotoGP. 21.340 14.240 7.240 3.840. QSL and certificate. Indianapolis Motor Speedway ARC, PO Box 18495, Indianapolis, IN 46218-0495. **www.w9ims.com**

Sep 13, 1400Z-2000Z, Hammond, LA. Southeast Louisiana Amateur Radio Club, K5R. 3rd Anniversaries of Hurricanes Katrina and Rita. 14.250 7.250. QSL. Scott Hernandez, K5R, 957 Nancy St, Mandeville, LA 70448. **groups.yahoo.com/group/K5R**

Sep 13, 1600Z-2300Z, San Diego, CA. USS *Midway* CV-41 Museum Radio Room, NI6IW. National POW-MIA Recognition Day and Commissioning of the USS *Midway* (CVB 41) in 1945. SSB 14.325 7.250 CW 14.060 7.040 BPSK 7.070-7.080 MT63 14.109 7.037 RTTY 14.080 7.080. QSL. USS *Midway* CV-41 Museum Radio Room, 910 N Harbor Dr, San Diego, CA 92101. **af6ha@yahoo.com**

Sep 13-Sep 14, 1300Z-2200Z, Elmira, NY. Elmira Radio Association, K2NSM. National Soaring Museum — Community Soaring Day. 14.260 07.260 18.160. Certificate. ARAST, PO Box 614, Horseheads, NY 14845-0614. **www.wa2ntk.com/k2nsm**

Sep 13-Sep 14, 1600Z-2000Z, Hancock, MI. Lake Effect Amateur Radio Club, W8Q. Michigan's Copper Mining Heritage/100th Anniversary of the Quincy Shaft #2 Rockhouse. 28.368 14.268 14.070 7.268 7.105 (QRS!) 146.505. QSL and certificate. John Forslin, c/o KD8DKU, 36 Southfork St, Marquette, MI 49855. **www.lakeefectarc.info/w8q-quincy**

Sep 13-Sep 21, 0100Z-2359Z, San Bernardino, CA. Citrus Belt Amateur Radio Club, W6A through W6Q. Route 66 On-The-Air. 21.366 14.266 7.266 3.866. Certificate. Citrus Belt Amateur Radio Club, PO Box 3788, San Bernardino, CA 92413. *17 clubs are participating in this event.* **route66ontheair2008@yahoo.com** *or* **www.w6jbt.org**

Sep 18-Sep 21, 0000Z-2359Z, Santa Ana, CA. Anaheim Police Radio Club, K6P. POW-MIA Recognition Day. 21.350 18.150 14.253 7.250. QSL. Mark McMullen, KM6HB, PO Box 27271, Santa Ana, CA 92799. **km6hb@arrl.net**

Sep 20, 1400Z-2100Z, Brookhaven, MS. Southwest Mississippi Amateur Radio Club, W5WQ. Old Brook Festival, celebrating the 150th anniversary of the city of Brookhaven. 14.270 7.270. QSL. Homer Richardson, 1545 Friendship Ln NW, Brookhaven, MS 39601. **w5wq.net**

Sep 20, 1500Z-2100Z, Elizabethtown, NC. Bladen Amateur Radio Society, W4BLA. 16th Annual Dublin Peanut Festival — Community Fun Day. 146.985 14.250 17.250 3.900. QSL. Bladen Amateur Radio Society, 5342 NC Hwy 87 W, Elizabethtown, NC 28337. **ki4syk@aol.com**

Sep 20, 1600Z-2000Z, Ravenna, OH. Portage Amateur Radio Club, K8B. Ravenna Balloon-A-Fair. 28.390 21.295 14.195 7.195. Certificate. Gregg Gary, WB8YYS, PO Box 6336, Akron, OH 44312. **wb8yys@arrl.net**

Sep 20-Sep 21, 1500Z-2100Z, Yonkers, NY. Yonkers Amateur Radio Club, W2YRC. 60th anniversary of club affiliation with ARRL. 14.250 7.055. QSL. Lou Giovannetti, KB2DHG, 1120 Warburton Ave Apt 4D, Yonkers, NY 10701. **www.yarc.org**

Sep 20-Sep 21, 1600Z-0400Z, Sharpsburg, MD. Antietam Radio Association, Inc, W3CWC. Commemorating the Battle of Bloody Lane at Antietam Battlefield. 14.257 7.168 9.903 147.09. QSL. Page Pyne, WA3EOP, 204 N Locust St, Apt 2S, Hagerstown, MD 21740-4051. **www.w3cwc.org**

Sep 20-Sep 26, 0100Z-2359Z, Rockwell Collins Amateur Radio Clubs. 75th Anniversary of Collins Radio. 28.455 28.050 21.385 21.050. QSL. *Collect 4 or more QSLs from 4 different facilities for special certificate — mail to WØCXX. QSLs will be returned. Complete list of frequencies and info at* **w5rok.us** *or* **w0cxx.us**

Cedar Rapids, IA. NØCXX. Rockwell Collins Amateur Radio Club, North Campus, 10211 Hall Rd, Cedar Rapids, IA 52411.

Melbourne, FL. W4CRC. Rockwell Collins Amateur Radio Club, 1874 Palmer Dr, Melbourne, FL 32935.

Toulouse, France. F6KNZ. Rockwell Collins Amateur Radio Club, 6 avenue Didier Daurat, Blagnac, France

Tustin, CA. W6CXX. Rockwell Collins Amateur Radio Club, Southern California Chapter, 14192 Franklin Ave M/S 550-100, Tustin, CA 92780.

Cedar Rapids, IA. WØCXX. Rockwell Collins Amateur Radio Club, South Campus, HQ Station, 10211 Hall Rd, Cedar Rapids, IA 52411.

Maty Weinberg, KB1EIB ♦ Special Events ♦ events@arrl.org

Richardson, TX. W5ROK. Rockwell Collins Amateur Radio Club, PO Box 833807 Mail Stn 461-290, Richardson, TX 75083-3807.

Sep 20-Sep 28, 0000Z-0000Z, Mitchell, IN. Hoosier Hills Ham Club, K9P. 63rd Annual Persimmon Festival. 28.450 21.350 14.250 7.250. Certificate. Tim Miller, 1021 Old State Road 450, Bedford, IN 47421. **k9us@att.net**

Sep 21-Sep 28, 0000Z-2359Z, Oxford, MS. University of Mississippi Amateur Radio Club, W5UMS. Presidential Debate at the University of Mississippi. SSB 21.250 14.250 7.250 3.860 CW 21.050 14.050 7.050 3.550 PSK RTTY. QSL. University of Mississippi Amateur Radio Club, PO Box 276, University, MS 38677. *No SASE required for QSL*. **www.w5ums.org**

Sep 26-Sep 28, 1200Z-2100Z, Hartford, CT. Veterans of Foreign Wars, Department of CT, W1V. Saluting Veterans from WWII thru Iraqi Freedom. 28.355 21.355 18.155 14.255. Certificate. Ted Ferreira, 76 Bolton St, Manchester, CT 06042. **wa1nxc@arrl.net**

Sep 27, 1300Z-2200Z, Slidell, LA. Ozone Amateur Radio Club, W5SLA. Celebrating 44 years of community service and radio fun. 14.257 7.120. Certificate. Michael White, 404 Holmes Dr, Slidell, LA 70460. **www.w5sla.net**

Sep 27, 1700Z-2200Z, Mohawk, NY. Ft Herkimer Amateur Radio Association, Inc, W2FHA. 10th Anniversary of the Town of German Flatts Living History Weekend. 14.240 7.240. Certificate. Christopher L. Bouck, 28 W State St, Dolgeville, NY 13329. **cbouck01@twcny.rr.com**

Sep 27-Sep 28, 0000Z-1600Z, Greenville, MI. Riverside Radio Amateurs, K8O. Klackle Orchard's Fall Fun Festival. 14.270 14.045 7.270 3.940. Certificate. David Sailer, 313 Hanover St, Belding, MI 48809. **www.saranac.k12.mi.us/rra**

Sep 27-Sep 28, 1300Z-2100Z, Blue Ridge Bonanza from the following locations. QSL. Ray Crampton, 1670 Catawba Rd, routville, VA 24175. **www.w4ca/blueridge**

Roanoke, VA. Roanoke Valley Amateur Radio Club, W4CA:

Rockfish Gap (MP0). 14.225 7.225
Bonanza Buena Vista (MP45.6). 14.230 7.230
Natural Bridge (MP 81.6). 14.235 7.235
Apple Orchard (MP 76.5). 14.240 7.240
Peaks of Otter (MP 84). 14.245 7.245
Mill Mountain Star (MP 121). 14.250 7.250
Mabry Mill (MP 176). 14.255 7.255
Groundhog Mountain (MP 188.8). 14.265 7.260
Fancy Gap (MP 199.5). 14.270 7.265
Blue Ridge Music Center (MP 213). 14.275 7.270

Winston Salem, NC. Forsythe Amateur Radio Club, W4NC

Cumberland Gap (MP 217.5). 14.280 7.275
Linville Falls (MP 317.4). 14.285 7.280
Mount Pisgah (MP 408.6). 14.290 7.285

Sep 27-Sep 28, 1400Z-0200Z, Windsor, CT. Hampden County Radio Association and the Vintage Radio and Communications Museum of CT, W1VCM. Windsor's 375th Birthday. 28.400 21.360 14.260 7.260. QSL. HCRA W1VCM, PO Box 562, Agawam, MA 01001. **www.vrcmct.org** *or* **www.hcra.org**

Sep 27-Sep 28, 1600Z-1600Z, Mount Vernon, OH. Mount Vernon Amateur Radio Club, K8EEN. Fifty Year Affiliation with ARRL. 28.340 14.240 7.240 3.840. Certificate. E. Mike McCardel, 23449 Bear Run Rd, Danville, OH 43014. **www.mvarc.net**

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, you must be an Amateur Radio club, and use the ARRL Special Events Listing Form, at **www.arrl.org/contests/spevform.html**, or if you prefer, forms are available via the Internet (**info@arrl.org**), or for an SASE (send to Special Requests, ARRL, 225 Main St, Newington, CT 06111, and write "Special Events Form" in the lower left-hand corner). Off-line completed forms may be mailed, faxed or e-mailed to ARRL, Attn: Special Events. Submissions must be received by ARRL HQ no later than the 1st of the second month preceding the publication date; that is, a special event listing for **Nov** *QST* would have to be received by **Sep 1**. In addition to being listed in *QST*, your event will be listed on the ARRLWeb Special Event page. QST

ARRL Emergency Communications Course Honor Roll

We honor the following individuals who have successfully completed the ARRL Emergency Communications Course, by completing the third course in the training series. These individuals successfully completed the Level 3 course between April 1 and June 30, 2008.

If you are interest in taking an Amateur Radio Emergency Communications Course, or one of our other ARRL online courses, visit **www.arrl.org/cep/**.

Tom Appleby, KI4PPR
Wesley Argue, WAØAA
David Barton, AI4GF
Chuck Basham, AI4KA
Robert Beardsley, KE5HRK
Dorothy Beatley, KG6FUY
John Bellows, KØQB
David Brandt, KE6IMN
Robert Carter, W4NNN
Douglas Carter, N4FPS
Ken Caruso, KS4NX
Frank Cassella, KB1IFX
Cliff Cheng, WW6CC
David Cicconi, N3DGC
Steve Conklin, AI4QR
Jennings Cox, KA4OTB
Lloyd Craft, KA3MSE
Gerry Dalton, W5MAY
Alexander Davies III, W4AVD
Gregory Davis, KI4NWD
Charles Davis, WA4UJC
Paul Eakin, KJ4G
Carole Edwards, WQ4V
Spencer Edwards, KZ4J
Vernon Eskew, KB9VKR
Truett Frazier, KB4ZGN
Charles Grandgent, K1OM
Gary Green, W4GRE
Merle Growden, KD6FBT
Gregory Guthrie, KD5WBC
Michael Harla, N2MHO
Kendall Harris, VE3MNY
Hubbard Harvey, N4HUB
Deborah Hicks, AD2H
Will Hicks, WI1L
Christopher Hodgdon, KE5IGO
Michael Kelly, WA9YNJ
Andrew Kitzman, K4CEO
Frank Knox, KS5F
Robert Larsen, KE7GB
Harold Leahy, KA1HII
Kerry Lemley, AI4CW
Lowell Lucore, W3HZ
Harry MacMullan, KI4ONE
Harley Maines, K8HM
Ed Manley, W4AGA
Louis Manziano, WA2FPO
Stace McRae, NN5TX
Phillip Michael, AI4YD
Ken Moore, K7DOW
James Moore, AB4WL
Steven Pituch, W2MY
Andrew Podner, N5AMP
Ivan Proctor, KC2NXC
Henry Prosser, K4HCP
David Ruby, KAØFBL
William Schmitt, KI4JOG
Trey Shannon, W5JOT
Adam Shirley, KI4WQD
David Smith, AD8D
Jim Spaulding, WØUO
Mary Starnes-Saunders, KI4JOO
Charles Stewart, NØPRZ
Craig Thighe, WØCLT
Jo Ann Thomas, AA9YT
Beverly Tipton, KI4JTV
David Warner, KA7IJK
Ricky Whittington, KD4AST
Jim Wooddell, K7WFR QST

www.arrl.org/cep/

AMATEUR RADIO WORLD

In June, Germany hosted both HAM RADIO 2008 and the IARU Administrative Council Annual Meeting.

HAM RADIO 2008

HAM RADIO 2008 in Friedrichshafen, Germany was June 27-29. With more than 17,000 attending, it is billed as Europe's biggest Amateur Radio exhibition. Held annually in the Lake Constance region, this is the 33rd international Amateur Radio exhibition and the 59th year of the Lake Constance Convention of Radio Amateurs, sponsored by the Deutscher Amateur Radio Club (DARC). Among the many programs and exhibits, this year's event included an amateur satellite theme and a big rally for young hams — as well as young prospective hams — with almost 20 activities for youngsters to experience the excitement of Amateur Radio on their own. More than 100 school teachers took part in special training courses to encourage use of Amateur Radio in their classrooms.

Each year, a contingent from ARRL attends HAM RADIO in Friedrichshafen to greet non-US members and to interact with other national radio societies. ARRL also supports DXCC card checking at its booth, a very popular activity among the international community that travels to this large show. According to event organizers, 180 exhibitors from more than 30 countries made the trip to HAM RADIO 2008, with almost 300 booths in the flea market.

HAM RADIO 2009 is scheduled for June 26-28, 2009 in Friedrichshafen.

BOB INDERBITZEN, NQ1R

A father and his daughter test out some of the radios on display at HAM RADIO 2008.

IARU Administrative Council

The Administrative Council (AC) of the International Amateur Radio Union held its Annual Meeting on June 24-25, 2008 in Konstanz, Germany, just prior to HAM RADIO 2008. Topping the agenda was the consultative process leading to nominations for IARU President and Vice President for the five-year term beginning on May 9, 2009. Current IARU President Larry Price, W4RA, announced in 2007 that he was not available to serve an additional term. The AC agreed that Vice President Tim Ellam, VE6SH, and Region 1 President Ole Garpestad, LA2RR, are suitably qualified to serve as IARU President and Vice President, respectively. Their nominations will be offered to the Member Societies for ratification.

The AC conducted a comprehensive review and updated the working document that defines the additional spectrum requirements of the Amateur and Amateur Satellite Services. Requests from the amateur satellite community for support of additional allocations were considered and referred to the IARU Satellite Adviser for additional information.

IARU International Coordinator for Emergency Communications Hans Zimmermann, HB9AQS/F5VKP, presented his report in person to the AC. He noted the outstanding performance of radio amateurs in China who responded to the recent tragic earthquake emergency. The Council also received reports of the other IARU international coordinators and advisers. The AC also heard a progress report from an ad hoc committee that is investigating the future role and structure of the IARU.

Region 1 representatives offered a resolution seeking to improve the operating standards of radio amateurs; this was adopted by the Council. The AC endorses and recommends the principles set out in the booklet *Ethics and Operating Procedures for the Radio Amateur* by John Devoldere, ON4UN, and Marc Demeuleneere, ON4WW, and encourages each IARU Region to consider this booklet, with a view to adopting it, including any regional variations that might be felt appropriate.

The Council also commissioned a study of the international QSL bureau system. The study will seek input from Member Societies on the problems they face in light of escalating postage and other expenses, as well as the anticipated impact of electronic confirmation systems such as the ARRL's Logbook of The World (LoTW).

The AC reviewed and renewed the three-year strategic plan for the development of support for Amateur Radio frequency allocations for the period 2008-2011. The principal focus is on preparations for the 2011 World Radiocommunication Conference (WRC-11), especially the attainment of an amateur allocation in the vicinity of 500 kHz.

The AC reviewed the 2009-2011 budget, as presented by the International Secretariat (ARRL). It includes provision for financial contributions from the three regional organizations to defray a portion of the expenses, in accordance with previously adopted policy.

The upcoming implementation of the worldwide exclusive allocation of 7100-7200 kHz that was adopted at the 2003 WRC and set to begin on March 29, 2009, was noted, and the many contributors to this achievement were recognized.

The Council selected *Amateur Radio: Your Resource in Disaster and Emergency Communication* as the theme for the next World Amateur Radio Day, April 18, 2009.

Each of the three IARU Regions presented status reports that the AC received and discussed. The next regional conference will be that of Region 1, to be held in Cavtat, Croatia in mid-November 2008. The next scheduled meeting of the IARU Administrative Council will be held in Christchurch, New Zealand in October 2009. QST

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

WB8IMY

ECLECTIC TECHNOLOGY

Communicating with a "Whisper"

Dr Joe Taylor, K1JT, is perhaps most famous in the Amateur Radio community for his *WSJT* software suite for *Windows*. *WSJT* has revolutionized the art of bouncing signals off the lunar surface, or the trails of meteors. (Yes, Virginia, hams do this stuff!) It offers several sound-card-based digital modes that make it possible to do these amazing tricks without the need for huge antenna arrays or 1000+ W. If you've never tried this free software, go to **physics.princeton.edu/pulsar/K1JT/** and see what you've been missing.

Dr Taylor's latest contribution is *WSPR*, affectionately known as "Whisper." This application uses your sound card and SSB transceiver to create signals with strong forward error correction and narrow band 4-FSK modulation. Whisper isn't a conversational mode. That is to say, you won't be using it to discuss the weather or your latest antenna configuration. Instead, amateurs are using it to exchange basic QSO information at very low signal levels — down to about –27 dB in a reference bandwidth of 2500 Hz.

Most of the Whisper activity is taking place on 30 meters, specifically at 10.1386 MHz USB. Power levels are typically at a "whisper" as well — if you're running more than 5 W, you're way too loud. See the *WSPR* guide at Joe's Web site, as well as the guide created by Andy O'Brien, K3UK, which you'll find at **www.frenning.dk/OZ1PIF_HOMEPAGE/Whisper_Guide.html** (case sensitive).

The Rise of the Femto Cells

Here is another one of those I-gotta-get-me-one-of-these products. The Samsung Ubicel represents what is known as a *Femto Cell*. The Femto Cell acts like a miniature cell site installed within your home. You simply place the little box in an out-of-the-way location and plug it into your broadband Internet (assuming you have it). The Femto Cell communicates with your cell phone in the normal fashion, exchanging voice calls, text messages, etc. All the data travels to and from the Internet, but as far as your cell phone is concerned, it is "talking" to a cell site. This is a great way to cure lousy coverage in localized areas, like my home! Sprint is offering this technology now and AT&T is in the test phase.

The Samsung Ubicell—one of the first Femto Cells on the market.

We have a similar capability in dual-band VHF/UHF transceivers that offer crossband repeat functions. I wonder how many hams actually use crossband repeat to temporarily fill gaps in coverage, especially during public service events? Or is this one of those transceiver bells and whistles that is usually forgotten?

Rain Power

Just when you thought we couldn't find another way to generate power, scientists from CEA/Leti-Minatec in Grenoble, France have developed a system that recovers the vibration energy from a piezoelectric structure impacted by a falling raindrop.

This is not a joke.

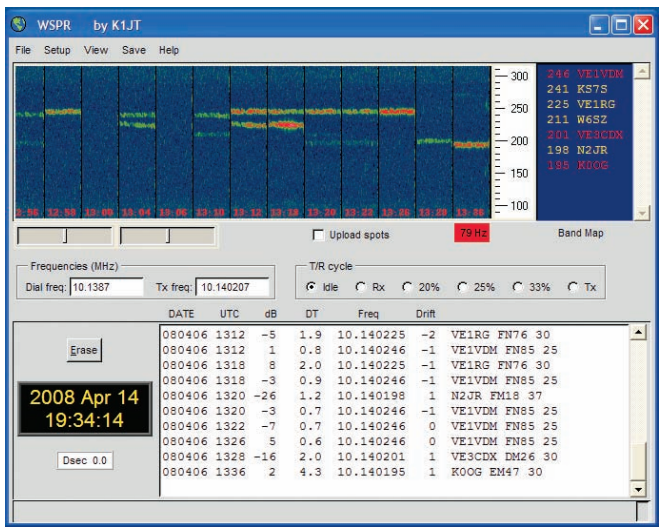
The system works with raindrops ranging in diameter from 1 to 5 mm, and simulations show that it's possible to recover up to 12 mW from one of the larger "downpour" drops.

To capture the raindrops' mechanical energy, the scientists used a PVDF (polyvinylidene fluoride) polymer, a piezoelectric material that converts mechanical energy into electrical energy. When a raindrop impacts the 25-micrometer-thick PVDF, the polymer starts to vibrate. Electrodes embedded in the PVDF are used to recover the electrical charges generated by the vibrations.

Areas that receive high amounts of annual rainfall could conceivably use such a system to supplement their power needs.

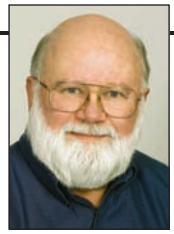
A Search Engine for Electronic Components

John Rehak, N6HI, passed along this handy nugget. It is a search engine for parts: **http://octopart.com**. You simply enter a part number and Octopart hunts down sources, prices, datasheets and more! QST



***WSPR* software by Dr Joe Taylor, K1JT, listens way below the noise for digital "whispers."**

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



K2TQN

OLD RADIO

Vacuum Tubes, from the Beginning?

I'm always reading my old magazines and found this month's subject in the February 1933 issue of *Radio-Craft*, a Gernsback publication.

An article caught my eye, titled: "50 Year Old Edison Lamp used in Receiver." I used some mental math subtracting 50 from the magazines date, 1933, and figured out it indicated 1883. That's quite a few years before radio and even more years before we started using tubes.

I have repeated the article here:

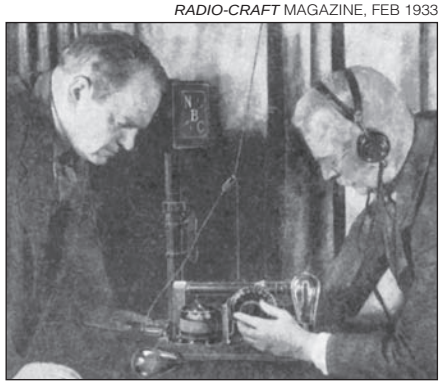
Has radio really advanced? Is present-day equipment really more sensitive, and does it really give better quality than the older radio equipment? These questions are most conveniently answered by referring to the two photographs shown.

It seems that about 50 years ago, Thomas Alva Edison discovered that if a cold metallic plate of some sort be placed around the filament of his incandescent lamp, there would be a flow of current from the filament to the plate. This effect, as will be readily recognized, is the fundamental principle of our modern vacuum tube. In order to obtain qualitative as well as quantitative data, Edison built several such "radio tubes," and one of them is shown in the photographs.

The original model of Edison's lamp was recently connected in a double-circuit tuner by the National Broadcasting Co. They picked up a signal from WJZ on the little receiver and fed the output to the input of WEAF for rebroadcasting purposes. Listeners all over the country state that the reproduction was as good as the ordinary programs. Dr. Clayton H. Sharp, well-known scientist, is shown tuning the set (which has a range of about one-half mile) while O. H. Caldwell, President of the New York Electrical Society looks on.

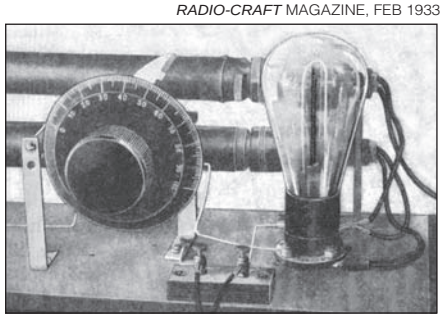
Now, radio men, do you think radio has advanced in the past fifty years?

RADIO-CRAFT MAGAZINE, FEB 1933



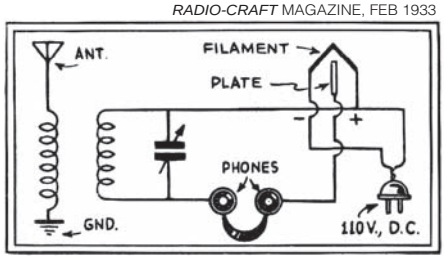
Left, Dr Orestes H. Caldwell, and Dr Clayton H. Sharp tuning the simple receiver with the 50 year old Edison tube.

RADIO-CRAFT MAGAZINE, FEB 1933



As published in the article: **The lamp has a carbonized bamboo filament surrounded by two upright thin wires which Mr. Edison used as the plate. The schematic circuit of the set is shown: it is simple, and was run directly off the 110-volt D. C. line. The large resistors shown were used to gradually bring the filament voltage up to 110-volts.**

RADIO-CRAFT MAGAZINE, FEB 1933



Schematic diagram of the double circuit receiver.

Who were these men, I asked myself. I first thought this might be a joke. But research showed them to be major electrical and radio pioneers of their time. Dr Clayton H. Sharp was a founder of the Illuminating Engineering Society of North America and was its president in 1907. Dr Orestes H. Caldwell was a member of the Federal Radio Commission (now known as the FCC) during the Radio Act of 1927 Congressional hearings, and later was editor of *Electronic Industries* magazine.

So my conclusion is this: I believe this story. Like many inventors, Edison made discoveries long before they would become useful or needed. If anyone has one of Edison's early bulbs, I would be interested to hear your results if you duplicate this experiment. By the way, Edison's discovery was called "The Edison Effect." Edison shared his discovery with Ambrose Fleming, the professor of electrical engineering at University College in London. And the rest is history. Fleming's patent #803,684, *Instrument for Converting Alternating Electric Currents into Continuous Currents*, was issued on November 7, 1905. This patent and other interesting information will be found on **www.k2tqn.com/**.

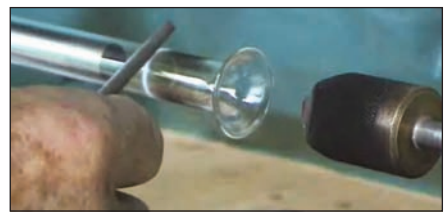
I further believe that some answers to our current energy problems might be found by reexamining earlier inventions.

HOW ARE TUBES MADE?

I received an interesting e-mail from Jim Hanlon, W8KGI, titled "Making vacuum tubes by hand." He went on to say, "This is a 17 minute video that I found fascinating."

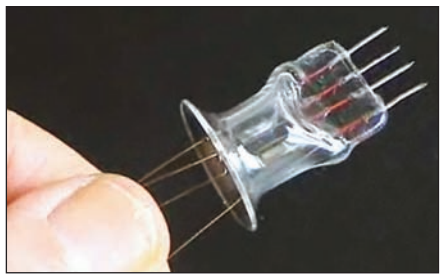
I clicked on the link he supplied and also found it fascinating. Some Internet searching revealed that it was apparently made by Claude Paillard, F2FO. I had difficulty reading his Web pages because they are in French, but thankfully this excellent video has only music playing as he masterfully creates triode radio tubes. No voice is needed to fully understand

1 Heating the glass.



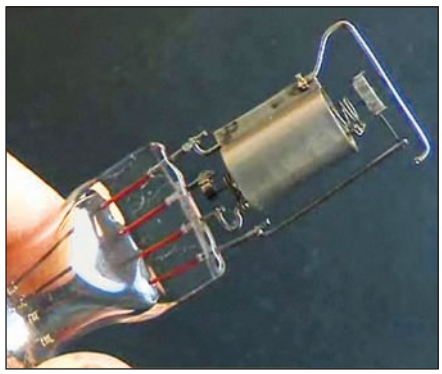
2 Flaring the hot glass.

John Dilks, K2TQN ♦ 125 Wharf Rd, Egg Harbor Township, NJ 08234-8501 ♦ k2tqn@arrl.org

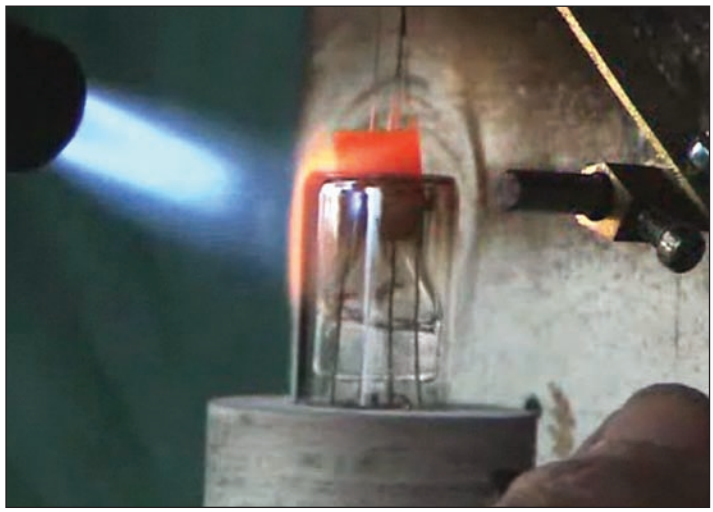


3 Flat structure used to support the filaments, grid and plate.

4 Attaching the air evacuation tube to the envelope

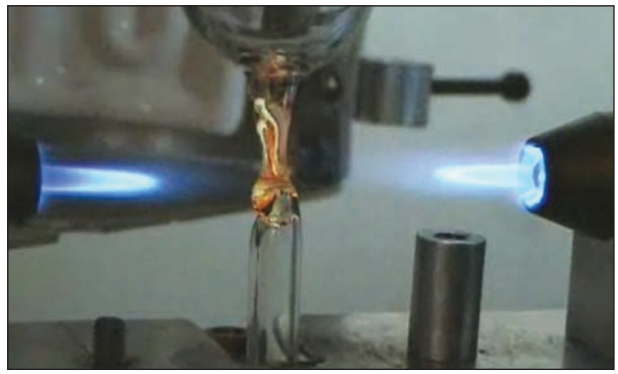


5 Flat structure with the filaments, grid and plate mounted

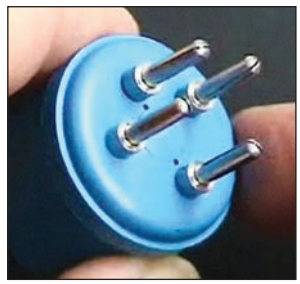


6 Welding the glass parts together.

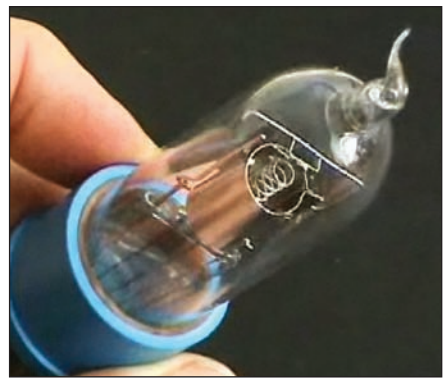
7 Evacuating the air.



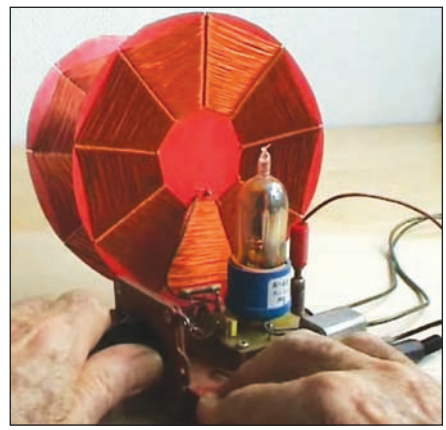
8 Sealing the tip.



9 Making the base.



10 Finished tube.



11 Tube working in radio set.

the process. At the end of the video he shows the equipment he used to make the tubes and places the tube in a radio and you can hear it playing.

Claude Paillard, F2FO, master craftsman.

I am providing some still photos taken from the video. This should give you an idea of how it is done. Please view the video in its entirety. I will provide links from my Web page, as the URL is quite long. Please visit **www.k2tqn.com/** and click to view it. Photos are from the video *Les Electrodes*. — *K2TQN*

AT THE FOUNDATION

The ARRL Foundation is proud to honor the 2008 scholarship winners, to celebrate their academic achievements and to recognize their commitment to Amateur Radio. We wish them well in their pursuit of higher education.

The application period for the 2009 awards opens October 1, 2008 and ends February 1, 2009. For more information about available scholarships and for complete application instructions and forms, go to **www.arrl.org/arrlf/scholgen**.

If you or your organization is interested in sponsoring an annual scholarship award, contact Mary Hobart, ARRL Foundation Secretary at **mhobart@arrl.org**.

Michael Volz, W8KAR
The Earl I. Anderson Scholarship

Stephen Simpson, KC8IOY
The Earl I. Anderson Scholarship

David Lambert, KC9BLA
The Earl I. Anderson Scholarship

Michael Ton, WTØN
The Richard W. Bendicksen, N7ZL Memorial Scholarship

Chris Renfrow, KD7TDC
The William Bennett, W7PHO, Memorial Scholarship

Daniel Bradke, W2AU
The Henry Broughton, K2AE Memorial Scholarship

Sabra Perry, KD7JPR
The Mary Lou Brown Scholarship

Elliott Liggett, KC8AOT
The Central Arizona DX Association Scholarship

Nicholas Bauer, KC9GZY
The L.B. Cebik, W4RNL, and Jean Cebik, N4TZP Memorial Scholarship

Reid Morine, W4RSM
The Challenge Met Scholarship

Andrew Grimmett, KD8GQA
The Challenge Met Scholarship

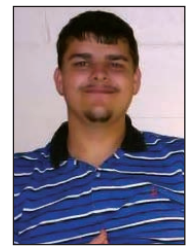
Lori Rose, N9BRH
The Chicago FM Club Scholarship

Thomas Catanach, KD5HHZ
The Tom and Judith Comstock Scholarship

Jonathan Rather, KCØCTR
The Irving W. Cook, WAØCGS, Scholarship

Cameron Cato, KI4KJR
The Charles Clarke Cordie Memorial Scholarship.

Jonathan Baize, AD5OJ
The Northern California DX Foundation Scholarship



Stephen Hughes, KI4EBV
The Dayton Amateur Radio Association Scholarship

Scott Button, KF3CP
The Dayton Amateur Radio Association Scholarship

Jacob Wagner, KD8CDC
The Dayton Amateur Radio Association Scholarship

Andrew Milner, KB1KPF
The New England Federation of Eastern Massachusetts Amateur Radio Association Scholarship

Brita Simcik, KB1HTF
The New England Federation of Eastern Massachusetts Amateur Radio Association Scholarship

Heather Jamieson, KB1IPO
The New England Federation of Eastern Massachusetts Amateur Radio Association Scholarship

Kathryn Laughlin, KB1LAY
The New England Federation of Eastern Massachusetts Amateur Radio Association Scholarship

David Clark, KD7NZK
The Charles N. Fisher Memorial Scholarship

Mary M. Hobart, K1MMH ♦ Secretary, ARRL Foundation Inc ♦ mhobart@arrl.org

Shannon Martinson, KCØYGI
The ARRL Foundation General Fund Scholarship

James Dunn, KCØKTP
The Paul and Helen L. Grauer Scholarship

Thomas Fielitz, KC8YAK
The K2TEO Martin J. Green Sr. memorial Scholarship

Rachel Jackman, KC8RVT
The Albert H. Hix, W8AH, Memorial Scholarship

Samuel Rose, KC2LRC
The Dr. James L. Lawson Memorial Scholarship

Mitchel Wilkinson, KE5GQI
The Fred R. McDaniel Memorial Scholarship

Charles McClish, KB9RGF
The Edmond A. Metzger Scholarship

Janet Ruminski, KC8WGT
The David W. Misek, N8NPX Memorial Scholarship

Andrew Cwalina, WA4JJZ
The Scholarship of the Morris Radio Club of New Jersey

Matthew Lape, N1XB
The Northern California DX Foundation Scholarship

Gregory Davis, N3ZL
The Northern California DX Foundation Scholarship

Kyle Fox, W4KTF
The Nemal Electronics Scholarship

John Hays, KC9LVZ
The Peoria Area Amateur Radio Club Scholarship

Rebecca Rich, KBØVVT
The PHD Amateur Radio Association Scholarship

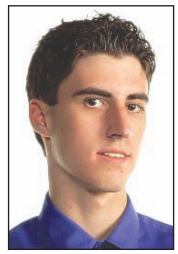
John Shipp, KC8TPN
The Thomas W. Porter, W8KYZ, Scholarship Honoring Michael Daughterty, W8LSE

Graham Sawyer, KCØYGT
The Bill Salerno, W2ONV Memorial Scholarship

Neil Gebhardt, KB9ZGZ
The Six Meter Club of Chicago Scholarship

Kayla Check, N8KAY
The Carol J. Streeter Scholarship

Stephanie Schaefer, KC2NSA
The Norman E. Strohmeier, W2VRS, Memorial Scholarship



John Tyler Cook, KI4KVL
The Gary Wagner, K3OMI, Scholarship

Daniel Ellis, KG4IVC
The L. Phil and Alice J. Wicker Scholarship

William Fisher, W4WJF
The YASME Foundation Scholarship

Kathryn Ankenbauer, KD8AHA
The YASME Foundation Scholarship

Andrew Alexander, KB9WPF
The YASME Foundation Scholarship

Alex Brech, KCØYLD
The YASME Foundation Scholarship

Tyler Hall, KC9DYL
The YASME Foundation Scholarship

Jeffrey Kabel, KB1KXL
The Yankee Clipper Contest Club, Inc Youth Scholarship

Not pictured: **Steven Chimel, KA3SRC, The You've Got a Friend in Pennsylvania Scholarship and Mary McDonald, WB5LBR, The Louisiana Scholarship**

ARRL FOUNDATION

COMING CONVENTIONS

SOUTHWESTERN DIVISION CONVENTION

September 12-14, Mesa, Arizona
F D V S

The Southwestern Division Convention, sponsored by the Amateur Radio Council of Arizona, will be held at the Mesa Convention Center, 263 N Center St. Doors are open for setup Friday 8 AM-3 PM; public Friday 3-5 PM, Saturday 8 AM-5 PM, Sunday 9 AM-noon. Features include swapmeet ($20 per space; each space is equivalent to two standard parking spaces), vendors, exhibitors, programs and forums (EmComm, DX, Satellite, Digital, Public Service, ARRL, NTS, AMSAT, Scouting, and more), VE sessions, QSL card checking, DX breakfast, free parking, RV parking (Thursday night through Sunday afternoon; self-contained only, $30). Talk-in on 147.24, 146.92 (both 162.2 Hz). Admission is $20. Booths are $325 (electricity included). Contact Rick Aldom, W7STS, Box 27226, Scottsdale, AZ 85255-0137; 480-707-8423; **natecf@gmail.com**; **www.azhamcom.org/**.

W9DXCC CONVENTION

September 19-20, Elk Grove Village, Illinois
S

The W9DXCC Convention (56th W9DXCC DX Convention and Banquet), sponsored by the Northern Illinois DX Assn, will be held at the Holiday Inn, 1000 Busse Rd (Rte 83). Doors are open Friday eve for Welcome Reception at 7:30 PM, Saturday registration at 8 AM, convention begins at 9 AM. Features include forums and presentations with world-renowned speakers; ARRL News and Views; DXCC, WAS, and VUCC card checking; CW Copying Contest; Hospitality Suites (Friday and Saturday eves at 10 PM), banquet (Saturday, 6:30 PM; special guest speaker Eric Scace, K3NA; Ducie Island, VP6DX). Talk-in on 147.36. Admission is $55 in advance, $60 at the door (convention and banquet); $30 in advance, $35 at the door (convention only). Contact Bill Smith, W9VA, 2635 Crestwood Ln, Riverwoods, IL 60015; 847-945-1564; fax 847-945-6554; **w9va@aol.com**; **www.w9dxcc.com**.

EMCOMM EAST CONVENTION

September 20, Rochester, New York
D V S

The EmComm East Convention, sponsored by the Monroe County ARES, will be held at St John Fisher College, 3690 East Ave. Doors are open 9 AM-5 PM. Features include training sessions on technical and educational topics, full schedule of speakers, special guest from ARRL HQ Dennis Dura, K2DCD (Emergency Preparedness and Response Manager), equipment and supplies vendors, Red Cross Emergency Communications Vehicle on display, VE sessions, continental breakfast and lunch. Talk-in on 146.61, 444.45 (both 110.9 Hz).

F = FLEA MARKET
D = DEALERS / VENDORS
H = HANDICAP ACCESS
V = VE SESSIONS
S = SEMINARS / PRESENTATIONS

August 15-16
New Mexico State, Albuquerque*

August 16-17
Southeastern Division, Huntsville, AL*

August 17
Kansas State, Salina*

August 22-24
New England Division, Boxboro, MA*

August 23-24
Roanoke Division, Weston, WV*

August 24
Western Pennsylvania Section, New Kensington, PA*

*See August *QST* for details.

October 11-12
Florida State, Melbourne

October 12
Connecticut State, Wallingford
Michigan State, Kalamazoo

October 17-18
AR Lighthouse, St Simons Island, GA

October 17-19
Pacific Division, San Ramon, CA

November 1-2
Georgia State, Lawrenceville

November 8
Alabama Section, Montgomery

Admission is $30. Tables are $75. Contact Jeff Wigal, WY7Q, Box 10280, Rochester, NY 14610; 585-241-9873; **info@emcommeast.org**; **www.emcommeast.org**.

SOUTH DAKOTA SECTION CONVENTION

September 20, Sioux Falls
F D V S

The South Dakota Section Convention, co-sponsored by the ARRL South Dakota Section and the Sioux Empire ARC, will be held at The Oaks, 3300 W Russell St. Doors are open 8 AM-5 PM. Features include flea market, vendors, forums, VE sessions, banquet, snack stand on premises. Talk-in on 146.895 (146.2 Hz). Admission is $5. Tables are $5. Contact Richard Beebe, NØPV, 913 S Gordon Dr, Sioux Falls, SD 57110; 605-376-4241; **n0pv@arrl.org**; **www.w0zwy.org**.

VIRGINIA SECTION CONVENTION

September 20-21, Virginia Beach
F D V S

The Virginia Section Convention, sponsored by Tidewater Radio Conventions, will be held at Virginia Wesleyan College, 1584 Wesleyan Dr. Doors are open Saturday 9 AM-5 PM, Sunday 9 AM-3 PM. Features include hamfest and electronics flea market, vendors, tailgating ($15 per space), forums and programs, VE sessions (both days). Talk-in on 146.97. Admission is $5 in advance, $7 at the door. Tables are $25 each. Contact Mr. Lynn Lilla, W9DJQ, 848 Stacey Pl, Virginia Beach, VA 23464; 757-479-1597; fax 757-673-7426; **hamfest@exis.net**; **www.vahamfest.net**.

SAN FRANCISCO SECTION CONVENTION

September 26-27, Ferndale, California
F D H V S

The San Francisco Section Convention (Redwood Coast Amateur Radio Convention), sponsored by Humboldt County's Amateur Radio Clubs, will be held at the Humboldt County Fairgrounds (Bellotti Hall), 1205 12th St. Doors are open Friday 3-6 PM for Wine and Cheese Welcome, Saturday 9 AM-5 PM. Features include swapmeet, commercial dealers, exhibitors, vendors, foxhunt, ARRL forum, specialty seminars, VE sessions, banquet (Saturday, 6 PM, by reservation only; contact Marci Campbell, KE6IAU, 707-442-3866), handicapped accessible, free parking. Talk-in on 146.7, 146.76 (both 103.5 Hz). Admission is $2, under 13 free. Tables are free. Contact Sally Marx, KG6WWK, 1356 McFarlan St, Eureka, CA 95501; 707-445-1207; **www.humboldt-arc.org**.

ARRL/TAPR DIGITAL COMMUNICATIONS CONFERENCE

September 26-28, Chicago (Elk Grove Village), Illinois
H S

The 2008 ARRL/TAPR Digital Communications Conference will be held September 26-28 at the Holiday Inn Hotel, 1000 Busse Rd, Elk Grove Village, IL. The conference is an international forum for radio amateurs to meet, publish their work and present new ideas and techniques. Presenters and attendees will have the opportunity to exchange ideas and learn about recent hardware and software advances, theories, experimental results and practical applications. Forums will feature the latest developments in Amateur Radio digital communications, as well as demonstrations of emerging digital technology. The Sunday seminar is titled "Software Radio Through the Looking-Glass," a discussion of Software Defined Radio led by Phil Harman, VK6APH. For more information call Tucson Amateur Packet Radio (TAPR) at 972-671-8277, or register online at **www.tapr.org/dcc.html**.

WASHINGTON STATE CONVENTION

September 27, Spokane Valley
F D V S

The Washington State Convention, co-sponsored by the Kamiak Butte Amateur Repeater Assn, Spokane Radio Amateurs, NW Tri-State ARO, Palouse Hills ARC, Inland Empire Radio Amateurs, Spokane DX Assn, University High School ARC and the Lilac City ARC will be held at University High School, 12420 E 32nd Ave. Doors are open for setup Friday 7-9 PM, Saturday 8 AM; public Saturday 9 AM-5 PM. Features include commercial and non-commercial vendors, seminars and displays, Open-Cry Auction, VE sessions (11 AM; Mary, AA7RT, 509-991-2192;

Gail Iannone ♦ Convention and Hamfest Program Manager ♦ giannone@arrl.org

aa7rt@arrl.net, forums (ARES/RACES, ARRL), WAS card checking, radio test gear table, post hamfest dinner (5 PM), free off-street parking for cars and RVs, refreshments. Talk-in on 147.24, 146.52. Admission is $5, 18 and under free. Swap tables are $5 before Sep 6, $7.50 after Sep 6; commercial tables are $12 before Sep 6, $15 after Sep 6 (plus admission). Contact Betsy Ashleman, N7WRQ, 3903 E 48th Ave, Spokane, WA 99223; 509-448-5821; **n7wrq@aol.com**; **www.kbara.org**.

PACIFIC NORTHWEST VHF CONFERENCE

October 3-5, Moses Lake, Washington
F S

The Pacific Northwest VHF Conference (15th Annual Conference), sponsored by the Pacific Northwest VHF Society, will be held at the Best Western Lake Front Hotel and Conference Center, 3000 Marina Dr. Doors are open Friday 6-8 PM, Saturday 8:30 AM-5 PM, Sunday 8-10 AM. Features include "Pizza Bash" (Friday eve), tailgate swapmeet in parking lot, technical presentations, great programs, top-notch speakers (keynote speaker Joe Taylor, K1JT), interesting round-table discussions, PNWVHFS Annual Meeting, free buffet lunch (Saturday), annual awards presentation, Saturday evening prime-rib dinner (6-8 PM), Sunday morning "Farewell Breakfast" (8-10 AM). Talk-in on 144.200 SSB, 146.58 FM simplex. Admission is $40 in advance, $50 at the door (includes lunch). Contact Steve Pack, WB7VAS, 25815 176th Place SE, Covington, WA 98042; 253-639-3631; **secretary@pnwvhfs.org**; **www.pnwvhfs.org**.

WESTERN NEW YORK SECTION CONVENTION

October 5, West Seneca
F D V S

The Western New York Section Convention (Greater Buffalo Hamfest), sponsored by the Lancaster ARC, will be held at the Ismailia Shrine Center, 1600 Southwestern Blvd (Rte 20). Doors are open for setup at 6 AM; public 7:30 AM-3 PM. Features include indoor flea market, vendors, buy and sell electronic equipment, ARRL talks, live demonstrations, VE sessions (registration 8 AM, testing 8:30 AM; John Maxwell, W2JM, 716-741-2317, **maxwell@acsu.buffalo.edu**; walk-ins welcomed), breakfast and lunch. Talk-in on 147.255 (107.2 Hz). Admission is $7 (under 10 free). Tables are $12 (Chuck Lawson, KC2BLH, 716-825-7097; **kc2blh@aol.com**). Contact Luke Calianno, N2GDU, 1105 Ransom Rd, Lancaster, NY 14086; 716-481-5747; **luke48@gmail.com**; **gbhamfest.hamgate.net/index.htm**.

Attention Hamfest and Convention Sponsors:

ARRL HQ maintains a date register of scheduled events that may assist you in picking a suitable date for your event. You're encouraged to register your event with HQ as far in advance as your planning permits. Hamfest and convention approval procedures for ARRL sanction are separate and distinct from the date register. Registering dates with ARRL HQ doesn't constitute League sanction, nor does it guarantee there will not be a conflict with another established event in the same area.

We at ARRL HQ are not able to approve dates for sanctioned hamfests and conventions. For hamfests, this must be done by your division director. For conventions, approval must be made by your director and by the executive committee. Application forms can be filled out online at **www.arrl.org/FandES/field/hamfests/regform.html**.

Note: Sponsors of large gatherings should check with League HQ for an advisory on possible date conflicts before contracting for meeting space. Dates may be recorded at ARRL HQ for up to two years in advance.

QST

HAMFEST CALENDAR

Attention: The deadline for receipt of items for this column is the **1st of the second month preceding publication date**. For example, your information must arrive at HQ by **September 1** to be listed in the **November** issue. Hamfest information is accurate as of our deadline; contact sponsor for possible late changes. For detailed directions to the event, see the event Web site or contact sponsor. For those who send in items for Hamfest Calendar and Coming Conventions: Postal regulations prohibit mention in *QST* of prizes or any kind of games of chance such as raffles or bingo.

Abbreviations: *Spr* = Sponsor, *TI* = Talk-in frequency, *Adm* = Admission.

Arizona (Mesa) — Sep 12-14, Southwestern Division Convention. See "Coming Conventions."

Arkansas (Jacksonville) — Sep 20 F D H V
8 AM-3 PM. *Spr:* Central Arkansas Radio Emergency Net (CAREN). Jacksonville Community Center, 5 Municipal Dr. Flea market, dealers, VE sessions, handicapped accessible, refreshments. *TI:* 146.94. *Adm:* $5. Tables: $15. Mark Barnhard, KD5AIV, 12563 Southridge Dr, Little Rock, AR 72212; 501-221-3909; **mbarnhard@aristotle.net**; **www.carenclub.com**.

California (Ferndale) — Sep 26-27, San Francisco Section Convention. See "Coming Conventions."

Colorado (Longmont) — Sep 28 F D V
Set up 6 AM; public 8 AM-1 PM. *Spr:* Boulder ARC. Boulder County Fairgrounds Exhibit Building, 9595 Nelson Rd. 55th Annual AR and Electronics Swapmeet, vendors, ARES demo, BARC Juniors Bargain Corner, VE sessions (10 AM sharp), breakfast and lunch. *TI:* 146.7. *Adm:* $5, under 13 free with paying adult. Tables: advance $10 (by Sep 20), door $15. Mike Derr, W3DIF, Box 17362, Boulder, CO 80308; 303-404-2161; **BARC70@arrl.net**; **www.qsl.net/w0dk/barcfest.html**.

Connecticut (Newtown) — Sep 14 F D H S
Set up 7 AM; public 8:30 AM-12:30 PM. *Spr:* Candlewood ARA. Edmond Town Hall, 45 Main St (Rte 6). Western CT Hamfest, flea market, new equipment dealers, commercial vendors, computer gear, tailgating ($10 per space, includes 1 admission), seminars, batteries special, mini foxhunt, handicapped accessible, free parking, refreshments. *TI:* 147.3 (100 Hz). *Adm:* $6, under 10 free. Tables: $15 (includes 1 admission). Joe de Groot, AB1DO, 30 Sunnyview Dr, Redding, CT 06896-1742; 203-938-4880; **ab1do@arrl.net**; **www.danbury.org/cara/hamfest.html**.

Florida (New Port Richey) — Sep 27 F
8 AM-2 PM. *Spr:* Suncoast ARC. First Lutheran Church, 6416 Delaware Ave. Pasco Co Hamfest, free tailgating. *TI:* 146.64. *Adm:* $5 (non-ham spouses and under 12 free). Tables: $10. Ron Wright, N9EE, 8849 Gum Tree Ave, New Port Richey, FL 34653; 727-376-6575; **mccrpt@verizon.net**; **www.qsl.net/sarc/**.

Florida (Orlando) — Sep 20 F H
Set up 7 AM; public 8 AM-2 PM. *Spr:* AR Unit of Bahia Shrine. Bahia Shrine Center, 2300 Pembrook Dr. Flea market, tailgating, handicapped accessible. *TI:* 147.39 (103.5 Hz). *Adm:* $3. Tables: $5. Warren Hill, W4WHH, 177 Hanging Moss Dr, Oviedo, FL 32765; 407-365-6682; **w4whh@arrl.net**; **www.bahiashrine.org/~radio/Tailgate.htm**.

Florida (Titusville) — Sep 27 F D V
7 AM-2 PM. *Spr:* North Brevard ARC. Jess Parish Hospital Parking Lot, Jess Parrish Ct and Washington Ave. Tailgating ($10 per space), commercial vendors ($15), electronics workshop, ARRL table, VE sessions, refreshments. *TI:* 145.25 (107.2 Hz). *Adm:* Free. Tables: $10. Bobby Jones, N6USP, 4743 Cambridge Dr, Mims, FL 32754; 321-264-2622; fax 321-383-1864; **n6usp@bellsouth.net**; **www.northbrevardarc.org/tailgateparty.htm**.

Georgia (Dallas) — Sep 20 F V
8 AM-4 PM. *Spr:* Paulding ARC. Paulding Meadows Park, Hwy 61 N. 18th Annual Hamfest, tailgating, VE sessions. *TI:* 146.895 (77 Hz). *Adm:* Free. Tables: Free. Andy Peltier, KI4HVN, 3188 Delhi Dr, Powder Springs, GA 30127; 770-943-4793; **andy_peltier@yahoo.com**; **pauldingarc.com**.

Illinois (Belvidere) — Sep 13-14 F D V
Saturday 6 AM-4 PM; Sunday 8 AM-3:30 PM. *Spr:* Chicago FM Club. Boone County Fairgrounds, US Rtes 76 and 20. Radio Expo, large outdoor flea market, three large indoor vendor buildings, VE sessions, camping available, refreshments. *TI:* 146.76 (107.2 Hz), 147.255 (114.8 Hz), 444.725 (118.8 Hz). *Adm:* advance $8, door $10. Tables: $20. Mike Brost, WA9FTS, 5127 N Monterey Ave, Norridge, IL 60706; 708-457-0966 (phone and fax); **mike2006@comcast.net**; **www.chicagofmclub.org**.

Illinois (Elk Grove Village) — Sep 19-20, W9DXCC Convention. See "Coming Conventions."

Illinois (Chicago/Elk Grove Village) — Sep 26-28, ARRL/TAPR Digital Communications Conference. See "Coming Conventions."

Illinois (Peoria) — Sep 20-21 F D V S
Saturday 6 AM-4 PM, Sunday 6 AM-2 PM (commercial buildings open 8 AM Saturday and Sunday). *Spr:* Peoria Area ARC. Exposition Gardens, 1601 W Northmoor Rd. Peoria Superfest, Amateur Radio Hamfest and Computer Show, giant outdoor flea market of new and used equipment and accessories, comput-

ers and software, electronic parts and components, commercial dealers and manufacturers reps, technical forums, VE sessions, QSL card checking, acres of free parking. *TI:* 147.075 (103.5 Hz). *Adm:* advance $6, door $8. Tables: $20. John Coker, N9FAM, 133 Vonachen Ct, E Peoria, IL 61611; 309-369-7428; **n9fam@arrl.net**; **www.peoriasuperfest.com**.

Iowa (Missouri Valley) — Sep 21 F D H
Set up 7 AM; public 8 AM-noon. *Spr:* Boyer Valley ARC. Eagles Club, 118 S 5th St. 10th Annual Flea Market, vendors, handicapped accessible. *TI:* 145.13 (136.5 Hz). *Adm:* $2 (family members under 16 free). Tables: $2. John Pixley, ABØVX, Box 181, Logan, IA 51546; 402-636-2001; **ab0vx@arrl.net**; **www.bvarc.net**.

Iowa (West Liberty) — Oct 5 F V
7 AM. *Sprs:* Muscatine and Washington Area ARCs. Muscatine County Fairgrounds, 101 N Clay St. Tailgating area free with gate admission, VE sessions. *TI:* 146.91, 146.85 (192.8 Hz). *Adm:* $5. Tables: $8. Tom Brehmer, NØLOH, 1114 E Tenth St, Muscatine, IA 52761; 563-260-5486; **n0loh@arrl.net**; **www.kc0aqs.org/hamfest.html**.

Kansas (Chanute) — Oct 4 F
8 AM-noon. *Spr:* Chanute Area ARC. Zion Lutheran Church Activity Center, 1202 W Main St. Swapmeet, fellowship. *TI:* 146.745 (100 Hz). *Adm:* $2. Tables: 3 free. Gary Sherard, WA5FLV, 20 N Plummer Ave, Chanute, KS 66720; 620-431-1667; **wa5flv@hotmail.com**; **www.caarc.org**.

Kansas (Wichita) — Oct 4 F V
8 AM-1 PM. *Spr:* Valley Center ARC. Sweetbriar Bingo Hall, 2349 N Amidon. 7th Annual Hamfest (largest in Kansas), VE sessions. *TI:* 146.94. *Adm:* $2. Tables: $5. Jim Cochran, KØRH, 3600 W 77th St N, Valley Center, KS 67147; 316-755-2283; **k0rh@cox.net**; **vcarc.org**.

Kentucky (Hazard) — Sep 20 F
8 AM-1 PM. *Spr:* Kentucky Mountains ARC. Wendell Ford Airport (Civil Air Patrol Bldg), Regional Airport Rd (KY Hwy 15). Swapfest. *TI:* 146.67 (103.5 Hz). *Adm:* $5. Tables: $5. John Farler, K4AVX, 1264 Hall Mountain Rd, Viper, KY 41774; 606-476-9662; **k4avx@arrl.net**; **www.k4avx.net/hf.pdf**.

Kentucky (Richmond) — Sep 13 F D V
8 AM-3 PM. *Spr:* Central Kentucky ARS. Madison County Fairgrounds, Hwy 52 E. Vendors, free tailgating with paid admission, educational demonstrations, VE sessions (1 PM), fellowship. *TI:* 145.37 (192.8 Hz). *Adm:* $6. Tables: $5. Mike Rogers, KE4ISW, 144 Allen Douglas Dr, Richmond, KY 40475; 859-624-9156; **ke4isw@arrl.net**; **www.qsl.net/ckars/hamfest/**.

Louisiana (Lake Charles) — Sep 13 F V S
Set up Friday 5-7 PM, Saturday 6-8 AM; public 8 AM-3 PM. *Spr:* Southwest Louisiana Amateur Repeater Club. Habibi Temple, 2928 Pack Rd. "Swampfest," forums, VE sessions (10 AM), auction (2 PM), breakfast and lunch (Gumbo). *TI:* 146.73. *Adm:* Free. Tables: $15 ($5 extra for power). Doug Phelps, WB5OZA, Box 7244, Lake Charles, LA 70606; 337-477-4909; **cajungeese@yahoo.com**; **www.swlarclub.bravehost.com**.

Maine (Alexander) — Sep 20 F V
8 AM-1 PM. *Spr:* St Croix Valley ARC. Alexander Elementary School, Rte 9. Indoor and outdoor flea market, tailgating, VE sessions, refreshments. *TI:* 147.33 (118.8 Hz). *Adm:* $5. Mike Sanford, KB1GEO, 203 S Princeton Rd, Alexander, ME 04694; 207-427-3058; **kb1geo@hotmail.com**.

Maine (Windsor) — Sep 7 F V S
8 AM-3 PM. *Spr:* Augusta ARA. Windsor Fairgrounds, Ridge Rd (SR 32). Flea market, forums, VE sessions. *TI:* 146.88 (100 Hz). *Adm:* $5. Tables: Free. Bill Crowley, K1NIT, 150 Maple St, Farmingdale, ME 04344; 207-623-9075; **k1nit@arrl.net**.

Maryland (West Friendship) — Oct 5 F D V
6 AM-4 PM. *Spr:* Columbia ARA. Howard County Fairgrounds, 2210 Fairgrounds Rd. Flea market, tailgating ($10 per space), vendors, VE sessions. *TI:* 147.135 (156.7 Hz). *Adm:* $6. Tables: $20 (indoors). David Prestel, W8AJR, 10160 Tanfield Ct, Ellicott City, MD 21042; 410-552-2652; fax 410-981-5146; **carafest@columbiaara.org**; **www.carafest.org**.

Massachusetts (Cambridge) — Sep 21. Nick Altenbernd, KA1MQX, 617-253-3776 (9 AM-5PM); **w1gsl@mit.edu**; **www.swapfest.us**.

Michigan (Adrian) — Sep 14 F D V
7 AM-4 PM. *Spr:* Adrian ARC. Lenawee County Fairgrounds, 602 Dean St. 36th Annual Ham Radio Swap, vendors, indoor and outdoor spaces, trunk sales ($5 per space), VE sessions, food on site. *TI:* 145.37 (85.4 Hz). *Adm:* $5. Tables: $10. Marjie Willey, KB8TMM, 307 Pentecost Hwy, Onsted, MI 49265; 517-467-6303; **maggie214@frontiernet.net**; **www.w8tqe.com**.

New Jersey (Essex) — Sep 7. Richard Denby, AB2SV, **ab2sv@arrl.net**; **www.qsl.net/k2gq** (Auction).

New Jersey (Mullica Hill) — Sep 21 F V
8 AM-2 PM. *Spr:* Gloucester County ARC. 4-H Fairgrounds, 275 Bridgeton Pike (Rte 77). Free tailgating, DXCC/VUCC card checking, VE sessions. *TI:* 147.18 (131.8 Hz). *Adm:* $6. Tables: $10. Harry Elwell, K2ATX, 819 Thoreau Ln, Williamstown, NJ 08094; 856-513-0407; fax 866-849-4493; **k2atx@comcast.net**; **users.tellurian.com/freddie/w2mmd/**.

New Jersey (Township of Washington) — Oct 4 F D V
8 AM-3 PM. *Spr:* Bergen ARA. Westwood Jr/Sr High School, 701 Ridgewood Rd. Fall Hamfest, indoor and outdoor vendors, VE sessions, DXCC card checking, refreshments. *TI:* 146.79 (141.3 Hz). *Adm:* $5. Tables: $15 (one spot). Jim Joyce, K2ZO, 286 Ridgewood Blvd N, Township of Washington, NJ 07676; 201-664-6725; fax 201-265-1366; **k2zo@arrl.net**; **www.bara.org**.

New Jersey (Wall Township) — Oct 4 F V
6 AM-1 PM. *Spr:* Ocean-Monmouth ARC. Project Diana Site, Marconi Rd. Tailgate Hamfest, VE sessions. *TI:* 145.11 (127.3 Hz). *Adm:* $5 (per car). Tables: $10. Jeff Harshman, N2LXM, 5 The Arborway, Ocean, NJ 07712; 732-996-0637; **n2lxm@arrl.net**; **www.omarc.org**.

New York (Ballston Spa) — Sep 13 F D V
7 AM-3 PM. *Spr:* Saratoga County RACES Assn. Saratoga County Fairgrounds, Prospect Ave. 23rd Annual Hamfest, tons of new and used equipment, vendors, tailgating (first space free with 1 admission; $5 for each additional space), foxhunt, VE sessions (9 AM, off grounds), free parking, food booth open all day serving breakfast and lunch. *TI:* 147.0 (91.5 Hz),147.24. *Adm:* $5. Tables: $5 (indoor; first-come, first-served basis; reservation and prepay encouraged). Darlene Lake, N2XQG, 314 Louden Rd #84, Saratoga Springs, NY 12866; 518-587-2385; **dar@saratogaspringsny.us**; **wa2umx.net**.

New York (Horseheads) — Sep 27 F D H V
8 AM-2 PM. *Spr:* ARA of the Southern Tier. Chemung County Fairgrounds, Grand Central Ave. 33rd Annual Elmira International Hamfest/Computerfest, indoor vendors, free tailgating, VE sessions, handicapped accessible, free parking, pancake breakfast, refreshments. *TI:* 147.36, 146.7 (backup). *Adm:* advance $5, door $6. Tables: $14 (by Sep 15), $17 (after Sep 15). Elliott Blauvelt, N2OJM, Box 614, Horseheads, NY 14845-0614; 607-739-5626; **2008hamfest@arast.org**; **www.arast.org**.

New York (Pompey/Syracuse) — Sep 13 F D H V
Set up Friday 4-8:30 PM, Saturday 6:30-7:45 AM; public 8 AM-2 PM. *Spr:* Radio Amateurs of Greater Syracuse. Pompey Hills Fire Department, Henneberry Rd. 53rd Annual Hamfest, indoor/outdoor flea market (outdoor space $5 plus admission), buy and sell ham radio and computer equipment, dealers, vendors, exhibitors, ARRL forum (10 AM), NTS, NWS, and RAGS tables, awards, VE sessions (10:30 AM, walk-ins welcomed), handicapped accessible, breakfast and lunch served until 12:30 PM. *TI:* 147.3. *Adm:* $5. Tables: 8-ft $10 (or bring your own, space $5). Viv Douglas, WA2PUU, c/o RAGS, Box 88, Liverpool, NY 13088; 315-698-4558; **ragsonline@hotmail.com**; **ragsinreview.com**.

New York (Queens) — Oct 5 F D H V
Set up 7:30 AM; public 9 AM-2 PM. *Spr:* Hall of Science ARC. NY Hall of Science Parking Lot (Flushing Meadow Corona Park), 47-01 111th St. Electronics and computer equipment, tailgating, dealers, QSL card checking, tune-up clinic, "Drop and Shop" available, VE sessions (10 AM), Museum Exhibit Station WB2JSM (free admission from 10-11 AM or $6 after with hamfest ticket), free parking, handicapped accessible, refreshments. *TI:* 444.2 (136.5 Hz), 145.27 (136.5 Hz). *Adm:* buyers $5, sellers $10 (per space); under 12 free. Stephen Greenbaum, WB2KDG, 85-10 34th Ave, Apt 323, Jackson Heights, NY 11372; 718-898-5599; **wb2kdg@arrl.net**; **www.HOSARC.org**.

New York (Rochester) — Sep 20, EmComm East Convention. See "Coming Conventions."

New York (West Seneca) — Oct 5.
Western New York Section Convention. See "Coming Conventions."

North Dakota (Grand Forks) — Oct 4 F V S
9 AM-2 PM. *Spr:* Forx ARC. Zion United Methodist Church, 1001 24th Ave S. Swap tables, seminars, VE sessions. *TI:* 146.94. *Adm:* $5. Tables: Free. Karen Noss, NØTKP, 1113 4th Ave N, Grand Forks, ND 58203; 701-775-7781 (phone and fax); **klnoss@gra.midco.net**; **www.wa0jxt.org**.

Ohio (Berea) — Sep 28 F V S
8 AM-2 PM. *Spr:* Hamfest Assn of Cleveland. Cuyahoga County Fairgrounds, 164 Eastland Rd. Hamfest/Computer Show, flea market, ARRL forum, VE sessions, refreshments. *TI:* 146.73 (110.9 Hz). *Adm:* $6. Tables: $20. William Beckman, N8LXY, c/o Hamfest Assn of Cleveland, Box 81252, Cleveland, OH 44181-0252; 800-CLE-FEST; **www.hac.org**.

Ohio (Cincinnati) — Sep 21 F D V S
Set up 6 AM; public 8 AM-3 PM. *Spr:* Greater Cincinnati ARA. Diamond Oaks Career Development Center, 6375 Harrison Ave. Flea market, commercial vendors, forums, hidden transmitter hunt, ARRL booth and forum, VE sessions, refreshments. *TI:* 145.37, 146.88. *Adm:* $6. Tables: $8 (per flea market space), $20 (commercial). Stan Cohen, W8QDQ, 2301 Royal Oak Ct, Cincinnati, OH 45237-2939; 513-531-1011 or 513-531-3834; fax 513-531-3834; **stanco49@zoomtown.com**; **gcara.org/**.

Ontario (Lindsay) — Aug 23. Ernie Roylance, VE3ERN, **ernieroylance@sympatico.ca**; **www.vhara.ca**.

Pennsylvania (Brownstown) — Oct 4 F V
Set up 6 AM; public 7 AM. *Spr:* Red Rose Repeater Assn. West Earl Community Park, Rte 772 E. Tailgating ($3), VE sessions. *Tl:* 147.015 (118.8 Hz). *Adm:* $1. Tables: $5. Dave Phillips, W3CWE, 344 N George St, Millersville, PA 17551; 717-872-6578; **w3cwe@comcast.net**; **w3rrr.org**.

Pennsylvania (Wrightstown) — Sep 28 F D
Set up 6 AM; public 7 AM. *Spr:* Mt Airy VHF Club (PACKRATS). Middletown Grange Fairgrounds #684, 576 Penns Park Rd. 37th Annual Flea Market, VHF/Microwave treasures. *Tl:* 146.52. *Adm:* $6. Tables: $10/$15. Ed Finn, WA3DRC, 174 Orthodox Dr, Richboro, PA 18954; **packrats_w3ccx@yahoo.com**; **www.packratvhf.com/Hamarama/hamarama.html**.

Rhode Island (Forestdale/N Smithfield) — Sep 20. Rick Fairweather, K1KYI, 401-864-9611 (7-8 PM only); **k1kyi@arrl.net**.

South Carolina (Rock Hill) — Oct 4 F D V
7 AM-2 PM. *Spr:* York County ARS. American Legion Post 34, 199 S Cherry Rd. Hamfest and Computer Expo, indoor vendors, tailgating, foxhunt exhibit, VE sessions, refreshments. *Tl:* 147.03. *Adm:* $7. Tables: $20. Sheila Parrish, KG4CDF, 2358 J P Dirt Rd, Edgemoor, SC 29712; 803-328-5983; **coy@navacore.net**; **www.rockhillhamfest.com**.

South Dakota (Sioux Falls) — Sep 20, South Dakota Section Convention. See "Coming Conventions."

Tennessee (Sevierville) — Sep 26-27 F V
Friday 2-7 PM; Saturday 9 AM-3 PM. *Spr:* Ten-Tec, Inc. Ten-Tec Inc, 1185 Dolly Parton Pkwy. 9th Annual Hamfest, VE sessions. *Tl:* None. *Adm:* Free. Tables: Free. Stan Brock, WDØBGS, 1185 Dolly Parton Pkwy, Sevierville, TN 37862; 865-453-7172; fax 865-428-4483; **sales@tentec.com**; **www.tentec.com**.

Texas (Belton) — Oct 4 F D V
7 AM-2 PM. *Spr:* Temple ARC. Bell County Expo Center, 301 W Loop 121. "The friendliest ham swapfest in the world!" Vendors, tailgating ($5 per space), VE sessions. *Tl:* 146.82 (123 Hz). *Adm:* $2. Tables: $10-$25. Mike LeFan, WA5EQQ, 1802 S 13th St, Temple, TX 76504; 254-773-3590; fax 254-231-4128; **mlefan@vvm.com**; **www.beltonhamexpo.org**.

Virginia (Virginia Beach) –– Sep 20-21, Virginia Section Convention. See "Coming Conventions."

Washington (Moses Lake) –– Oct 3-5, Pacific Northwest VHF Conference. See "Coming Conventions."

Washington (Spokane Valley) –– Sep 27, Washington State Convention. See "Coming Conventions."

Attention All Hamfest Committees!

Get official ARRL sanction for your event and receive special benefits such as an announcement in these listings, donated ARRL publications, handouts, discounted rates for display advertising, and other support.

It's easy to become sanctioned. Contact the Convention and Hamfest Branch at ARRL Headquarters, 225 Main St, Newington, CT 06111, 860-594-0262, or send e-mail to **giannone@arrl.org**. The application form can be filled out online at **www.arrl.org/FandES/field/hamfests/regform.html**.

Promoting your event is guaranteed to increase attendance. As an approved event sponsor, you are entitled to special discounted rates on *QST* display advertising and *ARRWeb* banner advertising. Call the ARRL Advertising Desk at 860-594-0207, or e-mail **ads@arrl.org**.

F = FLEA MARKET
D = DEALERS / VENDORS
H = HANDICAP ACCESS
V = VE SESSIONS
S = SEMINARS / PRESENTATIONS

September 2008 QUALIFYING RUNS

♦ W1AW Qualifying Runs are 10 PM EDT Friday, September 5 (0200Z September 6) and 7 PM EDT (2300Z) Wednesday, September 17 (10-40 WPM). The West Coast Qualifying Run will be transmitted on 3581.5, 7047.5, 14047.5, 18097.5 and 21067.5 kHz by station K6KPH at 2 PM PDT (2100Z) Saturday, September 13) (40-10 WPM). Unless otherwise indicated, code speeds are from 10-35 WPM.

ARRL VEC Volunteer Examiner Honor Roll

The ARRL VEC Honor Roll recognizes the top 25 Volunteer Examiners according to the total number of exam session they have participated in since their accreditations. Since each session requires an average time commitment of 2-4 hours or more, the thousands of hours these VEs have invested is extraordinary! Whether you are one of our VE Teams that test once a week, once a month or once a year, we want to express our warmest appreciation to all volunteers for their generous contributions to the ARRL VEC program.

If you are an ARRL VE, you can see your session stats online at **www.arrl.org/arrlvec/veparti.php**.

If you're not a VE, become one! See **www.arrl.org/arrlvec/become-a-ve.html**.

Examiner	*Sessions*	*Accreditation Date*
Sammy Neal, N5AF	467	20-Nov-84
Royal Metzger, K6VIP	368	29-Apr-85
Frank Glass, K6RQ	353	29-Apr-85
Karen Schultz, KAØCDN	327	6-Sep-84
Glenn Schultz, WØIJR	317	28-Sep-84
Harry Nordman, ABØSX	315	9-Jan-02
Paul Maytan, AC2T	290	6-Sep-84
David Laurel, KA6RHF	287	22-Apr-85
Franz Laugermann, K3FL	286	1-Dec-91
Leonard Scarpelli, W6IO	285	1-Nov-92
John Mackey Jr, KSØF	275	1-Oct-90
Victor Madera, KP4PQ	273	1-Mar-92
Kevin Naumann, NØWDG	261	17-Nov-02

Examiner	*Sessions*	*Accreditation Date*
Scott Swanson, K6PYP	257	1-Dec-92
Ralph Schutte, N6NAD	256	22-Aug-97
Mary Lewis, W7QGP	255	12-Aug-85
Daniel Calabrese, AA2HX	255	1-Nov-91
John Moore III, KK5NU	254	21-May-95
John Hauner, KØIH	254	11-Jan-85
Salvatore Teresi, W6EOA	252	21-Aug-89
David Fanelli, KB5PGY	251	1-Oct-91
James Henderson, N8MPC	248	1-Nov-91
Leslie Dale, NI5S	247	6-Sep-84
Michael Faucheaux, N5KBW	246	15-Jul-96
Gerald Grant, WB5R	245	4-Jan-85

SILENT KEYS

It is with deep regret that we record the passing of these amateurs:

AA1BL **Gormley**, Gordon W., Westminster, MA
N1BWP **Anderson**, William A. Jr, East Kingston, NH
WA1CBP **Colby**, H. N., Bow, NH
XE1CI **DeLazard**, Nellie, Pearcy, AR
♦K1EPX **Doolittle**, Ronald E. Jr, Beacon Falls, CT
N1FPY **Boehm**, Ralph J. E., Simsbury, CT
W1GDQ **Miller**, David L., S Yarmouth, MA
W1MJA **Pope**, Donald E., Billerica, MA
W1MLW **Buxton**, Kenneth E., Nashua, NH
W1QKA **Lachance**, Roland G., Nashua, NH
KA1TUZ **Doherty**, Richard C., North Andover, MA
W1ZOM **Byberg**, William O., Homosassa, FL
W2AWR **Cranmer**, Walter E., Beach Haven, NJ
♦WB2BMQ **Prince**, Carl P., Schenectady, NY
N2OUM **Dubas**, Walter H. Jr, Clifton, NJ
♦W2OWF **Fish**, Richard W., Honeoye Falls, NY
KC2QJ **Fink**, Julian D., Boynton Beach, FL
W2VPY **Auletto**, Cornelius, Huntington, NY
WA2ZBN **Earls**, Gerard J., Malverne, NY
KA2ZQI **Woodhead**, James R., Breinigsville, PA
KA3AED **McKenna**, Thomas R., Greenville, PA
KE3DE **Olack**, Arthur N., Kingston, PA
W3EER **Dershimer**, John S., Warminster, PA
K3EOQ **Groom**, Charles H., Philadelphia, PA
WA3F **Altvater**, Milburn E., Linden, VA
WB3GAW **Kinnaman**, John M. Jr, Pen Argyl, PA
♦♦W3HJ **Dickinson**, Robert V. C., Zionsville, PA
KA3LWE **Little**, Henry O., Max Meadows, VA
K3MHB **Wolozyn**, Bruno J., Oil City, PA
♦WA3UJE **Bortner**, James A., Chestertown, MD
W3YPL **Kranias**, Charles E., Biglerville, PA
K4AUU **Coffey**, Janice M., Buchanan, VA
K4BK **Rowe**, James M. Jr, Warner Robins, GA
WB4ETF **Nakamura**, Francis T., Charlotte, NC
♦WB4GM **McGlaughn**, Eugene L., Gadsden, AL
W4JLU **Rutledge**, James C., Selma, AL
WA4JUB **Lewis**, John C., Hermitage, TN
K4MZC **Hirsch**, Edward, Rockingham, NC
K4OH **Wood**, F. M., Seneca, SC
W4PFJ **Henry Hayhurst**, Adis M., Ocala, FL
W4PZL **Du Bose**, Jesse I., Lumpkin, GA
N4QD **Lerner**, Edward M., Spotsylvania, VA
K4REA **Ashley**, Russell E., Fort Mill, SC
K4RWI **Hales**, Marion R., Fairfax, VA
KE4SI **Johnson**, Robert, Ideal, GA
WB4TNF **Cashwell**, Mary L., Tampa, FL
KG4TPU **McGovern**, Elaine T., West Palm Beach, FL
W4TXK **Barze**, Keith E., Tuscaloosa, AL
KG4UHC **Van Wyckhouse**, Richard C., Winchester, KY
KI4VFZ **Morrison**, Eva L., Liberty Hill, SC
KA4VQS **Stone**, Henry A., Louisville, KY
W4WTA **Norton**, Carroll L., Martinez, GA
KG4YFN **Farrington**, Linda S., Cocoa, FL
KC5AID **Brandt**, Gwen L., Conway, AR
AA5BJ **Rhodes**, Lawrence L., Roswell, NM
W5EET **Arp**, Mack C., Houston, TX
W5FZY **Harris**, Elmer F., San Angelo, TX
KA5GYL **Pridemore**, Eddena S., Kirtland, NM
KA5JEV **Dean**, Jerry S., Lovington, NM
♦WD5KCD **Parks**, Dillion L. Jr, Reydon, OK
KA5OYO **Dupree**, Bill E., Deming, NM
K5QA **Crouch**, F. Lee, Euless, TX
KD5SDM **Bullard**, Carl A. Sr, Purcell, OK
W5UUG **Butt**, William W., Biloxi, MS
W5UWY **Duncan**, Reginald W., Cloudcroft, NM
AG5Y **Watson**, Willard L., Bella Vista, AR
WB5ZDS **Malone**, Bobby G., Madison, TN
K6AAG **Wohosky**, Robert C., Hesperia, CA
K6GIJ **Gee**, Dr Walter, San Jose, CA
K6GV **Woods**, Eric D., Sacramento, CA
KB6KQ **Pedersen**, Norman W., Kelso, WA
♦KB6KR **Goddard**, Leslie L., Woodlawn, TN
WA6LWE **Mason**, Madeleine T., Temple City, CA
W6NUA **Winters**, William A., Apple Valley, CA
KF6NXY **Hasselmann**, Detlev E., Solana Beach, CA
WA6OUU **Jones**, Ben D., Redding, CA
W6QJB **Meadows**, Gordon B., Santa Rosa, CA
N6QLN **Hicks**, Tim, San Diego, CA
KI6R **Briggs**, Bernard D., Loma Linda, CA
W6SFU **Dunn**, Glenn A., Peel, AR
W6SKF **Bacot**, Cornelius L. Jr, Moreno Valley, CA
♦K6SPK **McClain**, Hubert R., Los Angeles, CA
KC6TWP **Daub**, Guenter, Redondo Beach, CA
K6UKF **Barnes**, Robert B., Redwood City, CA
♦♦W6US **Shepherd**, Howard F. Jr, Seal Beach, CA
KG6UUP **Goldman**, Ronald M., Torrance, CA
W6YJU **Schweizer**, Earl G., Cardiff By The Sea, CA
N7BNB **Smith**, William F., Pickens, SC
KC7CU **Christian**, H A., Clarkdale, AZ
K7DMI **James**, Thomas E., McMinnville, OR
KD7EGN **Wintch**, Elliot J., Salt Lake City, UT
N7GHD **Lamb**, Charles J., Redmond, WA
K7GTE **Dunford**, Homer W., Glendale, AZ
N7GTF **Nielson**, Hugh, Hillsboro, OR
N7IVM **Bennett**, William E., Olympia, WA
K7KIP **Stilz**, Clifford L. Jr, Olympia, WA
N7SOQ **Johnson**, Harris A., Seattle, WA
W7TX **Macleish**, K. G., Chicago, IL
KH8A **Pringle**, Leonard J., San Ramon, CA
♦W8CNL **McClure**, Raymond H., North Augusta, SC
KD8CZK **Morris**, Jerry, Norton, OH
N8HRU **Goode**, Janet B., Waynesville, OH
W8HWA **Arnold**, Harold W., Delaware, OH
W8IRF **Mills** Sr, Franklin E., New Site, MS
AA8IZ **Hawkins**, Deane E., Chillicothe, OH
K8JHK **Noyes**, Agnes, Midland, MI
♦W8MVN **Helton**, Ernest M., Franklin, OH
WB8QJI **Oxley**, Emerald L., Berrien Springs, MI
K8TQM **Harris**, Gary L., Hillsboro, OH
W8UDG **Doles**, Andrew W., Macedonia, OH
WA8VUV **Taylor** Sr, William L., Leavittsburg, OH
N8XTN **Hall**, Kenneth D., Caro, MI
♦W8YKW **Williams**, Stanley B., Flint, MI
N9ANA **Dallmann**, Donald E., La Grange, IL
N9FTY **Luse**, Howard, Belvidere, IL
W9JOI **Schuch**, Frank, Oak Lawn, IL
W9KES **Slater**, Kenneth E., Porter, IN
K9LSA **Fish**, Paul C., Fort Wayne, IN
W9MLN **Cammack**, George D., Scottsville, KY
W9MZW **Welsh**, John R. Jr, Rockford, IL
KA9PMZ **Nelson**, Robert F., Lansing, IL
KB9QZR **Goetzinger**, Bruce G., Racine, WI
♦W9SLO **Polillo**, Peter J., Galesburg, IL
WA9SLT **Kirkpatrick**, Robert A., Streamwood, IL
WØCMK **Hanson**, Calmer P., Fergus Falls, MN
WDØDNS **Lehrer**, Paul L., Greeley, CO
WØIMO **Daher**, Charles A., Creve Coeur, MO
WØNQ **Hornsby**, John Jr, Anoka, MN
WØOES **Ballard**, Rose M., Calhoun, GA
KWØRM **McIntyre**, Ronald F., Salina, KS
WØYLQ **Wagner**, Robert A., Dubuque, IA
VE3HME **Wickham**, Allan S. R., Hamilton, ON, Canada
PY2FR **Roesler**, Thomas, Sao Paulo, Brazil
VS6DO **Bailey**, Paul R., Shatinn, Hong Kong

♦Life Member, ARRL
♦♦Charter Life Member

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

Amy Hurtado, KB1NXO ♦ Silent Keys Administrator ♦ sk@arrl.org

Field Organization Reports

Public Service Honor Roll
June 2008

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/**.

635 W5DY
546 WW6CC
535 W7TVA
497 KI4GEM
479 KC8NTE
410 AC8AL
385 KI4GWC KD1SM
365 K9LGU
340 K7EAJ
335 N7CM
330 W4DNA
320 KI4KWR
315 WB-7WOW
304 WB8RCR
282 WD8USA
280 KB9KEG KB2RTZ N1UMJ
273 W4CAC
245 N5NVP
234 KD5TXD
230 KØIBS
223 KA8ZGY
219 K4JRU
216 N7EIE
211 K4DND
210 WD9FLJ
208 W2KFV
205 KE7DVV
200 K5SFM KØBLR AC8AR
199 W2SFD
181 W7JSW
179 WA2BSS
176 KI4QAU
163 NY3H WU8Y
160 KGØGG KE5HYW
155 KK7TN W1PLW K8MFK
150 N8OD WB5ZED WB9JSR
148 N1CKM
145 K2HJ K8AMR
144 N3RB WB2KNS K8RDN
140 K4IWW W2EAG W1CAR W2DWR K7BFL KK3F KB1NMO
138 WD8JAW
136 W4SOU
135 K7BC W7QM WD5TL W3YVQ WB8OIF KG4TND
130 W4FAL AG9G N2QZ NN7H N8IO
127 NC4VA WA4UJC
126 WØSJS W4ZJY
125 W7EKB W5HUD K4GK
122 N4EJF KJ7NO
120 KK5GY KC5OZT K6JT W8UL KA4FZI N1LKJ W1GMF K1YCQ KK1X W7IG KB8NDS
119 N5MEL
117 W1REP
115 WØLAW W5PY KD1LE AB8SY
114 N2GJ K2GW
112 N2VC N9DGK
111 KS3Z
110 W4TTO N4ABM W7GB W6DOB N7BEC N1IQI N7XG N7YSS NX1Q
109 KØBXF
106 AD4BL
105 WX4H WG8Z KE4CB NØZIZ
103 WB4GHU WB2LEZ
101 WC5M
100 N2GS N9MN NR2F NØMEA N5OUJ WA2WMJ W3TWV W7GHT
K4SCL WB8SIQ K2UL KB2KLH WB2WAK WB6OTS NN7D KA4LRM N4MEH KM1N N7IE
99 W2GQJ N8DD WD8Q
98 W5XX WA1JVV
95 WB4FDT W2DSX KF7GC
94 K6RAU KB3LFG
93 WA2YBM W2CC N8NMA
92 KC4PZA
90 N1JX K1JPG KF4WIJ WB6UZX KB5KKT NF2G WA2CUW N3ZOC WB4BIK KA1RMV KA1GWE
88 KI4JQB N2VQA W8IM
84 KI4YV K5MC AA4BN
KM5VM W8CPG
83 W5GKH
82 W7VSE KE7OED K8AE
80 K7MQF AL7N KC2SKI N3SW WDØGUF W3CB WA2TWS NA7G K8KV
79 W5CU KC2ODN K8VFZ
77 K4BG
74 KE5DKV KØLQB WD8DHC KBØDTI
73 KB3LNM
72 K3IN
71 W2MGT
70 WØADZ NØDUW NØDUX NUØF KAØFUI AAØLD NØMHJ KØRXC NØUKO KØVVX KT5SR KD7THV K1HEJ W4QAT

The following stations qualified for PSHR in previous months but were not recognized in this column: (May) N2LTC 576, KA2ZNZ 364, AK2Z 330, NX1Q 110, KB2ETO 192, K2DYB 138, KB1NMO 140, K3CSX 125, N8VQT 110, K2AN 100, W2XAD 105, N2HQL 95, KA1RMV 90, KA1GWE 90, WB2IJH 90, KA2YKN 85, WB2SXY 84, K1HEJ, KB1NAL. (Apr) N1CKM 90. (Mar) N1CKM 105. (Feb) N1CKM 130. (Jan) N1CKM 107.

Section Traffic Manager Reports
June 2008

The following ARRL Section Traffic Managers reported: AK, AR, AZ, CO, CT, EB, EMA, ENY, EPA, EWA, GA, ID, IL, KY, KS, LA, MDC, MI, MN, MO, MS, NC, NFL, NH, NLI, NNJ, NNY, NTX, OH, OK, OR, SC, SFL, SD, SJV, SNJ, STX, TN, UT, VA, WCF, WMA, WTX, WI, WV, WY.

Section Emergency Coordinator Reports
June 2008

The following ARRL Section Emergency Coordinators reported: AZ, CO, CT, EWA, IN, KY, MDC, ME, MO, NC, NH, NM, NTX, OH, OK, SFL, SD, SNJ, VA, WPA, WTX, WV.

Brass Pounders League
June 2008

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	*Orig*	*Rcvd*	*Sent*	*Dlvd*	*Total*
WB5ZED	25	2062	1850	50	3987
KK3F	17	1342	1298	44	2701
W4ZJY	0	776	730	0	1506
KA9EKG	52	643	598	36	1329
N1IQI	0	192	1080	0	1272
WB5NKD	13	87	1156	0	1257
W8UL	0	509	463	3	975
WB5NKC	53	53	716	22	844
K7BDU	14	305	356	1	676
WB9JSR	0	300	315	11	626
W1GMF	0	391	231	0	622
WX4H	0	247	353	11	611
N1UMJ	26	274	264	15	579
N8IXF	0	265	239	7	511
AC8AR	0	234	275	7	516

The following stations achieved BPL with originations plus deliveries: KK5GY 168, K8LJG 118. QST

75, 50, AND 25 YEARS AGO

September 1933

- The cover photo shows several pages of schematic diagrams.
- The editorial takes a retrospective look at the first 20 years of the League's existence, discussing things it has accomplished and things yet to come.
- George Grammer tells us how to build "Plate Supplies to Conform to the New Regulations."
- In "The Inverted Ultraudion Amplifier," Hugo Romander, W2NB, describes "working the triode as a screen-grid transmitting amplifier."
- ARRL Secretary K. B. Warner reports that "Our Regulations Are Revised" (effective October 1), including widening of the 'phone subbands and a requirement for D.C. power supplies for transmitters.
- A short article reports: "Ten-Meter Band Still Holding Up."
- Ross Hull describes the "Featherweight Sets for the Ultra-High Frequencies," used by hams at the National Soaring Meet. An accompanying article reports on "Amateur Radio at the National Soaring Meet."
- "First Annual Field Day Report," excitedly announces, "The first Field Day was an unqualified success, according to about 50 accounts of station participation received."

September 1958

- The cover photo shows W1HDQ in his sports car, with his new two-band halo antenna for 50 and 144 Mc. mobile work.
- The editorial reports on the FCC's inspection of several West Coast contesters during the ARRL CW DX Test … which resulted in the license suspensions because of excessive transmitted power. Careful, men — the FCC has big teeth!
- Ed Tilton, W1HDQ, tells about "A Two-Band Halo for V.H.F. Mobile" for operation on 50 and 144 Mc.
- Yardley Beers, W2AWH, mulls over the old antenna question, "Match, or Not to Match?", concluding that a low S.W.R. "may actually be a minor consideration."
- Laird Campbell, W1CUT, describes a "Combination Power Supply and Modulator Using Transistors," for mobile use.
- Al Brogdon, W4UWA/DL4, tells about the simplicity of "Modifying the Viking Adventurer for 50 Mc." Al reports good local and DX contacts on both C.W. and A.M. 'phone using the Adventurer and a 4-element Yagi.
- "VR Break-In for the DX-100," by Emory Cox, WØCGZ, describes his outrigger differential keyer for the popular Heath rig.
- Jim Lomasney, W9LZV, tells about "A Desk-Top 650-Watt Amplifier," with a pair of 4X250B tubes in parallel and semiconductor diodes in the power supply.
- Well-known contester Larry LeKashman, W9IOP, gives us some good tips, in "Contest Operating."

September 1983

- The cover photo shows the Cadillac Mountain VHF QSO Party antenna array of WA2VUN/1.
- The editorial, "Amateur Radio's Newest Frontier," reports that astronaut Owen Garriott, W5LFL, is ready for the first ham operation from space.
- Ted Thompson, VE3FTT, discusses how to send "Graphics on RTTY."
- John Reed, W6IOJ, describes how to "Build a Satellite Transceiver Adapter," to integrate your station equipment for satellite contacts.
- Phil Rand, W1DBM, tells about "The 'Beeper': An Audible Frequency Readout for the Blind Amateur."
- In "A Top-Fed Vertical Antenna for 1.8 MHz — Plus 3," Carl Eichenauer, W2QIP, describes his antenna for 160, 80, 40, and 15 meters.
- Frank Noble, W3MT, tells us how to build "A Linear, Self-Calibrating Ohmmeter."
- Doug Blakeslee, N1RM, discusses his small battery-powered receiver, in "A Traveler's Receiver for 20 Meters."
- "The Ever-Useful Wavemeter," by Doug DeMaw, W1FB/8, reminds us of a useful measuring device from the 1920s.
- Steve Place, WB1EYI, tells us how to figure which way to point our beams, in "Finding OSCAR 10."
- Two articles tell about the work that went into getting permission and equipment for the upcoming W5LFL space shuttle operation: "Owen Garriott: The man behind the mission," by Roy Neal, K6DUE, and "They Made the First Space Operation Possible," by Peter O'Dell, KB1N.

Al Brogdon, W1AB ♦ Contributing Editor

W1AW SCHEDULE

W1AW's schedule is at the same local time throughout the year. From the second Sunday in March to the first Sunday in November, UTC = Eastern US Time + 4 hours. For the rest of the year, UTC = Eastern US Time + 5 hours.

♦ **Morse code transmissions:** Frequencies are 1.8175, 3.5815, 7.0475, 14.0475, 18.0975, 21.0675, 28.0675 and 147.555 MHz.

Slow Code = practice sent at 5, 7½, 10, 13 and 15 WPM.

Fast Code = practice sent at 35, 30, 25, 20, 15, 13 and 10 WPM.

Code bulletins are sent at 18 WPM.

♦ **W1AW Qualifying Runs** are sent on the same frequencies as the Morse code transmissions. West Coast Qualifying Runs are also transmitted monthly. See "This Month in Contesting" in this issue for further details on the Qualifying Runs. Underline one minute of the highest speed you copied, certify that your copy was made without aid, and send it to ARRL for grading. Please include your name, call sign (if any) and complete mailing address. The initial certificate is available for a $10 fee. Subsequent endorsement stickers are available for a $7.50 fee.

♦ **Digital transmissions:** Frequencies are 3.5975, 7.095, 14.095, 18.1025, 21.095, 28.095 and 147.555 MHz.

Bulletins are sent at 45.45-baud Baudot and 100-baud AMTOR, FEC Mode B. 110-baud ASCII will be sent only as time allows.

On Tuesdays and Fridays at 6:30 PM Eastern Time, Keplerian elements for many amateur satellites are sent on the regular teleprinter frequencies.

♦ **Voice transmissions:** Frequencies are 1.855, 3.99, 7.29, 14.29, 18.16, 21.39, 28.59 and 147.555 MHz.

♦ **Notes:** On Fridays, UTC, a DX bulletin replaces the regular bulletins. W1AW is open to visitors 10 AM to noon and 1 PM to 3:45 PM on Monday through Friday. FCC licensed amateurs may operate the station during that time. Be sure to bring your current FCC amateur license or a photocopy. In a communication emergency, monitor W1AW for special bulletins as follows: voice on the hour, teleprinter at 15 minutes past the hour, and CW on the half hour.

During 2008, Headquarters and W1AW are closed on New Year's Eve Day and New Year's Day (Dec 31 and Jan 1), Presidents Day (Feb 18), Good Friday (Mar 21), Memorial Day (May 26), Independence Day (Jul 4), Labor Day (Sep 1), Thanksgiving and the following day (Nov 27 and 28) and Christmas (Dec 25).

For more information, see **www.arrl.org/w1aw.html**.

PACIFIC	MTN	CENT	EAST	MON	TUE	WED	THU	FRI
6 AM	7 AM	8 AM	9 AM		FAST CODE	SLOW CODE	FAST CODE	SLOW CODE
7 AM-1 PM	8 AM-2 PM	9 AM-3 PM	10 AM-4 PM	VISITING OPERATOR TIME (12 PM-1 PM CLOSED FOR LUNCH)				
1 PM	2 PM	3 PM	4 PM	FAST CODE	SLOW CODE	FAST CODE	SLOW CODE	FAST CODE
2 PM	3 PM	4 PM	5 PM	CODE BULLETIN				
3 PM	4 PM	5 PM	6 PM	DIGITAL BULLETIN				
4 PM	5 PM	6 PM	7 PM	SLOW CODE	FAST CODE	SLOW CODE	FAST CODE	SLOW CODE
5 PM	6 PM	7 PM	8 PM	CODE BULLETIN				
6 PM	7 PM	8 PM	9 PM	DIGITAL BULLETIN				
6^{45} PM	7^{45} PM	8^{45} PM	9^{45} PM	VOICE BULLETIN				
7 PM	8 PM	9 PM	10 PM	FAST CODE	SLOW CODE	FAST CODE	SLOW CODE	FAST CODE
8 PM	9 PM	10 PM	11 PM	CODE BULLETIN				

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**.

D-RATS — An Application Suite for D-STAR

Amateur Radio Emergency Service — The Amateur Radio Emergency Service (ARES) consists of licensed amateurs who have voluntarily registered their qualifications and equipment for communications duty in the public service when disaster strikes. See **www.arrl.org/FandES/field/pscm/sec1-ch1.html** for more information.

D-STAR — A software and hardware standard for V/UHF digital voice and data operation adopted by JARL, the Japan Amateur Radio League. For more information, see **www.arrl.org/FandES/field/regulations/techchar/D-STAR.pdf**.

Emergency Operations Center (EOC) — Tactical operating headquarters established and maintained by government or public service entity for use during emergencies. EOCs typically include Amateur Radio station setups.

File transfer — Transmission via a network connection of a computer file between two computers.

Global positioning system (GPS) — Worldwide navigation system based on constellation of satellites surrounding the globe so that multiple satellites are in view at any time. Developed by the USAF for strategic purposes, it is now in common use by civilian vehicles as well.

NTS — National traffic system. An organized hierarchical structure of amateur radio nets designed to handle formal message traffic between any locations in the US. See **www.arrl.org/FandES/field/pscm/sec2-ch1.html** for more information.

QST — Q signal indicating a message intended for all amateurs. Also the name of the monthly journal of the ARRL.

An All Band HF Dipole Antenna

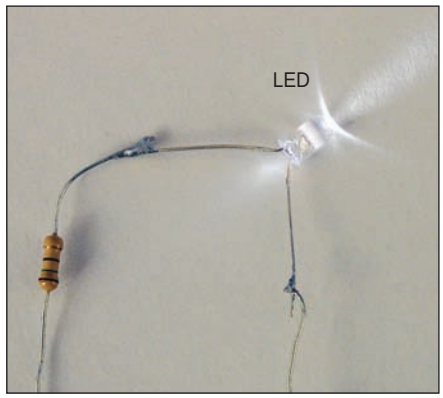
450 Ω window line — Two wire parallel conductor balanced transmission line in which the conductors are held in alignment by a polyethylene web with sections, or windows, removed from between the wires to reduce loss.

Dipole antenna — Radio antenna, generally about a half wave (λ/2) long and used by itself or as a part of a larger *array* of antenna elements.

FET — Field effect transistor. A kind of active solid state device in which a current between two electrodes is controlled by the electric field from a voltage applied to a *gate* element.

HF bands — High frequency, often called *short wave*, bands. In this context, the eight Amateur Radio bands between 3 and 30 MHz: 80, 60, 40, 30, 20, 17, 12 and 10 meters. These bands include those generally best for long range ionospheric propagation. See **www.arrl.org/FandES/field/regulations/bands.html** for details.

LED — Light emitting diode. A solid state device that efficiently converts an electrical current into light. See **en.wikipedia.org/wiki/LED** for more information.



Microcontroller — Miniature computer often configured with all its accessories and memory in a single integrated circuit. These are generally used as imbedded processors in equipment, rather than as general purpose computers.

PVC — Polyvinyl chloride. A thermoplastic polymer based material used in many types of plumbing pipes and fittings. Because of its availability, low cost and ease of fabrication, a popular insulating material for radio projects.

Hands-On Radio

Feedback — Signal, typically from a sample from the output port of an amplifier returned to the amplifier input. Can be used to form an oscillator, or to control gain or stability.

Op-amp — Operational amplifier. High gain active amplification device originally designed for analog computer use. Now commonly available as inexpensive integrated circuits used as the basis for many analog projects.

Synthesizers — Generator of ac signals in which the frequency is controlled by one of a number of digital techniques.

Time constant — Product of the value of a resistor and capacitor or inductor. During one time constant, the capacitor charged through the resistor, for example, reaches approximately 67% of its final value.

Getting on the Air — How About a Software Defined Radio?

FCC — Federal Communications Commission. The US government agency responsible for, among other things, regulation of all non-Federal Government uses of the radio spectrum.

IP address — Internet protocol address. Up to 12 digit dotted decimal notation of Internet address such as **161.58.186.233** (ARRL Web site). The variable length (depending on network class) first portion represents the network number, the remainder the user identity on the network.

Project 25 for Amateur Radio

Carrier squelch repeater — A basic repeater in which the transmitter will be enabled by any carrier signal detected by the receiver. Most repeaters use a tone squelch access system (see *CTCSS*) to limit transmission to those intending to use the repeater.

DTMF — Dual tone multi frequency. A system designed for pushbutton telephones that provided dial digits via a matrix of tones. Each key pad included one tone from a low group and one from a high group corresponding to position of the buttons. Such keyboards are often used for the remote control of equipment, such as repeater stations.

FM repeater — Radio system with receiver and transmitter on different frequencies. Signals received are retransmitted to extend system range.

Hexidecimal — Number system to base 16. Encoded with the digits 0 through 9 and symbols A through F. Frequently used for calculations within computer systems.

Trunked systems — Radio system typically used by commercial and government agencies. Short range vehicle systems are received at central locations and distributed through the network on dynamically assigned trunking channels for redistribution.

Maximizing the Mobile Motorist Mission

Ack — Packet type used to provide an acknowledgement to a data transmitting station that a packet has been correctly received.

CTCSS — Continuous tone coded squelch system. Subaudible tone arrangement sent by some FM transceivers to allow use of repeaters. See **www.arrl.org/members-only/tis/info/pdf/9612055.pdf** for more information.

EchoLink — One flavor of the use of the Internet to extend voice communications (voice over IP, VoIP) between amateurs using FM repeaters of operating from Internet connected computers. See **www.arrl.org/FandES/ead/materials/CARCEcholink.ppt** for more information.

Heads up display — Term borrowed from aircraft display systems that provided an image on the aircraft windscreen so a pilot could observe the data without taking eyes off the flight path.

IRLP — Internet radio linking project. Another application of VoIP to extend amateur communications. See **www.irlp.net** for more information.

National 2 meter simplex calling frequency — Voluntarily recognized frequency of 146.52 MHz used to establish direct (simplex, non repeater) FM voice communication. Upon establishment of communication, operators should switch to a recognized simplex operating channel (146.49, 146.55, 146.58 MHz, as examples) to continue contact and allow the calling channel to be available for use by others. For more information, see **www.arrl.org/FandES/field/regulations/bandplan.html**.

Telpac — A bi-directional gateway system designed route e-mail from VHF packet radio to Winlink for delivery.

Winlink — An Amateur Radio data network that can provide worldwide Internet connectivity between equipped amateur stations beyond the range of normal Internet connectivity. See **www.arrl.org/tis/info/winlink.html** for more information.

[1] *The ARRL Handbook for Radio Communications,* 2008 Edition. Available from your ARRL dealer or the ARRL Bookstore, ARRL order no. 1018. Telephone 860-594-0355, or toll-free in the US 888-277-5289; **www.arrl.org/shop/**; **pubsales@arrl.org**.

ANAHEIM, CA
(Near Disneyland)
933 N. Euclid St., 92801
(714) 533-7373
(800) 854-6046
Janet, KL7MF, Mgr.
anaheim@hamradio.com

BURBANK, CA
1525 W. Magnolia Blvd, 91506
(818) 842-1786
(800) 854-6046
Eric, K6EJC, Mgr.
Magnolia between
S. Victory & Buena Vista
burbank@hamradio.com

OAKLAND, CA
2210 Livingston St., 94606
(510) 534-5757
(800) 854-6046
Mark, WI7YN, Mgr.
I-880 at 23rd Ave. ramp
oakland@hamradio.com

SAN DIEGO, CA
5375 Kearny Villa Rd., 92123
(858) 560-4900
(800) 854-6046
Tom, KM6K, Mgr.
Hwy. 163 & Claremont Mesa
sandiego@hamradio.com

SUNNYVALE, CA
510 Lawrence Exp. #102, 94085
(408) 736-9496
(800) 854-6046
Dan, K6DN, Mgr.
So. from Hwy. 101
sunnyvale@hamradio.com

NEW CASTLE, DE
(Near Philadelphia)
1509 N. Dupont Hwy., 19720
(302) 322-7092
(800) 644-4476
Rick, K3TL, Mgr.
RT.13 1/4 mi., So. I-295
newcastle@hamradio.com

PORTLAND, OR
11705 S.W. Pacific Hwy.
97223
(503) 598-0555
(800) 854-6046
Leon, W7AD, Mgr.
Tigard-99W exit
from Hwy. 5 & 217
portland@hamradio.com

DENVER, CO
8400 E. Iliff Ave. #9, 80231
(303) 745-7373
(800) 444-9476
John, N5EHP, Mgr.
denver@hamradio.com

PHOENIX, AZ
1939 W. Dunlap Ave., 85021
(602) 242-3515
(800) 444-9476
Gary, N7GJ, Mgr.
1 mi. east of I-17
phoenix@hamradio.com

ATLANTA, GA
6071 Buford Hwy., 30340
(770) 263-0700
(800) 444-7927
Mark, KJ4VO, Mgr.
Doraville, 1 mi. no. of I-285
atlanta@hamradio.com

WOODBRIDGE, VA
(Near Washington D.C.)
14803 Build America Dr. 22191
(703) 643-1063
(800) 444-4799
Steve, W4SHG, Mgr.
Exit 161, I-95, So. to US 1
woodbridge@hamradio.com

SALEM, NH
(Near Boston)
224 N. Broadway, 03079
(603) 898-3750
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Chuck, N1UC, Mgr.
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- Emergency Auto ID

Low Price!

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- Wideband RX - 900 Memories
- 5W TX (300mw 220Mhz)
- Li-Ion Battery
- Fully Submersible to 3 ft.
- Built-in CTCSS/DCS
- Internet WIRES compatible

Now available in Black!

VX-6R

2M/220/440HT

- wideband RX – 900 memories
- 5W 2/440 , 1.5W 220 MHz TX
- Li-ION Battery - EAI system
- Fully submersible to 3 ft.
- CW trainer built-in

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- Ultra Rugged

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FREE YSK-7800

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- 500 Memories • DNR, IF Notch, IF Shift

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*Except 60M Band. **Frequency coverage may vary. Refer to owner's manual for exact specs. ***Tested to survive after being under 1m of water for 30 minutes. *◊ AA Alkaline batteries not included, radio comes with a AA alkaline battery tray. *◊ For shock and vibration. *◊ When connected to an external GPS. ✦ Icom rebate promotion offers guaranteed through September 30, 2008. Purchase must be made from HRO between 07/01/08 and 9/30/08. Contact HRO for details.

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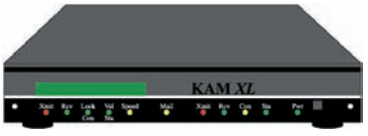

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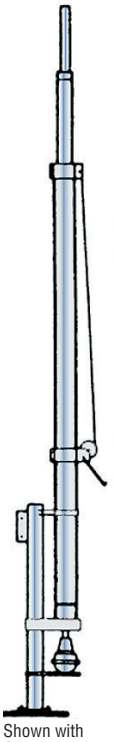

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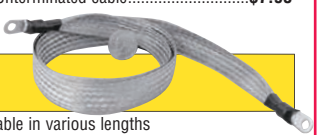

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- Highest quality Belden coaxial cable is used
- All cable assemblies are high voltage tested to handle full rated power
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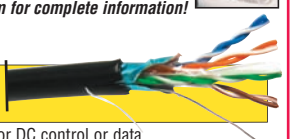

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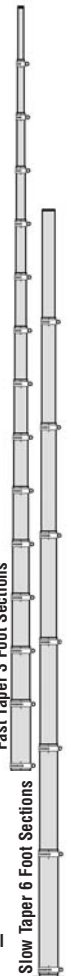
Part Number	Diameter/End Type	Price	Cost/Foot
DXE-AT1240	0.375", no slit	$2.70	$0.90
DXE-AT1241	0.500", one end slit	$3.30	$1.10
DXE-AT1242	0.625", one end slit	$3.60	$1.20
DXE-AT1243	0.750", one end slit	$3.90	$1.30
DXE-AT1244	0.875", one end slit	$4.20	$1.40
DXE-AT1245	1.000", one end slit	$4.50	$1.50
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



All Stainless Steel Element Clamps

DXE-ECL-060	7/8" and smaller tubing $1.90
DXE-ECL-10SS	1" and 1 1/8" tubing $1.90
DXE-ECL-12SS	1 1/4" tubing $1.90
DXE-ECL-16SS	1 3/8" and 1 1/2" tubing $1.90
DXE-ECL-20SS	1 5/8" and 1 3/4" tubing $1.90
DXE-ECL-24SS	1 7/8" and 2" tubing $1.90
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
DXE-ECL-40SS	2 7/8" and 3" tubing $1.90
DXE-ECL-44SS	3 1/4" maximum tubing $1.95

65 ft. Telescopic Aluminum Tubing Kit

- 65 ft. slow taper from HD 2" O.D. base to 7/8" O.D. top
- Build your own vertical antennas or arrays
- Use with DXE Insulated Base Assemblies

DXE-ATK65 ..... **$194.50**

Insulated Vertical Base Assemblies for 2" O.D. Antenna Masts

New!

Standard Base

- Tilt Base optional
- Two DXE-CAVS-1P mounting clamps required to attach base to mounting post

DXE-VE-BASE **$99.50**
DXE-CAVS-1P — V-Saddle Clamp $8.95
DXE-TB-3P — Tilt Base Assembly ... $62.50

Heavy Duty Base

- Tilt Base included
- Two DXE-CAVS-2P mounting clamps required to attach base to mounting post

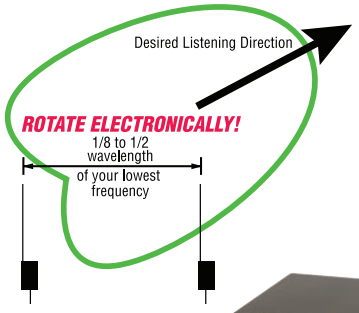
DXE-VA-BASE **$149.50**
DXE-CAVS-2P — V-Saddle Clamp $10.95

HEAR THE WEAK ONES!

Electronically Rotatable Receive Antenna System

- Hear weak stations by nulling a strong station on the same frequency
- Two-antenna alternative to RFS-Series Receive Four-Square Antenna
- Null out a single noise source from the opposite direction
- HF Amateur Radio, SWL or Broadcast AM DX reception
- Excellent directional receiving performance from 500 kHz to 15 MHz (usable from 300 kHz to 30 MHz)
- System includes DXE-NCC-1 Variable Phasing Controller and 2 high-quality DXE-ARAV2-type active receive antennas
- Can be installed in most back yards—only 9 ft. tall

DXE-AAPS-1P Active Antenna Phasing System with Controller.....**$995.00**



Receive Antenna Phasing Controller

Combine two identical receiving antennas to create a directional pattern—enables you to adjust the antenna pattern as if you were moving your antennas

Special Features

- Exceptional dynamic range—nearly 1000 times (30dB) better than nearest competitor
- Phasing is voltage controlled allowing precise resetting of phase
- Phasing rotates more than 360 degrees with smooth control
- Built-in two channel, voltage controlled attenuator system
- Low noise, high dynamic range amplifiers
- Vastly superior dual channel complementary phasing system
- Very low noise floor
- Separate controls for reversing channel and phase
- 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**

HAM-SWL

Active Receive Antenna

- Now available with relay protection from transmitter overload when used with TVSU-1
- Weak signal sensitivity rivals full size antenna
- Operates from 100 kHz to 30 MHz
- Excellent strong signal handling with +30 dBm output third order intercept
- Easy installation
- Available in vertical or dipole configuration

DXE-ARAH-1P Horizontal Configuration.....**$259.00**
DXE-ARAV-1P Vertical Configuration.....**$229.00**
DXE-ARAH2-1P Horizontal Configuration with relay.....**$289.00**
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Time Variable Sequencer Unit

- Protect receiver front end, preamplifiers, linear amplifiers, or other sensitive equipment from damage due to improper switching during the receive/transmit transition
- Five outputs tied to the CW keying or push-to-talk (PTT) lines each have adjustable delay from 0-30 ms in 2 ms increments
- Side-tone generator follows input of keyer, not transmitter
- Supports full CW break-in
- Ideal for protecting DXE-ARAV-2 or DXE-ARAH-2 Active Antennas from RF damage

DXE-TVSU-1 Time Variable Sequencer Unit **$159.95**

VERTICALS ON SALE

Best Antenna Value Anywhere!

DX Engineering now stocks replacement parts for all BTV antennas

Easiest assembly and tuning of any multi-band vertical!

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6BTV	(10, 15, 20, 30, 40, & 75-80m)	**$174.95**
DXE-8X19-RT	Coax Jumper Cable to BTV Base	**$16.95**
DXE-A0K-DCF	SO-239 Add-On Kit for BTV Base	**$19.95**
DXE-CBC-8XU2	Jumper, Radial Plate to DCF	**$18.99**

Hustler BTV Direct Coax Attachment All Stainless

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Current Baluns and Feedline Current Chokes

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Feedline Current Chokes

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Stainless Radial Plate with Coax Attachment

Makes radial attachment a snap!

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- Patented high current coax connection to radials

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DXE-CAVS-2P Stainless Saddle Clamp for attachment to round tube 1.0" to 2.0" O.D. **$10.95**
DXE-363-SST Silver/Teflon® bulkhead connector...**$6.95**
DXE-VFCC-H05-A Vertical Feedline Current Choke.....**$94.95**

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DXE-STPL-100BD Radial Wire Anchor Pins, 100-pack.....**$16.00**

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Thick, Laser Cut Stainless Steel Tilt Base

- Patent pending cam action allows you to easily raise or lower DX Engineering, Hustler, Hy-Gain, or Butternut for tuning, weather or CC&R accommodation.

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DXE-TB-4P For DX Engineering 40VA-1, Butternut, most Hy-Gain 1/4-wave verticals.....**$87.50**

HUSTLER BTV ADD-ONS

17m Add-On Kit

New!

- Full band under 1.5:1 SWR
- Minor adjustments for other bands
- Simple installation
- 850W SSB/CW power rating

Patent Pending

DXE-AOK-17M 17m add-on kit for BTV.....**$49.95**

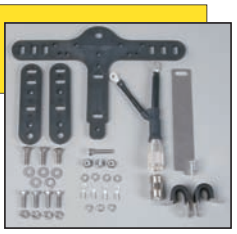
60m Add-on Kit

- 60m coverage for Hustler BTV series antennas
- Operates across the complete 60m band
- SWR of 1.5:1 or less
- Includes new capacitive compensator
- Retains all bands at peak performance

DXE-AOK-60M 60m Add-on Kit for Hustler BTV.....**$69.95**

EZ-BUILD™ HIGH PERFORMANCE ANTENNA COMPONENTS

Universal Wire Antenna Hardware Kit



- Multi-purpose center-T and end insulators to create many types of wire antennas
- Create single band, multi-band, multi-frequency and folded dipole antennas
- Easy solder-free construction
- Works with DX Engineering's 300 Ω ladder line for both the feed and elements
- Use with doublet, inverted-V, off-center fed, Zepp, long wire, rhombic, V-beam, and loop antenna configurations
- Kits available for coax or ladder line feed
- Center-T attaches to all DX Engineering baluns, including the new lightweight DXE-BAL050-H05-A
- All connections are visible for increased reliability

DXE-UWA-KIT Universal Wire Antenna Hardware Kit, no Coax Adapter.....**$17.95**
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- Best SWR and port isolation on the market!
- Weatherproof, welded stainless steel housing for best RF shielding
- 8-position switch, controller included
- Better than 1.1:1 SWR below 30 MHz

5 kW Key-Down RF Switch

- Better than 70 dB of port-to-port isolation

RR8-HP-P.....**$375.00**

10 kW Key-Down RF Switch

- Better than 60 dB of port-to-port isolation

RR8-SD-P.....**$495.00**

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VHF/UHF Dual Band Antenna
NMO Type Base,
144 MHz & 440 MHz
Commercial Quality
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For More Super Online Sale Items See Page 26

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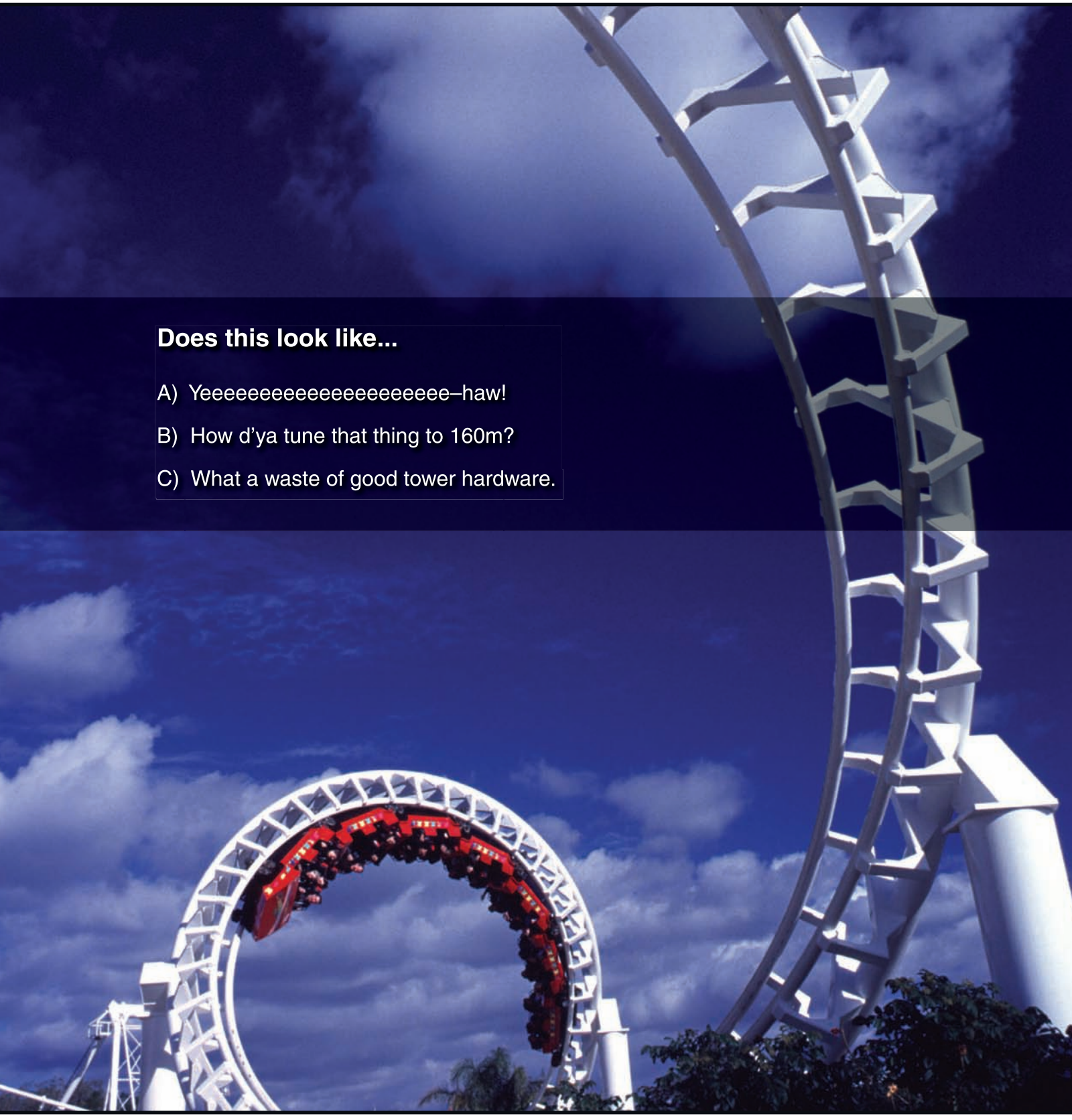
ARE YOU A HAM?



Does this look like...

A) Yeeeeeeeeeeeeeeeeeeeee–haw!

B) How d'ya tune that thing to 160m?

C) What a waste of good tower hardware.

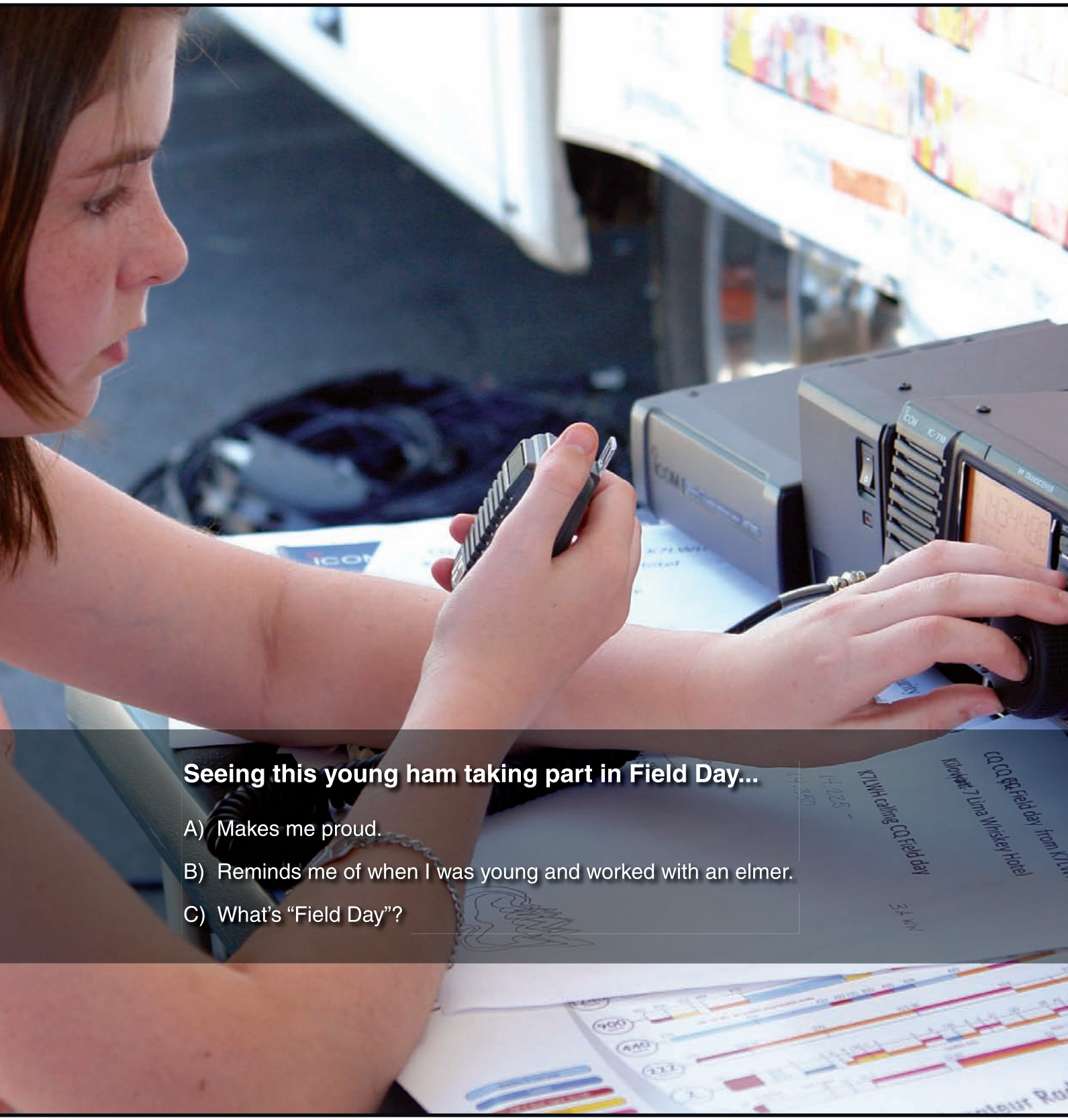

This really makes me think...
A) Whoa! Tires still chirp when I shift it into third!
B) Can't be late for the club meeting, I'm bringin' the doughnuts!
C) Say, look at those pretty blue flashing lights in my rear view mirror.

About this DXpedition site...

A) Now that's what I call a pile-up.

B) What a waste of a good ground plane.

C) I can't wait to show off my new bikini.



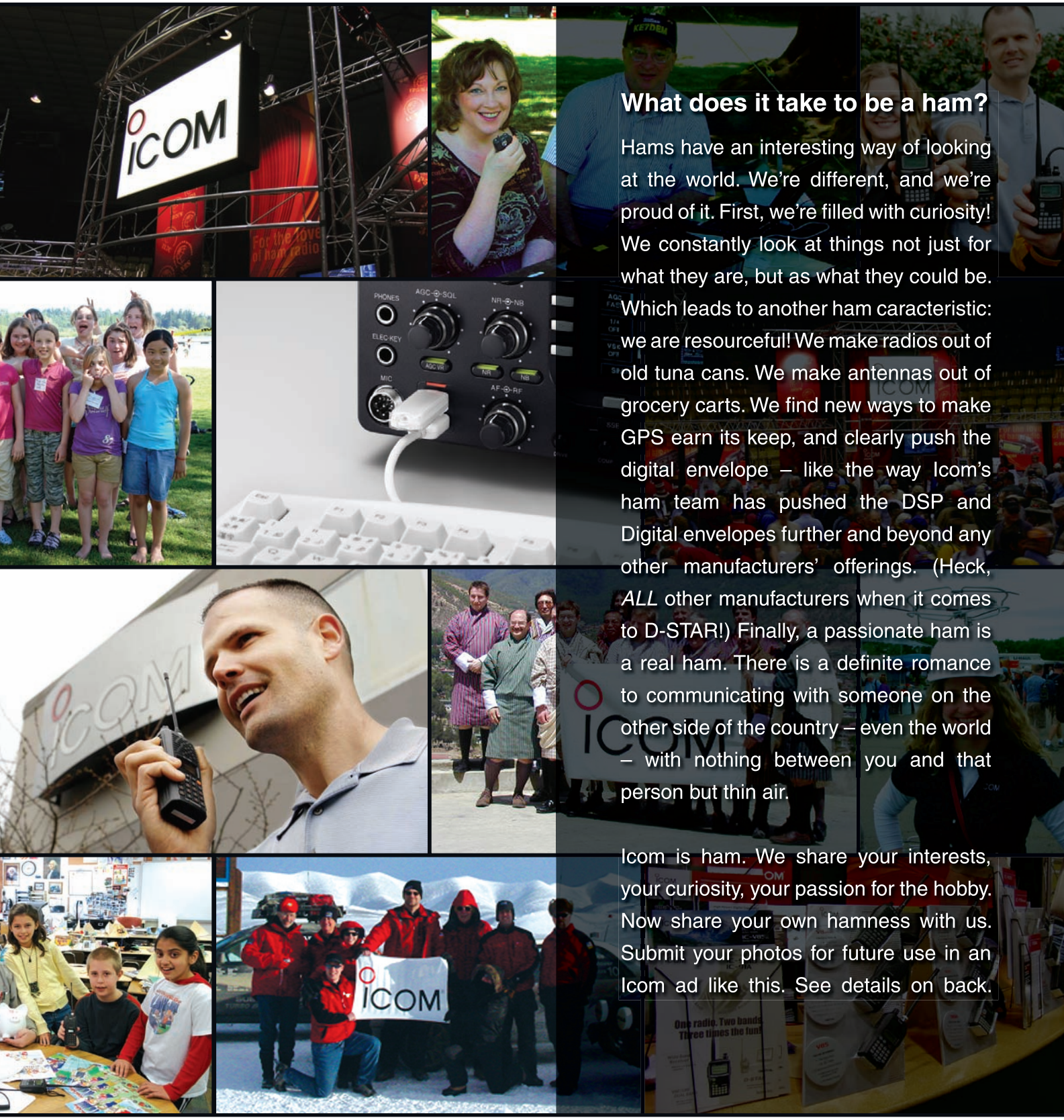
Seeing this young ham taking part in Field Day...

A) Makes me proud.

B) Reminds me of when I was young and worked with an elmer.

C) What's "Field Day"?

ARE YOU A HAM?



What does it take to be a ham?

Hams have an interesting way of looking at the world. We're different, and we're proud of it. First, we're filled with curiosity! We constantly look at things not just for what they are, but as what they could be. Which leads to another ham caracteristic: we are resourceful! We make radios out of old tuna cans. We make antennas out of grocery carts. We find new ways to make GPS earn its keep, and clearly push the digital envelope – like the way Icom's ham team has pushed the DSP and Digital envelopes further and beyond any other manufacturers' offerings. (Heck, *ALL* other manufacturers when it comes to D-STAR!) Finally, a passionate ham is a real ham. There is a definite romance to communicating with someone on the other side of the country – even the world – with nothing between you and that person but thin air.

Icom is ham. We share your interests, your curiosity, your passion for the hobby. Now share your own hamness with us. Submit your photos for future use in an Icom ad like this. See details on back.

SO, ARE YOU A HAM?

For nearly 50 years, Icom has stood for innovation, reliability, and value. No other ham radio manufacturer has introduced so many new models pushing the technological envelope in recent years than Icom. And Icom is right there! Pushing the digital technology, with advanced DSP and the remarkable opportunities of D-STAR. Digital and analog, all in one rig: The best of the past, with the promise of *A Future...*

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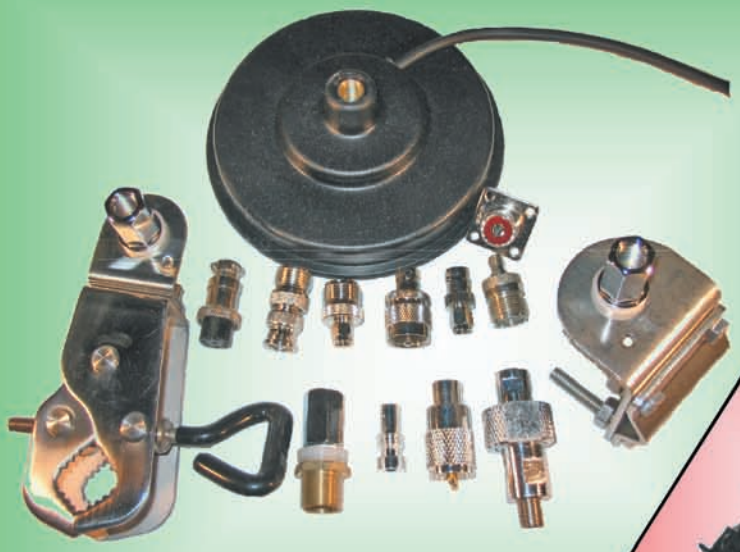

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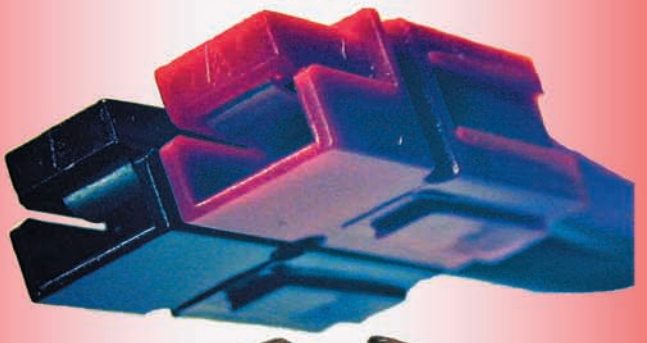

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- TX: HF/6M/2M • RX: 0.03-60, 108-174 MHz • Power: 5-100W
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- Includes separation cable

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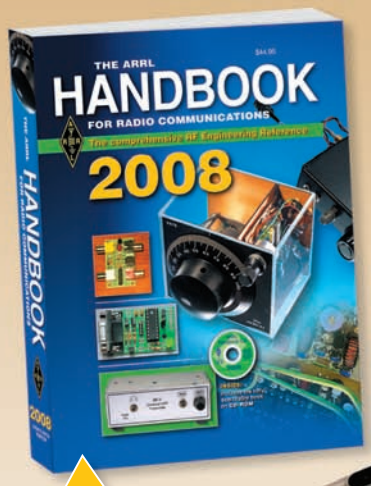

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Special **RG-8X 100' $42.00**

With two PL-259s installed and molded-on strain relief

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Pulleys - for antenna rope. Highest quality, marine quality with swivels to prevent twisting. Made for Dacron® rope. **For 3/16" rope @ $17.95 and for 5/16" rope @ $19.95**

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Built-in ground strap
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Dacron® Antenna Support Line, Mil Spec, single braid, strong, long-life, mildew and sun resistant support line.

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- **DR-03T** (pictured) 10 meters
- **DR-06T** 6 meters

- Same key-operations as DR-135-435 series mobile radios.
- EJ-41U internal TNC board is available as an option for 1200/9600bps packet (DR-06T only), no need to remove mic for packet operation.
- DR-03T 10 watts, H(10W)/M(5W)/L(2W) power settings.
- DR-06T 50 watts, H(50W)/M(20W)/L(5W) power settings.
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- Wide and narrow FM modes (16K0 & 8K50F3E / DR-03T is fixed for NFM)
- Theft alarm feature
- A large, palm-fitting commercial-grade backlit microphone with an 8 pin metal connector (not a modular plug) as well as direct frequency input and direct multi-function access such as monitor, call channel, power setting,memory to VFO plus more!
- Stays in mode you select (voice/packet) through power off cycles
- Ten autodial memories

Work simplex and the VHF and UHF Repeaters

- **144 MHz DR-135TMkIII** 50 watts, H/M/L power settings
- **220 MHZ DR-235TMkIII** (pictured) 25 watts, H/M/L power settings
- **440 MHZ DR-435TMKIII** 35 watts, H/M/L power settings

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- Rear panel DSUB9 computer connection
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- Ignition key on/off feature
- CTCSS, DCS encode+decode, DTMF encode and Tone-burst are all standards
- Clean, clear Alinco audio
- Super-wide 7 character alphanumeric display
- Wide and narrow FM modes (16K0 & 8K50F3E)
- Theft alarm feature
- A large, palm-fitting commercial-grade backlit microphone with an 8 pin metal connector (not a modular plug) as well as direct frequency input and direct multi-function access such as monitor, call channel, power setting, memory to VFO plus more!
- Stays in mode you select (voice/packet) through power off cycles
- Ten autodial memories

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- VHF/UHF full duplex operation includes V/U and U/V modes.
- Cross-band repeater function (where permitted: standard on DR-635T)
- 200 Memory channels
- H/M/L power output settings- VHF: 50/25/5W UHF: 35/20/5W
- Large 6 character alphanumeric display
- Selectable display color illumination (Blue, Violet or amber)
- Internal duplexer - single antenna connector
- Removable control head can be remotely mounted (requires optional EDS-9 separation kit) or allow transceiver to be inverted for optimal speaker placement.
- Expanded receive range includes FM broadcast band (WFM)
- Power supply voltage display
- Theft alarm feature
- Optional 1200 and 9600 bps packet operation with optional EJ-50U
- Digital voice communications with optional EJ-47U
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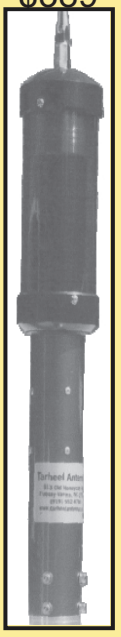

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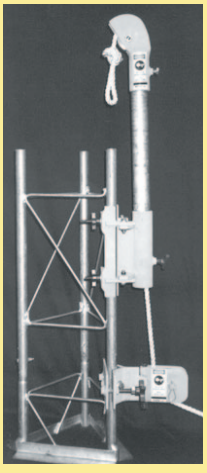

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- All cables included.

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AT-7000

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AT-897 for the Yaesu FT-897

If you own a Yaesu FT-897 and want a broad range automatic antenna tuner, look no further! The AT-897 Autotuner mounts on the side of your FT-897 just like the original equipment. We even added the ability to mount the "feet" on the side of the tuner so when you're transporting your rig by the handle, you can safely set it down and not worry about scratching the case. The AT-897 takes power directly from the CAT port of the FT-897 and provides a second CAT port on the back of the tuner so hooking up another CAT device couldn't be easier. ***Suggested Price$199***

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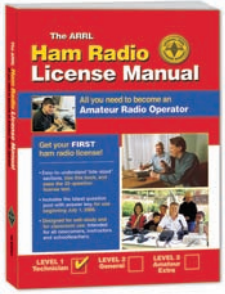

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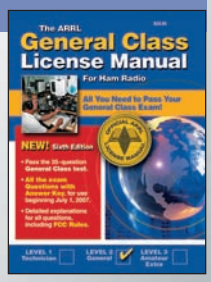

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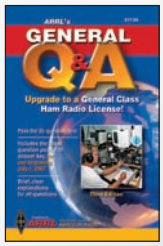

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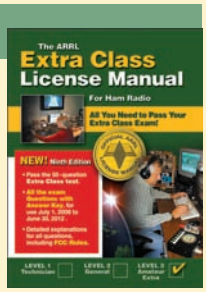

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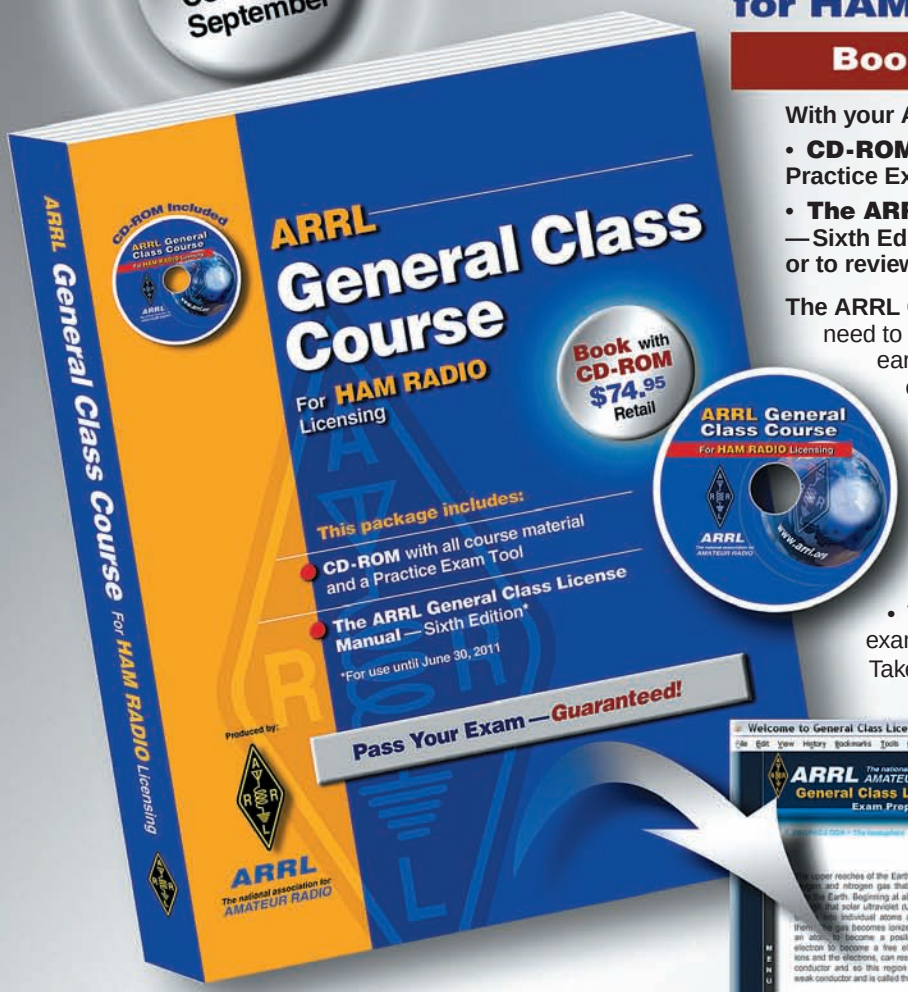

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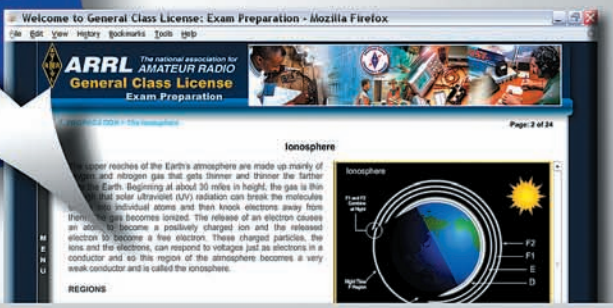

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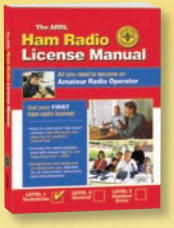

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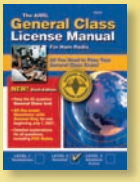

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Continued on page 142

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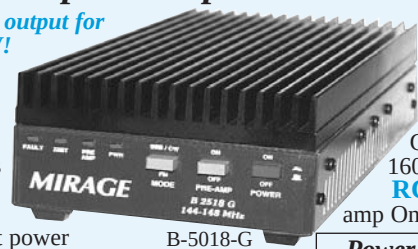

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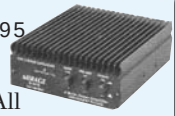

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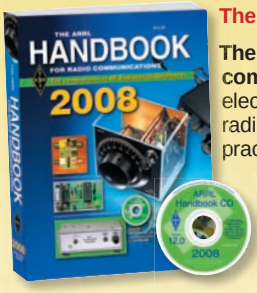

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MFJ Compact 200 Watt *IntelliTuners*™

Automatically tunes any unbalanced antenna . . . Ultra fast . . . 20,000 VirtualAntenna™ Memories . . . Antenna Switch . . . Efficient L-network . . . Matches 6-1600 Ohms at 200 Watts . . . 1.8-30 MHz . . . Digital SWR/Wattmeter . . . Audio SWR meter . . . Radio interface . . .

The MFJ-929 *IntelliTuner-Compact*™ lets you *automatically* tune any coax fed or random wire antenna 1.8-30 MHz at full 200 Watts SSB/CW. It can match 6-1600 Ohms (SWR up to 32:1) - - that's a 50% wider matching range at a higher power level than lesser competing products.

You get a *digital* SWR/Wattmeter with backlit LCD, antenna switch for 2 antennas, built-in radio interface and built-in internal BiasTee for remote tuner operation.

MFJ's exclusive *IntelliTune*™, *Adaptive Search*™ and *InstantRecall*™ algorithms give you ultra-fast automatic tuning with over 20,000 *VirtualAntenna*™ Memories.

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MFJ new *VirtualAntenna*™ Memory system gives you 4 antenna memory banks for *each* of 2 antenna connectors. You can select up to 4 antennas on each antenna connector. Each antenna has 2500 memories.

New!

MFJ-929
$219.95

4 Times the Solutions!

MFJ-929 gives you 256 values each of capacitance and inductances for 131,072 matching solutions. That's *4 times* the 32,768 matching solutions of competing products with only 128 L/C values each!

Highly intelligent, ultra-fast tuning!

Don't be fooled by competing products claiming fast search times -- if you have a *quarter* of the matching solutions, of course, it takes less time to search but it's *not* faster.

MFJ's much faster speed comes from advanced technology and software algorithms *not* from fewer matching solutions.

MFJ's *IntelliTuner-Compact*™ actually *measures* complex impedance -- *R* and *X* -- of your antenna, computes the L-network values needed and snaps in those components to give you an *instant* match.

If the load is out of measurement range, *AdaptiveSearch*™ determines the *smaller* subset from all solutions that can match a safe load -- and then searches *only* that subset -- others search through far more solutions.

Digital LCD SWR/Wattmeter

An easy-to-read, two-line, 16-character backlit LCD displays SWR, peak or average forward/reflected power, frequency, antenna 1 or 2, L/C tuner values, on/off indicators and other info. They are selected from easy-to-understand menus -- *not* complex combinations of buttons you can't remember.

A fast-response, high-resolution bargraph gives you an auto-ranging 20/200 Watt power meter. You get 60 segments each for forward and reflected power and 36 segments for SWR -- *try that with an 8 segment bargraph that makes you change power ranges and doesn't even give you reflected power!*

You can read inductance and capacitance *directly* in uH and pF. This turns you into an expert *L-network designer!* Match your load, read the resulting L/C values, then use them to build your fixed L-network.

Or, knowing the L/C values you can determine R and X of the load impedance.

Plus Much More!

***StickyTune*™** mode gives you one-hand tuning by locking the TUNE button -- just transmit to tune regardless of SWR.

Has audio SWR meter and audio feed back. Competing products don't.

Built-in 50 MHz frequency counter.

Its built-in radio interface lets you use a simple wire cable to compatible rigs. Others require a cable with expensive electronics.

Binding post for random wire. Self-test.

Highly efficient L-network. 10 Amp/1000V relays, RF duty silver mica capacitors. 6½ Wx2¾Hx7½D in. 2.4 lbs. 12-15 VDC/1Amp or 110 VAC with MFJ-1316, $21.95.

MFJ-928, $199.95. **Like** MFJ-929, less LCD, manual tune buttons.

MFJ-927, $259.95. **Weather** protected *remote* auto tuner for coax/wire ant., includes MFJ-4116 Power Injector. Most MFJ-929 features, no LCD/buttons.

MFJ-5114 K/Y/I/A, $19.95. Prewired Radio Interface cable for MFJ-929/928.

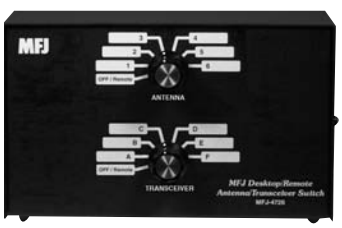
MFJ-4116, $24.95. Power Injector for remote MFJ-929/928 use. Sends DC/RF down coax.

Desktop/Remote Antenna and Antenna/Transceiver Switches

MFJ-4716
$89.95
6-position *Antenna* Switch

New!

MFJ-4726
$159.95
6-position *Antenna/Transceiver* Switch



Place these MFJ antenna or antenna/transceiver switches on your *desk* or use them *remotely*. You can place them out-of-the-way under your desk, in your garage or closet -- saves cable, eliminates cable mess.

Super easy-to-use rotary switches -- no complicated computer buttons to learn or microprocessors to fail or generate RFI that covers up rare DX.

Select 1 of 6 antennas and/or 1 of 6 transceivers in any combination. All unused inputs are grounded. Automatically grounds all inputs when you turn off your transceiver -- simply connect a sense line to your transceiver. When rotary switches are in OFF position, all inputs are grounded or control is transferred to the optional remote control.

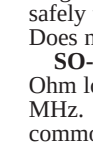
Ultra-fast gas discharge tube *lightning surge protector* protects transceiver and safely shunts static electricity and lightning induced surges safely to ground. Does not protect against direct lightning hit.

SO-239 connectors. 1500 Watts/50-75 Ohm load, 1-60 MHz. Useable to 150 MHz. Connects to remote control with common CAT 5 cable, not included (available from WalMart, etc.). Use 12 VDC or 110 VAC with MFJ-1312D, $14.95. For indoor use, not weather protected.

Antenna Switches - - 6 and 4 positions

• MFJ-4716, $89.95, *6-positions*; **• MFJ-4714, $79.95,** *4-positions.* 8Wx2¾Hx4¼D in.

Remote Controls:



• MFJ-4716RC, $39.95, *6-positions*; **• MFJ-4714RC, $39.95,** *4-positions.* 2¾Wx3¾Hx1D inches.

Antenna/Transceiver Switches - - 6 and 4 positions

Select one of 6 antennas *and* one of 6 transceivers in any combination with just two easy-to-use rotary switches.

Plug in antenna tuner, SWR/Wattmeter or other into its common ports, so it's always connected to the antenna and radio selected.

• MFJ-4726, $159.95, *6-positions*; **• MFJ-4724, $139.95,** *4-positions.* 8Wx5Hx4¼D"

Remote Controls: • MFJ-4726RC, $59.95, *6-positions*; **• MFJ-4724RC, $59.95,** *4-positions.* 2¾Wx3¾Hx1D"

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Who knows what the next challenge will be…

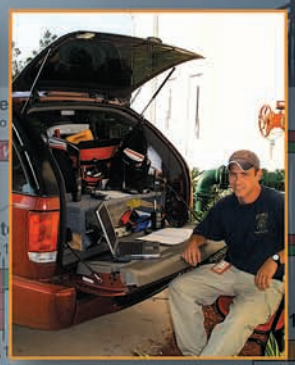
But we do know one thing …we MUST be prepared!

YOU can help…

…by making your generous contribution to the 2009 Spectrum Defense Fund!

ARRL must raise more than $333,000 this fall to fund its 2009 Spectrum Defense efforts.

Make the largest donation you can, by mail, phone or on the web at www.arrl.org/defense



For more information, contact:

Mary M. Hobart, K1MMH
Chief Development Officer
ARRL
225 Main Street
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MFJ TUNERS

New, Improved MFJ-989D 1500 Watt *legal limit* Antenna Tuner

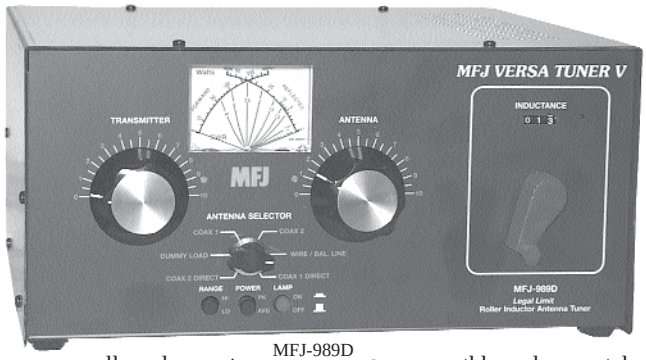
World's most popular 1500 Watt Legal Limit Tuner just got better -- much better -- gives you more for your money!

New, improved MFJ-989D *legal limit* antenna tuner gives you better efficiency, lower losses and a new *true* peak reading meter. It easily handles *full* 1500 Watts SSB/CW, 1.8 to 30 MHz, including MARS/WARC bands.

New dual 500 pF *air variable capacitors* give you twice the capacitance for more efficient operation on 160 and 80 Meters.

New, improved *AirCore*™ *Roller Inductor* gives you lower losses, higher Q and handles more power more efficiently.

New *TrueActive*™ peak reading Cross-Needle *SWR/Wattmeter* lets you read *true* peak power on all modes.



MFJ-989D $389.95

New high voltage *current balun* lets you tune balanced lines at high power with no worries.

New *crank knob* lets you reset your roller inductor quickly, smoothly and accurately.

New larger 2-inch diameter *capacitor knobs* with easy-to-see dials make tuning much easier.

New cabinet maintains components' high-Q. Generous air vents keep components cool. $12^{7}/_{8}$Wx6Hx$11^{5}/_{8}$D inches.

Includes six position ceramic antenna switch, 50 Ohm dummy load, indestructible multi-color Lexan front panel with detailed logging scales and legends.

The MFJ-989D uses the superb time-tested T-Network. It has the widest matching range and is the easiest to use of all matching networks. Now with MFJ's new 500 pF air variable capacitors and new low loss roller inductor, it easily handles higher power much more efficiently.

***No Matter What*™ Warranty**

Every MFJ tuner is protected by MFJ's famous one year *No Matter What*™ limited warranty. We will repair or replace your MFJ tuner (at our option) for a full year.

More hams use MFJ tuners than all other tuners in the world!

MFJ-986 Two knob *Differential-T*™

MFJ-986 $349.95

Two knob tuning (differential capacitor and *AirCore*™ roller inductor) makes tuning foolproof and easier than ever. Gives minimum SWR at only one setting. Handles 3 KW PEP SSB amplifier input power (1.5 KW output). Gear-driven turns counter, lighted peak/average Cross-Needle SWR/Wattmeter, antenna switch, balun. 1.8 to 30 MHz. $10^{3}/_{4}$Wx$4^{1}/_{2}$Hx15 in.

MFJ-962D *compact* kW Tuner

MFJ-962D $299.95

A few more dollars steps you up to a KW tuner for an amp later. Handles 1.5 KW PEP SSB amplifier input power (800W output). Ideal for Ameritron's AL-811H! *AirCore*™ roller inductor, gear-driven turns counter, pk/avg lighted Cross-Needle SWR/Wattmeter, antenna switch, balun, Lexan front, 1.8-30MHz. $10^{3}/_{4}$x$4^{1}/_{2}$ x$10^{7}/_{8}$ in.

MFJ-969 300W *Roller Inductor* Tuner

MFJ-969 $219.95

Superb *AirCore*™ Roller Inductor tuning. Covers *6 Meters* thru 160 Meters! 300 Watts PEP SSB. *Active* true peak reading lighted Cross-Needle SWR Wattmeter, *QRM-Free PreTune*™, antenna switch, dummy load, 4:1 balun, Lexan front panel. $3^{1}/_{2}$Hx$10^{1}/_{2}$Wx$9^{1}/_{2}$D inches.

MFJ-949E *deluxe* 300 Watt Tuner

MFJ-949E $179.95

More *hams use MFJ-949s than any other antenna tuner in the world!* Handles 300 Watts. Full 1.8 to 30 MHz coverage, custom inductor switch, 1000 Volt tuning capacitors, *full size* peak/average lighted Cross-Needle SWR/Wattmeter, 8 position antenna switch, dummy load, *QRM-Free PreTune*™, scratch proof Lexan front panel. $3^{1}/_{2}$Hx$10^{5}/_{8}$Wx7D inches. **MFJ-948, $139.95.** Economy version of MFJ-949E, less dummy load, Lexan front panel.

MFJ-941E *super value* Tuner

MFJ-941E $139.95

The *most for your money!* Handles 300 Watts PEP, covers 1.8-30 MHz, *lighted* Cross-Needle SWR/Wattmeter, 8 position antenna switch, 4:1 balun, 1000 volt capacitors, Lexan front panel. Sleek $10^{1}/_{2}$Wx$2^{1}/_{2}$Hx7D in.

MFJ-945E HF/6M *mobile* Tuner

MFJ-945E $129.95

Extends your mobile antenna bandwidth so you don't have to stop, go outside and adjust your antenna. Tiny 8x2x6 in. *Lighted* Cross-Needle SWR/Wattmeter. Lamp and bypass switches. Covers 1.8-30 MHz *and* 6 Meters. 300 Watts PEP. **MFJ-20, $6.95,** mobile mount.

MFJ-971 *portable/QRP* Tuner

MFJ-971 $119.95

Tunes coax, balanced lines, random wire 1.8-30 MHz. Cross-Needle Meter. SWR, 30/300 or 6 Watt QRP ranges. Matches popular MFJ transceivers. Tiny 6x$6^{1}/_{2}$x$2^{1}/_{2}$ in.

MFJ-901B *smallest* Versa Tuner

MFJ-901B $99.95

MFJ's smallest (5x2x6 in.) and most affordable wide range 200 Watt PEP Versa tuner. Covers 1.8 to 30 MHz. Great for matching solid state rigs to linear amps.

MFJ-902 *Tiny Travel* Tuner

MFJ-902 $99.95

Tiny $4^{1}/_{2}$x$2^{1}/_{4}$x3 inches, full 150 Watts, 80-10 Meters, has tuner bypass switch, for coax/random wire. **MFJ-904H, $149.95.** Same but adds Cross-needle SWR/Wattmeter and 4:1 balun for balanced lines. $7^{1}/_{4}$x$2^{1}/_{4}$x$2^{3}/_{4}$ inches.

MFJ-16010 *random wire* Tuner

MFJ-16010 $69.95

Operate all bands anywhere with MFJ's reversible L-network. Turns random wire into powerful transmitting antenna. 1.8-30 MHz. 200 Watts PEP. Tiny 2x3x4 in.

MFJ-906/903 *6 Meter* Tuners

MFJ-906 $99.95

MFJ-906 has lighted Cross-Needle SWR/Wattmeter, bypass switch. Handles 100 W FM, 200W SSB. **MFJ-903, $69.95**, Like MFJ-906, less SWR/Wattmeter, bypass switch.

MFJ-921/924 *VHF/UHF* Tuners

MFJ-921/924 $89.95

MFJ-921 covers 2 Meters/220 MHz. **MFJ-924** covers 440 MHz. SWR/Wattmeter. 8x$2^{1}/_{2}$x3 in.

MFJ-931 *artificial* RF Ground

MFJ-931 $109.95

Eliminates RF hot spots, RF feedback, TVI/RFI, weak signals caused by poor RF grounding. Creates artificial RF ground or electrically places far away RF ground directly at rig. **MFJ-934, $209.95**, Artificial ground/300 Watt Tuner/Cross-Needle SWR/Wattmeter.

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Never before has a compact HT offered as many features, and such high powered performance as the TH-F6A. Arm yourself with one today and gain your own airwave superiority.

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- FM/FM-W/FM-N/AM plus SSB/CW receive
- Bar antenna for receiving AM broadcasts
- Special weather channel RX mode
- 435 memory channels, multiple scan functions
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- Built-in charging circuitry for battery recharge while the unit operates from a DC supply
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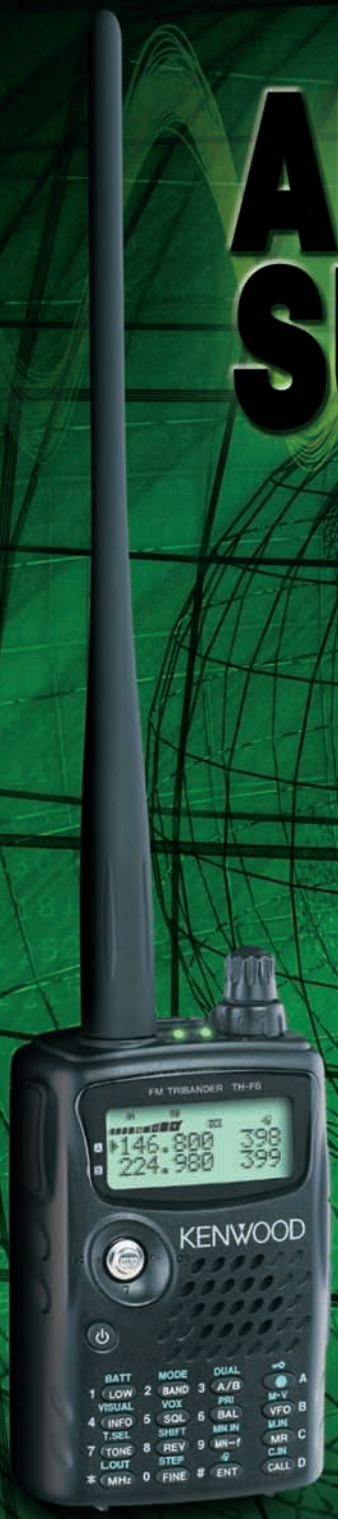
- Large frequency display for single-band use
- Automatic simplex checker
- Wireless remote control function
- Battery indicator • Internal VOX • MCP software

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



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MFJ tiny Travel Tuner

Tiny 4½x2¼x3 inch tuner handles full 150 Watts! Covers 80-10 Meters, has tuner bypass switch, tunes nearly anything!

MFJ brings you the *world's smallest* full power 150 Watt 80-10 Meter Antenna Tuner. Extra wide matching range lets you tune nearly any antenna.

It's no toy, its got guts! Built with real *air* variable capacitors (600 Volt, 322 pF) and *three* stacked powder iron toroids to handle real power -- not just QRP. Bypass switch lets you bypass tuner when you don't need it.

You can use nearly any transceiver at full power with nearly any coax fed or random wire antenna for portable, home or mobile operation.

It's perfect for compact rigs like Icom IC-706MKIIG, Yaesu FT-100D, Kenwood TS-50, QRP rigs and others with a built-in SWR meter.

Operate anywhere, anytime with a quick easy set-up! Tune out SWR on your mobile whip from inside your car. Operate in your apartment with a wall-to-wall antenna or from a motel room with a wire dropped from a window or from a mountain top with a wire over a tree limb. Great for DXpeditions or field day. Be prepared for emergencies.

MFJ-902 is so small and handy, you'll rely on it wherever you go! It's easy to pack away in your briefcase, suitcase, backpack, glove compartment or desk drawer. It's tiny enough to slide in your back hip pocket! 4½Wx2¼Hx3D inches.

MFJ-902
$99.95

Tiny Travel Tuner with 4:1 Balun

MFJ-902H
$119.95

MFJ-902H, same as MFJ-902 *Tiny Travel Tuner* but has *4:1 balun* for balanced lines and 5-way binding posts for balanced lines and random wire. 5¾Wx2¼Hx 2¾D in.

Tiny Travel Tuner with Cross-Needle SWR/Wattmeter

MFJ-904
$129.95

MFJ-904, same as MFJ-902 *Tiny Travel Tuner* but has *Cross-Needle SWR/Wattmeter.* Read SWR, forward and re-flected power all at a glance in 300/60 and 30/6 Watt ranges. 7¼Hx2¼Hx2¾D inches.

ALL-in-one *Tiny Travel Tuner* with 4:1 Balun *and* SWR/Wattmeter

MFJ-904H
$149.95

ALL-in-one! MFJ-904H, same as MFJ-902 *Tiny Travel Tuner* but has *4:1 balun for balanced lines* and Cross-Needle SWR Wattmeter. Read SWR, forward and reflected power all at a glance in 300/60 and 30/6 Watt ranges. Has 5-way binding posts for balanced lines and random wire. 7¼Hx2¼Hx2¾D inches.

Long 10/12 foot Telescoping Whips

MFJ-1954
$29.95
10 Feet

MFJ-1956
$34.95
12 Feet

MFJ-1954 10 foot extended, 19 inches collapsed, MFJ-1954, $22.95. 12 foot extended, 22.5 inches collapsed. MFJ-1956, $29.95. Standard 3/8 inch by 24 threaded stud for use with all standard mounts. Durable 1/2 inch diameter plated brass. Telescopes for full 1/4 wave operation 2 to 12/15 Meters. Cover 17, 20, 30, 40, 60, 80, 160 Meters with loading coil. Use two for multi-band dipoles. Replace screwdriver antenna whip for highly efficient *fixed* mobile operation.

MFJ RF Isolator

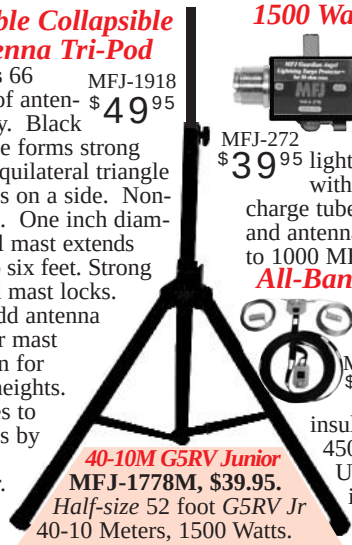
MFJ-915
$29.95

MFJ-915 *RF Isolator* prevents unwanted RF from traveling on the outside of your coax shield into your transceiver. This unwanted stray RF can cause painful RF "bites" when you touch your microphone or volume control, cause your display or settings to go crazy, lock up your transceiver or turn off your power supply. In mobile installations, stray RF could cause your car to do funny things even blow your car computer. Clear up these problems, plug an MFJ-915 between your antenna and transceiver. *Don't operate without one!* 5x1½ inches. For 1.8 to 30 MHz.

Portable Collapsible Antenna Tri-Pod

MFJ-1918
$49.95

Holds 66 pounds of antenna steady. Black *steel* base forms strong braced equilateral triangle 40 inches on a side. Non-skid feet. One inch diameter steel mast extends height to six feet. Strong base and mast locks. Easily add antenna mount or mast extension for greater heights. Collapses to 38 inches by 4 inch diameter. 6¾ pounds.



40-10M G5RV Junior
MFJ-1778M, $39.95.
Half-size 52 foot *G5RV Jr* 40-10 Meters, 1500 Watts.

1500 Watt Lightning Surge Protector

MFJ-272
$39.95

Protect your expensive transceiver from static electricity and lightning induced surges with an ultra-fast gas discharge tube. Plug between rig and antenna, attach ground. DC to 1000 MHz. SO-239s.

All-Band G5RV Antenna

MFJ-1778
$44.95

Cover all bands, 160-10M with tuner. 102 ft. long, 1.5kW. Custom fiberglass insulator stress relieves 450 Ohm ladder line. Use horizontally, as inverted vee or sloper. Marconi on 160M.

Glazed Ceramic Antenna Insulator

MFJ-16C06
6-Pack
$4.56
(79 cents each)

Authentic *glazed ceramic* antenna insulator. Extra-strong -- will not break with long antennas and will not arc over or melt even under full legal power. Molded ridges give extra-long high voltage path to prevent high-voltage breakdown. Smooth wire holes prevent wire damage. Use as center or end insulator for dipoles, doublets, G5RVs, guy wires and others.

Current Balun/Center Insulator

MFJ-918
$24.95

True *1:1 Current Balun/Center Insulator* forces equal currents into dipole halves to reduce coax feedline radiation and field pattern distortion. Reduces TVI, RFI and RF hot spots in your shack. 50 ferrite beads on *Teflon*(R) coax. 1.5kW, 1.8-30 MHz. Stainless steel hardware. *Direct* antenna connection. 5x1½ in.

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and Nearest Dealer . . . 800-647-1800

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MFJ . . . the world leader in ham radio accessories!

MFJ *Balanced Line* Antenna Tuner

Superb balance . . . Very wide matching range . . . Covers 1.8-54 MHz . . . Cross-Needle SWR Wattmeter . . . Handles 300 Watts . . . Compact size . . .

The MFJ-974HB is a* fully balanced true *balanced line antenna tuner. It gives you superb current balance.

Johnson Matchbox

For decades, the Johnson Matchbox has been the standard of comparison for balanced line antenna tuners. But, it had a severely limited matching range and covered only 80, 40, 20, 15 and 10 Meters.

***The** MFJ-974HB is its successor*. It meets today's needs and even surpasses the Johnson Matchbox outstanding performance.

Everything You Need

The MFJ-974HB gives you excellent current balance, very wide matching range(12-2000 Ohms) and covers 1.8 through 54 MHz *continuously* including all WARC bands, 160 Meters, 6 Meters and the new 60 Meter band. Handles 300 Watts SSB PEP and 150 Watts CW.

Tuning is fast and easy - - just three tuning controls. You can adjust for highly efficient broadband low-Q operation or use higher Q when you encounter extreme loads.

A large three-inch lighted Cross-Needle SWR/Wattmeter lets you read SWR, peak or average forward and reflected power *all at a glance* on 300/60 or 30/6 Watt ranges.

A ground post is provided to ground one output terminal so you can also tune random wires and coax fed antennas.

Compact 7½Wx6Hx8D in. fits anywhere.

Tunes any Balanced Line

The MFJ-974HB tunes any balanced lines including 600 Ohm open wire line, 450/300 Ohm ladder lines, 300/72 Ohm twin lead - - shielded or unshielded.

Superb current balance minimizes feedline radiation that can cause troublesome TVI /RFI, painful RF bites, mysterious RF feedback problems and radiation pattern distortion.

Excellent Balance, Excellent Design

The MFJ-974HB is a *fully balanced* wide range T-Network. *Four* 1000 Volt air variable capacitors are gear driven. A high-Q air wound tapped inductor is used for 80-10 Meters with separate inductors for 6 and 160 Meters. The tuning components are mounted symmetrically to insure electrical balance.

MFJ-974HB
$209.95

A 1:1 *current* balun is placed on the low impedance 50 Ohm input side to convert the balanced T-Net-work to un-balanced operation. An efficient balun is made of 50 ferrite beads on RG-303 *Teflon*™ coax to give very high isolation. It stays cool even at max power.

Balanced Line = Extremely Low Loss

Balanced lines give extremely low loss.

Doublet, horizontal loop, vertical loop, quad, double extended Zepp, Lazy H, W8JK antennas all give efficient multi-band operation when fed with balanced lines.

6-80 Meter Balanced Line Tuner

MFJ-974B
$189.95

MFJ-974B, $189.95. Same as MFJ-974H but for 6-80 Meter operation (no 160 Meters).

160-6 Meters All Band Doublet Antenna

MFJ-1777, $59.95. 102 feet doublet antenna covers 160-6 Meters with balanced line tuner. Super strong custom fiberglass center insulator provides stress relief for 450 Ohm ladder line (100 feet included). Authentic *glazed ceramic* end insulators. Handles 1500 Watts.

MFJ *High Current* DC Multi-Outlet Strips

Choose super versatile 5-way binding posts AND/OR Anderson PowerPole® connectors

Anderson PowerPole® is a registered trademark of *Anderson Power Products.*

Provide multiple high current DC outlets for transceivers and accessories from your main 12 VDC power supply – keeps you neat, organized and safe. Prevents fire hazard. Keeps wires from tangling up and shorting. Outlets are fused and RF bypassed.

All MFJ DC power strips have *built-in* six foot, eight gauge, flexible color-coded cable with ring tongue terminals -- *no extra cost. RF-tight* aluminum cabinet has mounting ears and ground post with wing nut.

Choose MFJ's *super versatile* super heavy duty 5-way binding posts (spaced for standard dual banana plugs) and/or *Anderson PowerPole®* outlets.

Each *Anderson PowerPole®* is individually fused as needed. Standard color coded automobile fuses plug in externally. Extra *PowerPole®* connectors, contacts, fuses are included at *no extra cost.*

Versatile 5-Way Binding Posts

MFJ-1118
$84.95

Power two HF and/or VHF rigs and six accessories from your main 12 VDC supply. *Built-in 0-25 VDC voltmeter*. Two pairs 35 amp 5-way binding posts, fused and RF bypassed for transceivers. Six pairs RF bypassed binding posts with master fuse, ON/OFF switch, and "ON" LED provide 15 Amps for accessories. 12½x2¾x2½ in.

All PowerPoles®

MFJ-1128
$104.95

12 outlets, each fused, 40 Amps total. Three high-current outlets for transceivers. Nine *switched* outlets for accessories. Mix and match in-cluded fuses as needed (one-40A, one-25A, four-10A, four-5A, three-1A fuses installed). *Built-in 0-25 VDC Voltmeter*. Includes *extra* 12 pairs of *PowerPole®* contacts and *extra* 10 fuses (2 each: 1, 5, 10, 25, 40A) -- *no extra cost*. 12Wx1¼Hx2¾D in.

MFJ-1126
$84.95

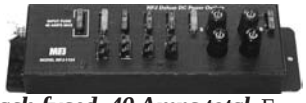
8 outlets. each fused, 40 Amps total. Factory installed fuses: two 1A, three 5A, two 10A, one 25A, one 40A. *Built-in 0-25 VDC Voltmeter*. Includes *extra* 6 pairs of *Anderson PowerPole®* contacts and *extra* 5 fuses (1, 5, 10, 25, 40A) -- *no extra cost*. 9Wx1¼Hx2¾ inches.

PowerPoles® AND 5-Way Binding Posts

MFJ-1129
$114.95

The best of both worlds! ***10 outlets, each fused, 40 Amps total.*** Three high-current outlets for rigs -- 2 *PowerPoles®* and 1 versatile high-current 5-way binding post. Seven *switched* outlets for accessories (20A max) -- 5 *PowerPoles®* and 2 versatile binding posts. Mix and match included fuses as needed (1- 40A, 2-25A, 3-10A, 3-5A, 2-1A installed). *Built-in 0-25 VDC Voltmeter*. Includes *extra* 7 pairs of *PowerPole®* contacts, and 10 fuses (2 each,1,5,10, 25, 40A) -- *no extra cost*.12½Wx1¼Hx2¾D in.

MFJ-1124
$64.95



6 outlets, each fused, 40 Amps total. Four *PowerPoles®* and two high-current 5-way binding posts, Installed fuses: 1-40A, 2-25A, 2-10A, 1-5A, 1-1A. Includes 4 pair *PowerPole®* contacts, and 5 fuses -- *no extra cost*.

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MFJ . . . The World Leader in Ham Radio Accessories!

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.

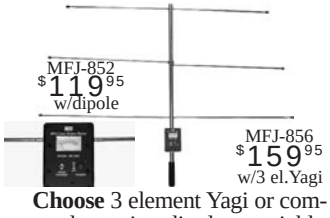
Extra-large three-inch lighted Cross-Needle meter reads SWR (1:1 to 8:1), forward and reflected power *simultaneously*.

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.

Find Power Line Noise fast!

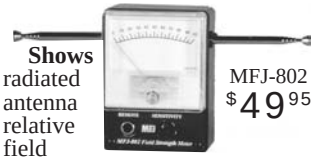


MFJ-852
$119.95
w/dipole

MFJ-856
$159.95
w/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.

Field Strength Meters



MFJ-802
$49.95

Shows radiated antenna relative field strength. Determine radiation pattern. **MFJ-802** has huge 3 inch meter. Telescoping dipole reduces influence of surrounding objects and is more reliable, 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.

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.

MFJ Frequency Counters

MFJ-886
$119.95

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 in.

MFJ-888
$189.95

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 in.

MFJ *HF/VHF/UHF Dummy Loads*

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 in. **MFJ-250, $69.95.** Includes transformer oil (no PCB).

Dry 1.5 kW *HF/VHF/UHF* 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 10 minutes, 1500 Watts for 10 seconds. 3Wx3H x9D in. SO-239 connector. **MFJ-264N, $84.95.** With type "N" connector.

Dry 300 Watt *HF/VHF* Dummy Load

MFJ-260C
$39.95

Air-cooled, non-inductive resistor in a perforated metal housing; SO-239 connector. Full load for 30 seconds. Silk-screened derating curve to 5 minutes. Handles 300 Watts. SWR below 1.1:1 to 30 MHz, 1.5:1 from 30 to 650 MHz. 2¼x2¼x7 inches. **MFJ-260CN, $49.95.** With type "N" connector.

MFJ CW Reader/Keyer

MFJ-464
$199.95
(Keyboard, paddle not included.)

Plug MFJ's CW Reader with *built-in* Keyer into your transceiver's phone jack and key jack. Now you're ready to compete with the world's best hi-speed CW operators -- and *they won't even know you just passed the code test!* Sends and reads 5-99 WPM. Automatic speed tracking. Large 2-line LCD shows send/receive messages. Use paddle or computer keyboard. Easy menu operation. Front panel speed, volume controls. 4 message memories, type ahead buffer, read again buffer, adjustable weight/sidetone, speaker. RFI proof.

MFJ Atomic Wrist Watch

MFJ-186RC
$29.95

Receives atomic time signal WWVB and sets your watch automatically -- always accurate to milliseconds. Select 12/24 hour format and pacific, mountain, central, eastern time zones. Displays hour, minutes, seconds, day and date. Displays year, month and day in calendar mode. Alarm, stopwatch functions. Brilliant blue backlight. Water-resistant.

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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MFJ *Switching* Power Supplies

Power your HF transceiver, 2 meter/440 MHz mobile/base and accessories with these new 15, 25, 45 or 75 Amp MFJ MightyLite™ Switching Power Supplies!

No RF hash . . . Super lightweight . . . Super small . . . Volt/Amp Meters . . .

MFJ's adjustable voltage switching power supplies do it all! Power your HF or 2M/440 MHz radio and accessories.

MFJ's *MightyLites*™ are so light and small you can carry them with one hand! Take them with you anywhere.

No more picking up and hauling around heavy, bulky supplies that can give you a painful backache, pulled muscle or hernia.

These babies are clean . . . Your buddies won't hear *any* RF hash on your signal! *None* in your receiver either! These super clean *MightyLites*™ meet all FCC Class B regulations.

Less than 35 mV peak-to-peak ripple under 25 or 45 amp full load. Load regulation is better than 1.5% under full load.

You won't burn up our power supplies! MFJ Power supplies are *fully protected* with Over Voltage, Over-temperature and Over Current protection circuits.

MFJ *MightyLites*™ can be used anywhere in the world! They have switchable AC input voltage and work from 85 to 135 VAC or 170 to 260 VAC. Replaceable fuse.

A whisper quiet internal fan efficiently cools your power supply for long life.

The smallest and lightest power supply in ham radio!

MFJ-4125
25 Amp w/o Meters
$109.95

MFJ-4125 powers HF/2M/440 MHz rigs and accessories. 25 A max, 22 Amps continuous @ 13.8VDC. 110 or 220 VAC. 2.86 lbs. 5¾Wx3Hx5¾D in.

MFJ-4125P, $124.95. Like above, but adds 2-pair of Anderson PowerPoles™.

MFJ-4225MV
25 Amp with Meters
$149.95

MFJ-4225MV, 25 Amps max, 22 Amps continuous. Like MFJ-4125 but adds Volt/Amp meters, cigarette lighter plug. 5¼Wx4½Hx6D in. Weighs 3.7 lbs. Use 85 to 135 VAC or 170 to 260 VAC. Replaceable fuse.

MFJ-4245MV
45 Amp
$199.95

MFJ-4245MV, 45 Amps max, 40 Amps continuous. Like MFJ-4225MV but weighs 5.5 lbs. 7½Wx4¾Hx9D inches. It's a great workhorse for multi-rig base stations! Two sets of quick connects on rear of unit.

MFJ-4175
75 Amp
$359.95

MFJ-4175, 75 Amps *continuous*. 13.8-14.2 VDC. 7.8 pounds. 6½Wx3½Hx10D inches.108-132 VAC. Great for Ameritron ALS-500M mobile amplifier!

High Current Multiple DC Power Outlets

MFJ-1118 powers two HF/VHF transceivers and six or more accessories from your 12 VDC power supply . . . Choose versatile 5-way binding posts or Anderson PowerPoles™

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. Similar to MFJ-1118. No 30 amp posts, "ON" LED or voltmeter. 15 Amps total.

MFJ-1112
$44.95

MFJ-1112, $44.95. Similar to MFJ-1116. No on/off switch, LED, meter, fuse. 15 Amps total.

MFJ-1117
$64.95

MFJ-1117, $64.95. For powering *four* HF /VHF radios (two at 35 Amps each and two at 35 Amps combined) simultaneously. 8x2x3 in.

MFJ-1128
$104.95

MFJ-1128, $104.95. Three high-current outlets for transceivers. Nine *switched* outlets for accessories. Mix and match included fuses as needed (one-40A, one-25A, four-10A, four-5A, three-1A fuses installed). *Built-in 0-25 VDC Voltmeter*. Extra contacts, fuses. 12Wx1¼Hx2¾D inches.

MFJ-1126
$84.95

MFJ-1126, $84.95. Factory installed fuses: two 1A, three 5A, two 10A, one 25A, one 40A. *Built-in 0-25 VDC Voltmeter*. Includes *extra PowerPole*® contacts and *extra* fuses -- *no extra cost*. 9Wx1¼Hx2¾ in.

MFJ-1129
$114.95

MFJ-1129, $114.95. Three high-current outlets for rigs -- 2 *PowerPoles*® and 1 versatile high-current 5-way binding post. Seven *switched* outlets for accessories (20A max) -- 5 *PowerPoles*® and 2 versatile

MFJ-1124
$64.95

binding posts. Fuses include (1- 40A, 2-25A, 3-10A, 3-5A, 2-1A installed). *Built-in 0-25 VDC Voltmeter*. Includes extra *PowerPole*®12½Wx1¼Hx2¾D inches.

MFJ-1124, $64.95. Four *PowerPoles*® and two high-current 5-way binding posts, Installed fuses: 1-40A, 2-25A, 2-10A, 1-5A, 1-1A. Includes 4 pair extra *Anderson PowerPole*® contacts, and 5 fuses -- at *no extra cost*.

15A Switching Power Supply

MFJ-4115
$89.95

MFJ-4115 is 1½ lbs. and a tiny 3¾Wx2¼Hx 3¾D inches. Easily fits in an overnight bag and can power most VHF/UHF or QRP rigs. AC input 90 to 130 Volts. 13.8 VDC output, 17 Amps surge and 15A continuous. 1 set of 5-way binding posts.

MFJ 35/30 Amp DC Power Supply

MFJ-4035MV
$149.95

This 19.2 lb. transformer delivers 35 Amps max and 30 Amps continuously. Use any 110 VAC outlet. Highly regulated with load regulation better than 1%. Ripple voltage is less than 30 mV. Over-voltage, fold back short circuit and over-temperature protections. Adjustable voltage 1-14 VDC with detent @ 13.8 VDC. Voltage/current meters. Output terminals: pair of five-way binding posts, two pairs of quick-connects and a covered cigarette lighter socket for mobile accessories. Measures 9½Wx6Hx9¾D inches.

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MFJ *Pocket size* Morse Code Reader™

Hold near your receiver -- it instantly displays CW in English!

Automatic Speed Tracking . . . Instant Replay . . . 32 Character LCD . . . High-Performance Modem . . . Computer Interface . . . Battery Saver . . .

MFJ-461
$89.95

Is your CW rusty?

Relax and place this tiny pocket size MFJ Morse Code Reader near your receiver's speaker . . .

Then watch CW turn into solid text messages as they scroll across an easy-to-read LCD display.

No cables to hook-up, no computer, no interface, nothing else needed!

Use it as a backup in case you miscopy a few characters - - it makes working high speed CW a breeze - - even if you're rusty.

Practice by copying along with the MFJ-461. It'll help you learn the code and increase your speed as you instantly see if you're right or wrong.

Eavesdrop on interesting Morse code QSOs from hams all over the world. It's a universal language that's understood the world over.

Automatic Speed Tracking

MFJ *AutoTrak*™ automatically locks on, tracks and displays CW speed up to 99 Words-Per-Minute.

Simply place your MFJ-461 close to your receiver speaker until the lock LED flashes in time with the CW.

Four Display Modes

1. Bottom line scrolls and fills with text, then that entire line is displayed on top line until bottom line refills -- makes reading text extra easy! Automatically displays speed in WPM.

2. Same as **1**, without speed display -- gives you maximum text display.

3. Top line scrolls, bottom line displays speed in Words-Per-Minute.

4. Both top and bottom lines scroll.

Two-line LCD display has 32 large 1/4 inch high-contrast characters.

MFJ Instant Replay

The last 140 characters can be instantly replayed. This lets you re-read or check your copy if you're copying along side the MFJ-461.

High Performance Modem

Consistently get solid copy from MFJ's high performance *PLL* (*phase-lock loop*) modem. Digs out weak signals. Even tracks slightly drifting signals.

Of course, nothing can clean up and copy a sloppy fist, especially weak signals with lots of QRM/QRN.

Computer Interface

The MFJ-461's serial port lets you display CW text full screen on a bright computer monitor -- just use your computer serial port and terminal program.

More Features

When it's too noisy for its microphone pickup, you can connect the MFJ-461 to your receiver with a cable.

Battery saving feature puts MFJ-461 to sleep during periods of inactivity. It wakes up and decodes when it hears CW.

Uses 9 Volt battery (not included).

True Pocket Size

Fits in your shirt pocket with room to spare - smaller than a pack of cigarettes. Tiny $2^{1}/_{4}$x$3^{1}/_{4}$x1 in. $5^{1}/_{2}$ ounces.

No Instruction Manual needed!

Super easy-to-use! Just turn it on -- it starts copying instantly!

Accessories

MFJ-26B, $9.95. Soft leather protective pouch. Clear plastic overlay for display, push button opening, strong, pocket/belt clip secures MFJ-461.

MFJ-5161, $14.95. MFJ-461 to computer serial port cable (DB-9).

MFJ-5162, $7.95. Receiver cable connects MFJ-461 to your radio's external speaker 3.5 mm jack.

MFJ-5163, $10.95. Cable lets you use external speaker when MFJ-461 is plugged into radio speaker jack. 3.5 mm.

MFJ *Pocket* Morse Tutor

MFJ-418
$89.95

Learn Morse code anywhere with this tiny *MFJ Pocket-sized Morse Code Tutor*™! Practice copying letters, numbers, prosigns, punctuations or any combination or words or QSOs. Follows ARRL/VEC format. Start at zero code speed and end up as a high speed *CW Pro!* LCD, built-in speaker.

MFJ Code Oscillator

MFJ-557
$39.95

MFJ-557 Deluxe Code Practice Oscillator has a Morse key and oscillator unit mounted together on a heavy steel base -- stays put on your table! Portable. 9-Volt battery or 110 VAC with MFJ-1312D, $15.95. Earphone jack, tone and volume controls, speaker. Adjustable key. Sturdy. $8^{1}/_{2}$x$2^{1}/_{4}$x$3^{3}/_{4}$ inches.

MFJ *Pocket* CW Keyer

MFJ-403P
$79.95

Built-in Iambic Paddle. Thumbwheel speed control. Adjustable weight. Adjustable sidetone with speaker. Iambic modes A or B. Fully automatic or semi-auto "bug" mode. Reversable paddle. Tune mode. RF-proof. Battery Saver. Tiny $2^{1}/_{4}$Wx$3^{1}/_{4}$H x1D inches.

MFJ *miniature* Travel Iambic Paddle

MFJ-561, $24.95. $1^{3}/_{4}$Wx$1^{3}/_{4}$Dx$^{3}/_{4}$H in. *Formed* phosphorous bronze spring paddle, stainless steel base. 4 ft. cord, 3.5 mm plug.

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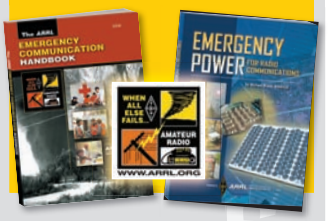

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QST 9/2008

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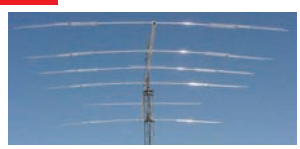

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- Optional RF μ -Tune Units for 160 m, 80/40 m and 30/20 m Bands

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.

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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.

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All-Terrain Performance

On or off the road, Kenwood's new TM-271A delivers powerful mobile performance with 60W maximum output and other welcome features such as multiple scan functions and memory names. Yet this tough, MIL-STD compliant transceiver goes easy on you, providing high-quality audio, illuminated keys and a large LCD with adjustable green backlighting for simple operation, day or night.

144MHz FM TRANSCEIVER

TM-271A

▮ 200 memory channels (100 when used with memory names) ▮ Frequency stability better than ±2.5ppm (-20~+60°C) ▮ Wide/Narrow deviation with switchable receive filters ▮ DTMF microphone supplied ▮ NOAA Weather Band reception with warning alert tone ▮ CTCSS (42 subtone frequencies), DCS (104 codes) ▮ 1750Hz tone burst ▮ VFO scan, MHz scan, Program scan, Memory scan, Group scan, Call scan, Priority scan, Tone scan, CTCSS scan, DCS scan ▮ Memory channel lockout ▮ Scan resume (time-operated, carrier-operated, seek scan) ▮ Automatic repeater offset ▮ Automatic simplex checker ▮ Power-on message ▮ Key lock & key beep ▮ Automatic power off ▮ Compliant with MIL-STD 810 C/D/E/F standards for resistance to vibration and shock ▮ Memory Control Program (available free for downloading from the Kenwood Website: ***www.kenwoodusa.com***)

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