# QST

DEVOTED ENTIRELY TO AMATEUR RADIO

MAY 2009 WWW.ARRL.ORG


# ARRL National Convention in Dayton

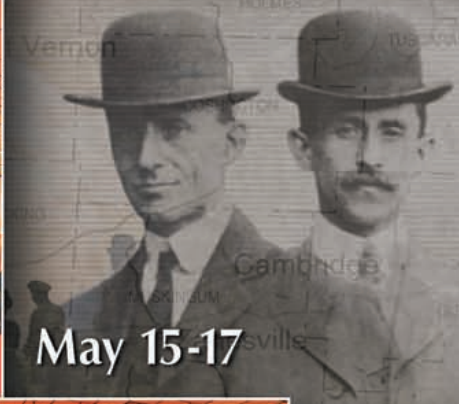
## —The Birthplace of Aviation

**QST reviews:**



**Inside:**





May 15-17

ARRL NATIONAL CONVENTION DAYTON 2009 DAYTON HAMVENTION®


**Special Dayton Ad Section page 129!**



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Official Journal of ARRL The national association for AMATEUR RADIO

# IC-7000

**DIGITAL IF FILTERS**
No optional filters to buy! All the filters you want are at your fingertips. Simply dial-in the desired width and select sharp or soft shapes for SSB and CW modes.

**AGC LOOP MANAGEMENT**
The digital IF filter & manual notch filter are included in the AGC loop, so you won't have AGC pumping.

**35W OUTPUT IN 70CM BAND**
High power MOS-FET amps supply 35W output power in 70CM band as well as 100W in HF/50MHz bands and 50W in 2M.

**HIGH STABILITY CRYSTAL UNIT**
The 7000 incorporates a high-stability master oscillator, providing 0.5ppm (-0°C to +50°C). A must for data operation!


**DIGITAL VOICE RECORDER (DVR)**
The DVR makes portable contesting or mini-DXpeditions a breeze! Record your callsign, CQ, or other information in 4 transmit playback memories with alphanumeric labels. Record incoming signals for up to 25 minutes, too!

**DDS (DIRECT DIGITAL SYNTHESIZER) CIRCUIT**
Icom's new DDS circuit improves C/N ratio, providing clear, clean transmit signal in all bands.

**USER-FRIENDLY KEY ALLOCATION**
Eight of the most used radio functions – such as NB, NR, MNF, and ANF – are controlled by dedicated function keys. Those keys are grouped around the display for easy visibility.

**TWO POINT MANUAL NOTCH FILTER**
Pull out the weak signals! Apply 70dB of rejection to two signals at once!

## *No need to steal the spotlight.*

## *We've had it all along.*

Makes ham radio so much fun, you'll never want to leave the car again. Or your home. The 7000 is ideal as a mobile or base station. So much power and so many features, yet such a small footprint. Must be an Icom. Visit your authorized Icom dealer today and start conquering the world.

HF/6M @ 100W (40W AM), 2M @ 50W (20W AM), 70CM @ 35W (14W AM) • DSP$^2$ - Dual DSP Processors • Digital IF Filters • Twin Pass Band Tuning • Multiple AGC Loops • MNF$^2$ - Dual Manual Notch Filters

**For the love of ham radio.**

ICOM®

# Icom has the radio for the experts...

## IC-R9500 ICOM'S ULTIMATE WIDE BAND RECEIVER

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

# ...or for those just getting started.

## IC-R75 WIDE BAND RECEIVER

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

## *Now bundled with RadioCom 4.5*

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

## PCR1500

THE "BLACK BOX"

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

## PCR2500

DUAL BAND "BLACK BOX"

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

## IC-R1500

MOBILE OR PC CONTROL

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

## IC-R2500

2 WIDE BAND RX IN 1

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

## NEW IC-RX7

STYLISH SCANNER WITH SMART INTERFACE

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

## IC-R5 SPORT

COMPACT WIDE BAND

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

## IC-R20

ADVANCED WIDE BAND

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

**Contact your favorite Authorized Icom Dealer today!**

ICOM®

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

# hy-gain® ROTATORS

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

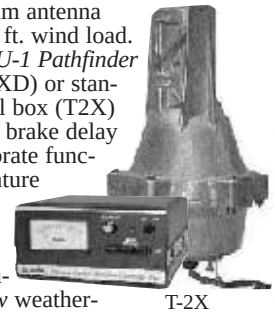
### HAM-IV

HAM-IV
$649.95

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

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

### TAILTWISTER SERIES II



T-2X
$799.95

T-2XD
$1229.95
with DCU-1

**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.

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

### CD-45II

CD-45II
$449.95

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

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

### HAM-V

HAM-V
$1099.95
with DCU-1

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

### AR-40

AR-40
$349.95

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

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

### HDR-300A

HDR-300A
$1499.95

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
$89.95

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

RBD-5
$29.95

***NEW!*** Automatic Rotator Brake Delay

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

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## News and Features



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**Our Cover**
Get ready to Do It at Dayton! Known as the "Birthplace of Aviation," Dayton was the hometown to the Wright Brothers. In the spirit of their ingenuity, the 2009 ARRL National Convention/ARRL EXPO will feature "hands-on" activities. Our cover spotlights not only the Wright Brothers, but the spirit of Amateur Radio. The Dayton Hamvention is indeed an event for all ages — Nancy Rabel Hall, KC4IYD, and her daughter Carol of North Olmstead, Ohio, meet up with Ohio Section Manager Joe Phillips, K8QOE (bottom inset). Scott Hartlage, KF4PWI, shows a young ham how to participate in a fox hunt, one of the many events put offered at the ARRL Youth lounge (top inset). Both photos by Joel P. Kleinman, N1BKE. For more on the 2009 ARRL National Convention May 15-17, turn to page 71.

# Departments




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

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Foreign remittances should be by international postal or express money order or bank draft negotiable in the US and for an equivalent amount in US funds.





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Fax: **860-594-0259**

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


**HF/50 MHz 100 W Transceiver**

## FT-950

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

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

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

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

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

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

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

DMU-2000
Data Management Unit (option)

**"The Best of the Best Just Got Better"**

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

**For the latest Yaesu news, visit us on the Internet:**
**http://www.vertexstandard.com**

Specifications subject to change without notice. Some accessories and/or options may be standard in some areas. Frequency coverage may differ in some countries. Check with your local Yaesu dealer for specific details.

YAESU
*Choice of the World's top DX'ers℠*

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US Headquarters
10900 Walker Street
Cypress, CA 90630 (714)827-7600

# 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

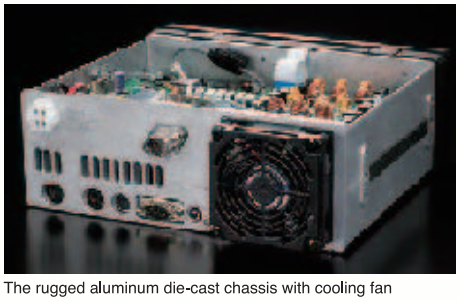
### ■ The IF DSP guarantees quiet and enjoyable highperformance HF/50 MHz operation


**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

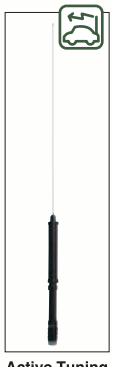


The rugged aluminum die-cast chassis with cooling fan

### ■ 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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HF/50 MHz 1 kW* Linear Amplifier

* Without 12/10 meters and 500 W on 6 meter in USA

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# The New Standard of Excellence in Linear Amplifier Technology!

## For a bold, clean signal from "Top Band" through the "Magic Band", the VL-1000/VP-1000 QUADRA SYSTEM belongs in your station!

- **Innovative Quadra Push-Pull RF Design for 1 kW of MOSFET Power**
- **Powerful 16-bit Control CPU Provides High-Speed Antenna Tuning with Extensive Memory and Multi-Band Memory Data Backup**

- **Large Dot-Matrix LCD Display Features World's First Panoramic SWR Monitor**

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- **Direct Air Flow Cooling System Provides Efficient Dissipation of Heat**

- **Automatic Band Change for Quick QSY**


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# Change

*"This time last year, the price of crude oil on the world market had risen above $100/barrel and was heading toward $150. Last summer the cost of energy appeared to be the greatest threat to the global economy, driving up other costs and creating 'stagflation.'"*

How quickly things can change! By the end of the summer, the meltdown of the financial sector had made our earlier worries seem trivial by comparison. You may have picked up this copy of *QST* seeking a temporary escape from such concerns, so we won't dwell on this unpleasant subject. The point is simply this: change is inevitable. Predicting change will never be perfect and will often be wildly inaccurate, but adapting to change is necessary for survival.

Clouds can have silver linings. Last year, oil prices seemed destined to make a wide variety of alternative energy sources much more attractive — good news for technologists, investors, and environmentalists alike. Projects that had languished were dusted off; business plans that previously didn't add up were given another look. Then the financial crisis took center stage, credit dried up, oil plunged back below $50/barrel, and the sense of urgency surrounding alternative energy dissipated as if it were just another bubble.

Yet we know that the global demand for energy is growing. It seems a safe bet, if there is such a thing, that it will continue to grow even faster than the world's population. There may be a question as to timing, but future generations will regard our near-universal reliance on petroleum with as much wonder as we regard our ancestors' reliance on whale oil to light their lamps.

What does this have to do with radio, Amateur Radio in particular? Part of the answer is obvious: we use electrical energy to power our equipment. Sometimes we use alternative energy because, well, there is no alternative. Early radio amateurs did not necessarily enjoy access to commercial power, particularly in rural areas; they had to find other ways to light their filaments. Even today there are large areas of the country that are "off the grid" and always will be.

At home we normally can count on electricity to be available as long as we pay the bill, but we yearn to be more self-reliant. We brag that Amateur Radio works when all else fails, but how many of us can operate indefinitely without some external source of electrical power? Low-power equipment can be operated for many hours from a car battery, but batteries eventually must be recharged or replaced. When a falling tree limb can plunge us back into the 18th century — when it may take weeks for hurricane, tornado, or ice damage to be repaired — we ought to have some way of staying on the air and in touch with the outside world.

So, let's keep thinking about alternative energy. Our immediate priorities may have changed since last summer, but someday we'll need it.

Change occurs whenever a new administration takes charge in Washington. While it's too early to gauge results, this administration is committed to science, to stimulating the economy, and to dramatically increasing the production of alternative energy. Turning these commitments into reality takes people, and as this issue was going to press an interesting personnel change was announced: FCC Commissioner Jonathan Adelstein will be moving over to the Department of Agriculture to serve as Administrator for the Rural Utilities Service. Among his responsibilities will be the distribution of $2.5 billion in stimulus grants to increase the availability of broadband in rural areas.

While we are sorry to lose Commissioner Adelstein at the FCC, it is reassuring that someone with knowledge of telecommunications will be in charge of this important and expensive program. Some proponents of broadband over power line (BPL) technology seem to regard the broadband stimulus grants as an opportunity to breathe new life into BPL as a way to deliver broadband service to consumers, at a time when most of the BPL industry has shifted its focus from broadband delivery to power grid management applications. His years at the FCC have taught Commissioner Adelstein that BPL was excessively hyped and that it is clearly uneconomic in sparsely populated areas. We know he is familiar with BPL's interference potential and that he will not forget this as he moves up the street to the USDA. Even so, we will be watching closely as this and other government broadband initiatives take shape.

Other changes are taking place at the FCC. Acting Chairman Michael Copps moved swiftly to improve internal communications and morale at the agency. After a period of years when the most minor decisions had to be cleared through the Chairman's office — which meant that most of them never were — the FCC staff once again is empowered to do their jobs. We are already seeing positive results from this clearing of a regrettable bottleneck.

It is not clear how soon President Obama's nominee for FCC Chairman, Julius Genachowski, will be confirmed by the Senate and sworn into office. Commissioner Adelstein's impending departure means there are two other vacancies to be filled, one by a Democrat and one by a Republican. The new Commissioners will have broad responsibilities and many constituencies, but we will make sure they quickly become familiar with how much the Amateur Radio Service benefits our country — and how little support we require from the FCC in return.

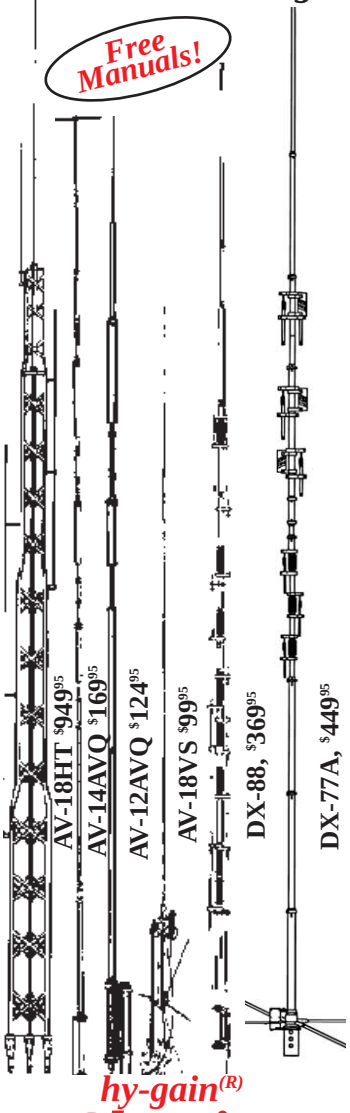
We want them to understand that the value of Amateur Radio is one small constant in a turbulent, changing world.

**David Sumner, K1ZZ**
**ARRL Chief Executive Officer**

# hy-gain® HF VERTICALS

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

Free Manuals!




## hy-gain® Classics

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

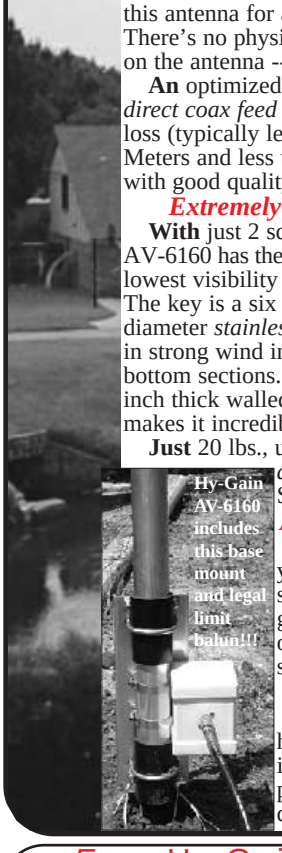
| Model # | Price | Bands | Max Power | Height | Weight | Wind Surv. | Rec. Mast |
|---|---|---|---|---|---|---|---|
| AV-18HT | $949.95 | 10,15,20,40,80 | 1500 W PEP | 53 feet | 114 pounds | 75 MPH | ------ |
| **AV-14AVQ** | **$169.95** | **10,15,20,40** | **1500 W PEP** | **18 feet** | **9 pounds**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

## Hy-Gain 160-6 Meters Self-Supporting Vertical

***Full 1500 Watts, 43 feet, includes base mount***

New! AV-6160 $399.95 UPS SHIPPABLE

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




### *Exceptional Performance*

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

### *Just talk with automatic tuner!*

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

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

### *Extremely low wind loading*

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

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

### *Assembles in an hour*

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

### *Stealth Operation*

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

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

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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

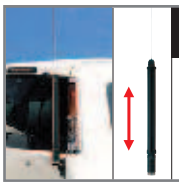
HF/50/144/430 MHz
100 W All Mode Transceiver (144 MHz 50 W/430 MHz 20 W)

**Automatic Matching for FT-897/857 Series Transceivers**

## FC-40

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

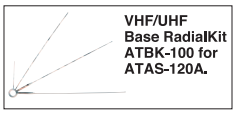
WATERPROOF



**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** ATAS MICRO
**Manually-Tuned Portable Antenna**



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# This Just In

**Joel P. Kleinman, N1BKE**
jkleinman@arrl.org

## In Brief

- President Obama has nominated Julius Genachowski as FCC Chairman. Upon Senate confirmation, Genachowski will replace Acting FCC Chairman Michael Copps.
- The Fifth Global Amateur Radio Emergency Communications Conference (GAREC) — hosted by the Japan Amateur Radio League (JARL) — will be held in conjunction with the JARL Ham Fair at Tokyo Big Sight on August 24-25.
- FCC Special Counsel Laura Smith visited ARRL Headquarters on March 5 and 6, her first official visit as Special Counsel. Details are in Happenings, elsewhere in this issue.
- Registration is open for the next USA Amateur Radio Direction Finding Championships, June 5-7, in Boston, Massachusetts.
- The inaugural Train the Trainers course — supported by a grant from the ARRL Foundation — made its first appearance on February 13-14 at HamCation in Orlando, Florida. For more information, see Happenings elsewhere in this issue.
- Radio Amateurs of Canada (RAC) has elected Bob Cooke, VE3BDB, as its president. He replaces Dave Goodwin, VE3AAQ/VO1AU, who resigned from the post.
- Richard Garriott, W5KWQ, who was very active while he traveled aboard the International Space Station in October, will be attending the 2009 ARRL National Convention — hosted by the Dayton Hamvention — as a special guest of the ARRL and AMSAT. For more information, see Happenings elsewhere in this issue.
- Cancer researcher John Kanzius, K3TUP, of Erie, Pennsylvania, passed away February 18 at age 64. He discussed his research into finding a cure for cancer using radio waves in a February 2008 *QST* article.
- The theme of World Amateur Radio Day in 2009 is Amateur Radio: Your Resource in Disaster and Emergency Communication. The day is celebrated each April 18 to commemorate the founding of the IARU.
- A team of Amateur Radio operators in the Australian state of Victoria assisted in the battle to control a series of devastating bushfires.
- The winner of the *QST* Cover Plaque Award for February is Rick Campbell, KK7B, for his article "Designing and Building Transistor Linear Power Amplifiers."
- These online course sessions began April 3: Amateur Radio Emergency Communications Level 1, Radio Frequency Interference, Antenna Design and Construction, Ham Radio (Technician) License Course, Analog Electronics and Digital Electronics.

## Media Hits

*Allen Pitts, W1AGP*

- Sometimes a media hit just makes you feel good. ModernPrincess.com is a national level womens' blog about life in general. On January 20, Amy Durnal wrote a long piece about her husband being a ham and his extensive volunteerism for community service work. She sums it up at the end with "And I couldn't be prouder of him."
- Another was in the *Pittsburgh Post-Gazette* on January 29 in which Teresa Lindeman wrote about the extensive work of frequency coordinators at the Super Bowl event in Tampa. She notes the complexity of the task and wonders that the "Crews checking the RF equipment look rather like ham radio operators." Yes, Teresa, they do indeed...and we know why!

We interrupt this article to bring you a ***special bulletin…***

*Two* new video Public Service Announcements are now available! One, a 30 second PSA, is for placement on broadcast or cable TV and highlights the technology of Amateur Radio. It is available as an *.mov* file and as a DVD disk. The second is a 30 second *.wmv* video for Field Day promotions meant for computers and is small enough to place in e-mails and on Web sites and to share. Both are available *now*. Information about them is at **www.arrl.org/pio**. Promote Field Day and Amateur Radio in your home area.

In addition to higher than usual numbers of EmComm, promotional and personality based hits, there were several in unusual places that were of interest.

- The *Antarctic Sun* published a major article about "Modern Day Hams" and how Amateur Radio's excitement has not dissipated there. While many of the scientists were hams before they arrived, communications with the ISS and the fun of pileups keeps the radios in heavy use.
- *Signal Magazine*, published by the Armed Forces Communications and Electronics Association, did an extensive article on MARS, the Military Affiliate Radio System. Relating its history from its beginnings in 1925, they explored its changing mission and new challenges.
- *Popular Science* reported on the second planned trip of space tourist Charles Simonyi, KE7KDP/HA5SIK, to the ISS. "Frankly, I was not a HAM enthusiast before the first flight. But through the training, I saw what an active group the HAM people are."
- The American Legion's national Web site at **www.legion.org** put an Amateur Radio story on their front page on March 5. They showed the service by hams at Legion Post 283 in Pacific Palisades, California.
- Finally, we have to mention the many dramatic stories from Omaha, Nebraska, where a cleaning crew found some ham radio gear (probably a balun or trap), and took it to the authorities who promptly blew it up! Some stories just make you feel good, and some make you laugh.

HAROLD KRAMER, WJ1B

***Section Manager lineup:*** **At the March 7-8 Radiofest Monterey Bay (aka the ARRL Santa Clara Valley Section Convention) near Monterey, California: San Francisco SM Bill Hillendahl, KH6GJV; Santa Clara Valley SM Bill Dale, N2RHV; East Bay SM Andy Oppel, N6AJO, and ARRL HQ staff member Bob Inderbitzen, NQ1R.**

## Hams Help FCC Spread Word about DTV Conversion

DAVE MALEY, WAØZZG

**A local TV station, KWWL-TV, interviews Tracy Waldon, Chief Economist of the FCC's Media Bureau, at the Cedar Rapids, Iowa display.**

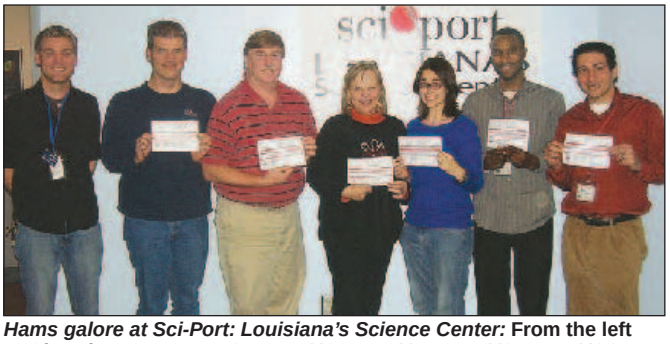
Members of the Cedar Valley Amateur Radio Club and other amateurs in the Cedar Rapids, Iowa area set up shop in a local mall to allow shoppers, walkers and other visitors to stop by and ask questions about the Analog to Digital TV conversion and to get possible solutions to problems they were encountering. A practical demonstration was also set up to guide visitors through the setup process for the converter boxes. The group assisted about 150 members of the Cedar Rapids community in making the transition.

## Louisiana Science Museum Now Staffed by Hams

Christopher Barber, WX5CW, Planetarium Engineer for Sci-Port: Louisiana's Science Center in Shreveport, recently conducted a 15 hour "hands-on" Technician course. As a result, he is now joined by six newly licensed Amateur Radio operators: Cathy Williamson, KE5YSB (Education Coordinator for Caddo Parish Schools), Brian McWilliams, KE5YRZ (Public Programs Manager), Robert McGuire, KE5YSA (Director of Education and Public Programs), Greg Andrews, KE5YSD (Astronomy Programs Leader), John Armistead, KE5YSE (Director of IMAX) and Tiffany Veillon, KE5YSC (Planetarium Presenter). With the help of the newly licensed staff members and local clubs, Christopher hopes to help spark interest in Amateur Radio among students and teachers from surrounding schools.

According to ARRL Louisiana Section Manager Gary Stratton, K5GLS, Christopher is spearheading an Amateur Radio display and presentation for the thousands of youngsters who visit Sci-Port each year. In support of these efforts, Stratton recently donated a variety of ARRL books to the Science Center. More information is on their Web site, **www.sciport.org**.
*— David Gore, W5DSG, Louisiana Section Public Information Coordinator and Gary Stratton, K5GLS*

DAVID GORE, W5DSG




***Hams galore at Sci-Port: Louisiana's Science Center:*** **From the left — Class instructor WX5CW, KE5YSE, KE5YRZ, KE5YSB, KE5YSC, KE5YSA and KE5YSD.**

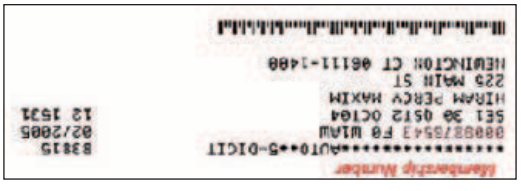
# Inside HQ

## Further *QST* Improvements

An e-mail reflector that I subscribe to recently had a debate about whether an Amateur Radio station is ever completely finished. Is it operating at peak efficiency? Are the antennas in the best shape? The resounding answer was "no way." There is always something that can be improved. We feel that same way about this publication, *QST*. We are always working to improve its usefulness, readability and reader satisfaction. Here are some improvements that we are implementing in this issue.

Beginning this month we are dropping the designation "QST Workbench" that we have used as a header on features such as *The Doctor is IN, Hands-On Radio, Hints and Kinks* and *Short Takes*. The columns are still there; we are just eliminating the "Workbench" section name. The *QST Workbench* section began as the *New Ham Horizons* in February 1993 *QST* with a title switch to *New Ham Companion* in the following issue. Soon after, however, we discovered that the information in this section appealed to veteran amateurs as well as to newcomers. So, we broadened the subject matter a bit and called it *Workbench* starting in the January 2000 issue. But recent surveys and reader comments have shown that members do not see the *Workbench* material as being separate from the rest of the *QST*, so it makes sense to eliminate it as a special section, reducing reader confusion and visual clutter.

Speaking of confusion, you may have noticed that the mailing label printed on the cover of this month's *QST* is upside down. The simple explanation is that in March, the US Postal Service changed the requirements for address labels for magazines such as *QST.* This has to do with the automated machinery used to sort and distribute magazines and it also applies to our other periodicals, *NCJ* and *QEX*. So, the text on the cover will read in one direction and the mailing label the other!




Also, in this issue we will be making it more convenient for our readers to find additional information about our advertisers. Over the past several years, we have added a number of new advertisers and this has caused us to decrease the type size and readability of our Index of Advertisers. We will now feature a new, two page index, in the back of *QST* that will contain our advertisers' Web addresses in addition to their company names and the page numbers of their ads. In the interest of full disclosure, we have to admit that the advertisers also like this new arrangement!

Finally, this month is the annual Dayton Hamvention issue of *QST*. This year Hamvention is also the ARRL National Convention. On page 71 you will find an article with all of the details about our ARRL EXPO area and its many exciting new features. In addition, a Hamvention special advertising section starts on page 129. Hope to see you in Dayton!

**73,**

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

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528 Miller Rd, Judsonia, AR 72081
w5zn@arrl.org

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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

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RODNEY STAFFORD, W6ROD
5155 Shadow Estates
San Jose, CA 95135
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## 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

**Mickey D. Cox, K5MC**
754 Cheniere Drew Rd, West Monroe, LA 71291
(318-397-1980); **k5mc@arrl.org**

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

## Great Lakes Division

**Jim Weaver, K8JE**
5065 Bethany Rd, Mason, OH 45040-8130
(513-459-1661); **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
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## Midwest Division

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

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65 Pioneer Trail, Hannibal, MO 63401
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**Tom Frenaye, K1KI***
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*Vice Director:* **Mike Raisbeck, K1TWF**
85 High St, Chelmsford, MA 01824
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**Jim Fenstermaker, K9JF**
1525 NW 57th St, Seattle, WA 98107
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51442 Mac Ct, La Pine, OR 97739
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## Pacific Division

**Bob Vallio, W6RGG***
18655 Sheffield Rd, Castro Valley, CA 94546
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1308 Burbank St, Alameda, CA 94501-3946
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PO Box 20186, Albuquerque, NM 87154-0186
(505-463-9468); **n5zgt@arrl.org**

*Vice Director:* **Dwayne Allen, WY7FD**
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## Southeastern Division

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230 Latigo Loop, Harvest, AL 35806;
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*Vice Director:* **Sandy Donahue, W4RU**
PO Box 9424, Dothan, AL 36303
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## Southwestern Division

**Richard J. Norton, N6AA**
21290 West Hillside Dr, Topanga, CA 90290
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*Vice Director:* **Marty Woll, N6VI**
21301 Candice Pl, Chatsworth, CA 91311-1404
(818-773-9655); **n6vi@arrl.org**

## West Gulf Division

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2210 S 77 Sunshine Strip, Harlingen, TX 78550
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*Eastern Pennsylvania:* Eric Olena, WB3FPL, 284 Blimline Rd, Mohnton, PA 19540 (610-775-0526); **wb3fpl@arrl.org**

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*South Dakota:* Vacant

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

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*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**

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*Eastern Massachusetts:* Michael P. Neilsen, W1MPN, 5 Otsego Dr, Hudson, MA 01749-3127 (978-389-0558); **w1mpn@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:* Edward Stuckey, AI7H, 2300 W Polo Green Ave, Post Falls, ID 83854-9680 (208-457-0354); **ai7h@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)

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*Nevada:* Joe Giraudo, N7JEH, 720 Holyoke Dr, Spring Creek, NV 89815-5306 (775-738-7110); **n7jeh@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:* Garth Crowe, N7XKT, 1206 Avalon Ct, Gillette, WY 82716-5202 (307-686-9165); **n7xkt@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:* Jay Urish, W5GM, 1711 Buckeye Dr, Flower Mound, TX 75028-1259 (972-691-0125); **w5gm@arrl.org**

*Oklahoma:* Dean Feken, KL7MA, 111 Noble Ave, Perry, OK 73077-2610 (580-336-8495); **kl7ma@arrl.org**

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

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**You** get a full kilowatt PEP output from a whisper quiet desktop linear. Compact 15½Wx8½Hx14D inches. Plugs into your nearest 120 VAC outlet. Covers 160 to 15 Meters, including WARC and MARS (user modified for 10/12 Meters w/license).

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Suggested Retail

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$2045
1 *Eimac*(R) tube, 1250 W

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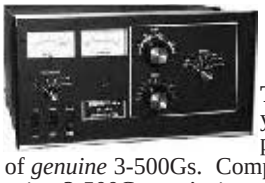

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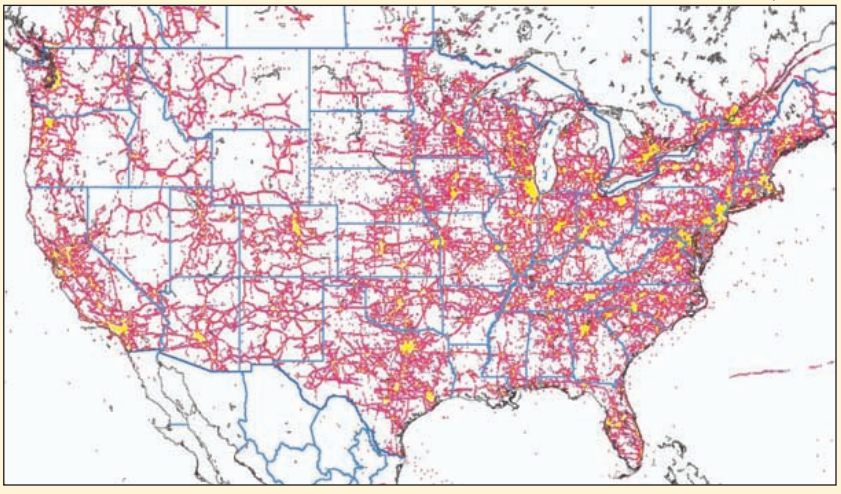
## APRS Map Shows Activity (and Holes)

The accompanying map reveals not only two months of APRS (Automatic Position Reporting System) activity but also, by inference, the holes in coverage. In the poor coverage areas, local ham clubs are encouraged to support an APRS packet digipeater on 144.39 MHz not only to serve their local group but also the ham travelers passing through. APRS is not just a tracking system, but a live text messaging and local information display system to keep travelers with APRS radios fully informed of ham activity around them and in contact anywhere in the world. For more about the APRS network see **www.aprs.org/APRS-tactical.html**.
*— Bob Bruninga, WB4APR*

COURTESY BOB BRUNINGA, WB4APR



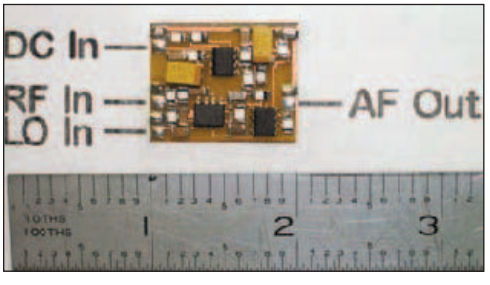
***APRS activity mapped:*** **Images of mobile APRS activity (in the US and in other parts of the world) is updated live by Hessu, OH7LZB, on his http://aprs.fi/ site.**

ADAM BROWN, KC4/K2ARB

***Long may it wave:*** **The author of the January 2009 *QST* article about his recent ham radio experiences in Antarctica, Adam Brown, KC4/K2ARB, sent us this photo. It was taken while the author was on a minor DXpedition to the "melon" at the Hunneus Base (owned by INACH — the Institute Antarctico Chilena). Adam was doing a trial run of the first of the synchronized 20 meter amateur beacons to be installed as part of a newly emerging multinational ANTBEAP (Antarctic Beacon Project) — and to make a few hundred QSOs from a "new one."**

## Miniature Analyzer Circuit Available — for Free!

Kriss Bennett, N6TRH, of Lake Wales, Florida, designed and built a miniature version of the circuit described for use in the spectrum analyzer from the October 2008 issue of *QST* [G. Steber, WB9LVI, "Experimenter's RF Spectrum Analyzer," pp 36-40]. While the supply lasts, the tiny boards are available free of charge from Ed Smith, W4EDS, 4350 George Taylor Rd, Spencer, VA 24165. Ed says the board "would certainly be nice for portable, remote requirements."

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DUAL BAND DUAL RECEIVE

50 W 2 m/70 cm* Dual Band FM Mobile
**FT-8800R** *70 cm 35 W

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(220 MHz: 300 mW )
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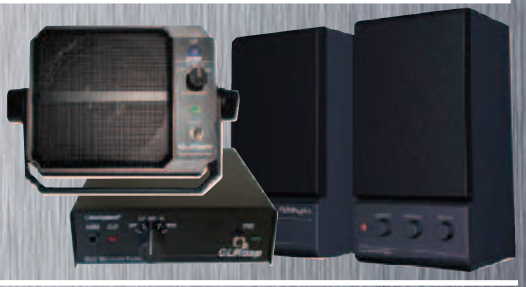

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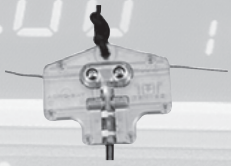

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# CORRESPONDENCE

## VIBROPLEX REVISITED

♦ Two *QST* articles — "A Lost Dit of Vibroplex History" [Feb 2009, pages 58-59] by Brian R. Page, N4TRB, and "Vibroplex — The Company and its Classic Key" [Jan 2003, pages 48-49] by John Ceccherelli, N2XE — both state that Vibroplex's first or original manufacturing facility was located in Norcross, Georgia. This is not correct. The first Vibroplex factory was located at 53 Vesey Street in New York City. The United Electrical Manufacturing Company (UEM) was incorporated in New York on February 17, 1904. Horace G. Martin was the Vice President and General Manager of UEM; he and Edward Buchanan were two of seven directors of the corporation. Initially, UEM manufactured the Autoplex, a semi automatic electro-mechanical key invented by Martin. In 1907, UEM moved to Norcross, Georgia.

Edward Buchanan had lofty plans for UEM in Norcross that included the production of an automobile called the Nor-X. After the collapse of the brokerage firm A.O. Brown & Co. in August 1908 and subsequent failure of UEM (Albert Brown was one of four subscribers of UEM), Martin tried to personally obtain financing for the Nor-X, but was unsuccessful. In order to support his wife and five children, he found work in Atlanta as a telegrapher. His father-in law was a high ranking officer with Western Union in Atlanta. Martin continued to assemble and sell his Vibroplex on the side while working as a telegrapher and moved to New Jersey in early 1910.

JOHN CASALE, W2NI, ARRL Life Member
Troy, New York

## FORTY QUESTIONS

♦ I just read the article by ARRL Technical Relations Manager Brennan Price, N4QX ["Party Time on 40 Meters," Apr 2009, pages 60-61]. There was a lot of information and history of the 40 meter band in the article, but no mention of the impact on the 7200-7300 kHz band space that the broadcasters still have access to. Does this mean that 7200-7300 kHz portion will become saturated with broadcast stations? This will in effect make that part useless for Amateur Radio.

ROBERT BOFANI, WD9IDV
Grayslake, Illinois

◊*Brennan Price, N4QX, responds*: March 29 — the date broadcasters were scheduled to vacate 7100-7200 kHz in ITU Regions 1 and 3 — also brought a shift in the broadcasting allocation to include a new allocation at 7350-7400 kHz in all ITU regions, and 7400-7450 kHz in ITU Regions 1 and 3. Stations in the fixed and land mobile services still occupy these segments, but became secondary to broadcasting on March 29 and now operate under significant restrictions. So broadcasters do have room to shift outside of 7200-7300 kHz.

## MIDWAY MEMORIES

♦ It brought back pleasant memories to read about the Midway Islands ["How's DX?" Apr 2009, pages 89-90]. I got my General and Advanced licenses there in 1977 as KM6FF. As a new General, this was my only experience being on the called end of a rare DX pileup. The club on the island was small, but we ran a lot of phone patches back to the mainland for the sailors.

GORDON MARTIN, ABØMU
Copperas Cove, Texas

## TAKE ME BACK TO TECH

♦ Congratulations to Michael J. Keane, K1MK, for his excellent article on the early history of the MIT Radio Society, W1MX, as it turns 100 this year ["'Rah for Technology! America's Oldest College Amateur Radio Club Turns 100," Apr 2009, pages 57-58]. As a member of the Class of '55 and a member of the MIT Radio Society, I remember when W1MX was located in an old Quonset hut instead of its present-day location in Walker Memorial. W1MX has an illustrious 100 year history; it's a privilege to have kept up an association with it for more than half of that history.

JIM AHLGREN, W4RX
McLean, Virginia

♦ With great interest, I just read K1MK's article on the MIT Radio Society, but wish to point out that W1YK — the Amateur Radio station at Worcester Polytechnic University in Worcester, Massachusetts — was the first college Amateur Radio station to actually conduct two way communications. Per the Worcester Polytechnic Wireless Society's Web site (**www.wpi.edu/~wpiwa**), "WPI was on the air before MIT's similar club, as MIT was having trouble finding aerial supports. This makes WPI the first operational college radio station in the United States."

PETER HEINS, N6ZE, ARRL Life Member
Thousand Oaks, California

◊*Michael J. Keane, K1MK, responds*: MIT's student newspaper, *The Tech*, reported on December 10, 1909 that the MIT Wireless Society (now the MIT Radio Society) was in operation. *The Pennsylvanian*, the University of Pennsylvania's campus newspaper, reported that that school's wireless club was operational on or around January 1, 1910. In addition to WPI's claim, there were contemporary reports of wireless stations on the campuses of Columbia, Cornell, Princeton and Penn State by the end of 1909 and the first part of 1910.

## RADIATING FUN

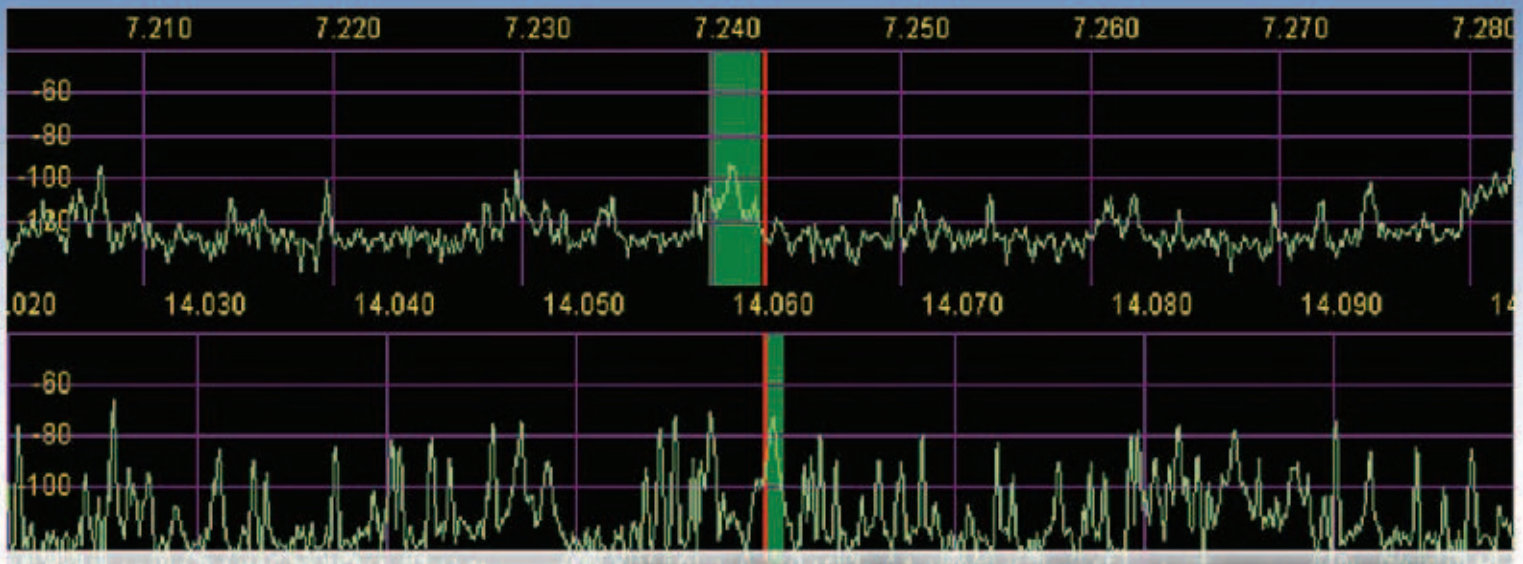
♦ I was pleased to see Steve Sant Andrea's, AG1YK, tip for using squirrels and acorns to help raise a dipole ["Hints & Kinks," Apr 2009, page 81]. This was the very method my father successfully used to deploy numerous wire antennas. For a number of years, every spring saw my father furiously tying acorns to fishing line and strategically placing the acorns around the towering pines that dotted our yard. Father even managed to exploit the climbing and flying prowess of a small family of flying squirrels to put up several inverted-Ls and rhombics.

While Mr Sant Andrea cautions the reader against using the pilot line/acorn assembly in the fall, we, on the contrary, have found this method quite useful for laying out radials. Come late October or early November, a field of 120 radials can be laid out within hours.

TREVOR V. IPSWICHE, WINK
Pataconk Isthmus, Rhode Island

**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.

# Did You See It?

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### Specifications

**SOLID STATE**
**Freq. Band:**
1.8~28 MHz all HF amateur bands
**Operation Mode:**
SSB, CW, RTTY
**Exciting Power (RF Drive):**
100W max. (85W, typical)
**Output Power (RF Out):**
1.5kW min. SSB/CW
(1.2kW on 28MHz)
1kW RTTY (5 minutes key down)
**Auto Band Set:**
With most modern ICOM, Kenwood, Yaesu HF Transceivers
**Antenna Tuner:**
Compatible with external Tokyo Hy-Power HC-1.5KAT
**RF Power Transistors:**
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**Antenna Relay:**
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Built-in 220/230/240/250VAC, 3kVA max.
**Dimension and Weight:**
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- LED power level meter will always indicate the relative output power level for the convenience of the operator.

### Specifications

**Frequency:**
HF Band (1.8 ~ 28MHz and 50MHz Amateur Bands)
**Mode:** SSB(A3E), CW(A1A), FM(F3E)
**RF Output Power:**
SSB (PEP)/CW 45W
**RF Drive Power:** 5W max.
**DC Power:** DC 13.8V, 8.5A max.
**In/Out Impedance:** 50Ω
**In/Out Connectors:** SO-239
**Major Circuits and Functions:**
1. Class AB wide band linear power amp
2. Automatic/manual switching output low pass filters
3. WARNG (Protection circuit) for over-voltage and over-drive
4. LED meter for indicating transmitting power level
5. Send-receive switching remote terminal
6. ALC
**Final RF Power Transistor:**
RD30HVF
(by Mitsubishi Electric) x 2
**Accessory Parts:**
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Coax jumper cable with PL-259 connectors x 1
Remote control cable for FT-817 x 1
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**Dimensions:**
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# Troubleshooting Radios

*Before you pack it up and ship it off, check it out yourself.*

**Mal Eiselman, NC4L**

I have been repairing the Yaesu FT-102 HF transceiver for the past 19 years and have spent more than 10,000 hours in this endeavor on this one radio model alone. In all, I have worked through problems in several hundred of these radios over the period. As you may be aware the most significant problem with this radio (as well as many others) is intermittent signal path losses. I am trained as a cardiologist and never had any formal training in troubleshooting RF circuitry, except in my pursuit of perfection for the '102. During this time I have accumulated a wealth of knowledge in how to track down these problems in the '102, as well as in most other radios and I would like to share these principles with you.

It's like the old proverb that if you give a man a fish you feed him for a day but if you teach him how to fish you will feed him for the rest of his life. The principles that I am going to share with you are easy to understand and perform by almost any ham. Finding an intermittent and then sledgehammering it into the ground (I am not speaking literally, of course) so that it never, never occurs again is a true joy and an enormous source of satisfaction. Although my examples are for the '102 they can be applied to other ham radio equipment.

## Let's Get Started — Here's What You Need

There are three instruments that you must have. The first is the digital multimeter that most hams already possess. The second is an oscilloscope — nothing fancy is required, since it will be mostly used at audio frequencies. It must, however, be an analog type. Digital 'scopes will not always give you the instantaneous information you need because they are not real time instruments. Good 'scopes can be obtained at hamfests or on the internet for $50 to $100. They are all-powerful when used for troubleshooting (see Figure 1). The third instrument is your own intuitive brain. It is the most important of all the troubleshooting instruments. One other possibility is a low tech signal generator (nothing fancy is needed) and this is required only if your radio does not have a marker or calibrator function. Here is how I troubleshoot a '102.

## The First Step — Get a Signal to Work With

Turn on the transceiver and set the frequency to 14,274.0 kHz, the mode to USB and the RF amplifier to ON. If you can disable the transmitter, do so or be careful not to switch to TRANSMIT during this test. Leave the antenna unconnected. Keep the SHIFT and WIDTH controls centered, straight up on the '102. Turn on the 25 kHz marker signal (at the back chassis on the '102) or set your signal generator to 14,275.0 kHz.

If your calibration is close, you should receive a tone of about 1 kHz (14,275.0 – 14,274.0 kHz). Peak the preselector for maximum signal on the S-meter. These maneuvers will provide you with a strong IF signal and 1 kHz audio tone from your speaker because of the USB offset.

Adjust the VOLUME control for minimal audible signal as the sound is not important in this part of the test. If the relays and the rest of the receiver are working properly at that moment you should read a signal of +10 to +15 dB over S-9 on a '102 and something similar on other transceivers. If you do not have a calibrator in your radio, then an inexpensive signal generator should be used to inject enough power to obtain an S-9 + 10 dB signal. Remember your radio must be on USB with the generator's frequency 1 kHz above the radio's frequency to receive the audio tone. The actual audio frequency is not important long as you get a good identifiable tone.


**Figure 1 — An oscilloscope that is typical of those that can be purchased from eBay or at hamfests for $50 to $100. It is a dual channel 'scope with 35 MHz bandwidth — more than is usually needed.**

### *Look at Your Output*

Hook up a shielded lead from the AUDIO OUT jack of the radio to one VERTICAL INPUT connector of the scope. On the '102, I use the AUDIO OUT jack of the six socket RCA connector board on the back of the set. In any other radio, just connect a wire to any audio source including the speaker leads and hook that up to the INPUT connector of your 'scope. Adjust the scope VERTICAL GAIN control or the radio's AF GAIN control until the signal fills six large vertical divisions centered in the cathode ray tube (CRT) display. Adjust the TIME BASE control for 5 ms/division.

Next, turn the automatic gain control (AGC) circuit to OFF. This switch is on the front panel of the '102 but other radios may vary. Be careful, as the audio may become very loud and distorted and the signal will be off the scope. Adjust the RF gain control so that the signal level on the CRT screen is at the same level as before pushing the AGC to the OFF position. This will decrease the audio output and its distortion to the previous normal level. Follow the same procedure with any other radio.

At this point any signal path loss — no matter how slight — will be reflected by a change in the signal's amplitude on the CRT. You will be able to see a 0.1 dB change in level. This is because the AGC is defeated and you are not in saturation of the resulting IF or audio signals. A 6 dB power loss anywhere from the antenna input to the final audio amplifier, will halve the voltage amplitude of the CRT trace. This will be reflected by

your audio signal's vertical amplitude dropping from six divisions of the scope (total excursion) to three divisions.

### What's it all Mean?

This degree of RF or IF signal loss would not be heard with usual on-the-air circumstances with the AGC engaged. That is because the AGC's function is to compensate so that the audio voltage and volume stay the same even though the input varies. You would not notice a 6 dB difference on an on-air signal with fading (QSB) and static. It is too small a change unless the signal is very near the noise level. Remember, however, that in reality a 6 dB loss represents losing 75% of the power of your received signal. On the other hand when people lose their S meter deflection or their receiver drops out they are having a 60 to 100 dB loss of signal. That magnitude is equivalent to a million to a billion fold loss of signal.

While troubleshooting with a scope you have the ability to see minuscule changes accurately. The sensitivity of this setup permits you to judge accurately when you are losing even small amounts of signal with certainty and thereby detect, locate and repair the defect.

### Give it a Tap

Okay; now you have the radio in the test mode with everything set up to see even the smallest of losses, if any. But you have to stimulate things. I use the plastic handle of my trusty ratcheted screwdriver and I tap the metal chassis fairly hard (it is best to have the upper and lower cases off) and at the same time I look at the sweep of the CRT for changes as shown in Figure 2.

Even if a radio has no intermittents at all, you will notice that at some point of force with your banging you will encounter relay bounce. This will be a very short loss of the signal on the CRT for perhaps 10 or 20 ms, 2 to 4 horizontal divisions at 5 ms per division. This is normal and represents the fact that the contacts are separating because of the vibrations set up by the percussive force of the screwdriver. This then is the amount of force that you should use to check out the rest of the radio. As I mentioned, the 10 or 20 ms disturbance in the CRT display is normal but if it persists any longer, there are intermittent problems.

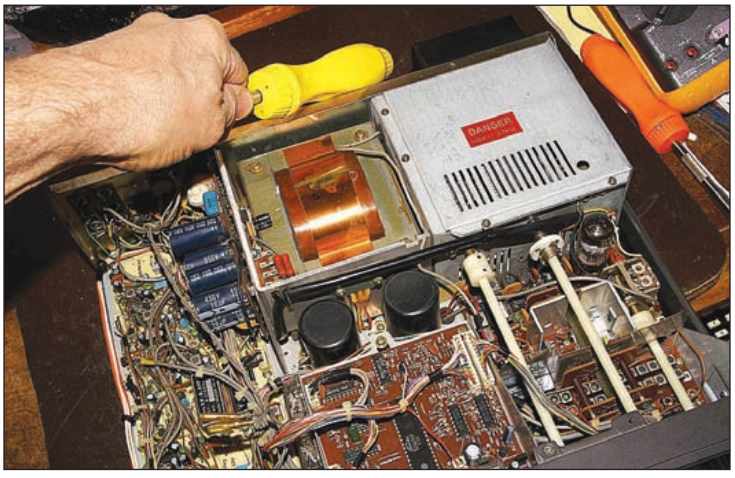

**Figure 2 — Only hit the chassis hard enough to get the bounce effect (see text) on the scope pattern. In all testing use good common sense.**

If you notice that the level changes to a flat line at the middle of the CRT, there is trouble. Remember, I am a cardiologist and flat lines are very bad! This happens in the most severe cases but most of the time the loss is intermediate and you may only lose 5% of the vertical height. If you hit it again, the pattern may settle on a different level or even return to the prior level. No matter how small the level of change *it is not normal* if it persists. After the 20 ms time interval the level should be exactly back to where it started since the relay bounce phenomena is completed by that time and the contacts should have reseated without any added resistance in the circuit.

**Figure 3 — Response to a brisk tap. Note that the sweep is at 5 ms per division. The disturbance persists 4 divisions and then resettles to the same level it was before the strike(s).**

### Poke to Find the Sensitive Spots

The next thing that you should do is to take a nonconductive plastic pen or plastic tuning wand and tap on the top of each relay in the radio while watching the CRT. Don't use the screwdriver inside the radio. This should be done relatively softly as when the relay is bad it will be quite sensitive. I suggest that you tap each relay several times to make sure, using a repetitive motion. (See Figure 4.)

Next, try tapping and flexing the boards as well as moving the wire harnesses and plugs with the tuning wand. There should be no collapsing of the CRT signal. That will occur with poorly crimped interconnect plugs or fracture traces on the boards, as well as bad relays or components.

## The Second Step

This is a similar type of test and complements the above procedure, but it uses sound from the speaker as the watch point.

Change the FREQUENCY control of the radio to read 14,275.00 kHz, right on one of your calibrator harmonics, or the signal generator's actual frequency. Tune until you get a zero beat or just have no tone coming through the audio system. This occurs when the carrier signal and receiver signal are exactly the same. Keep your AGC in the OFF position. Next, turn AF GAIN up as far as it will go with the RF GAIN in the minimal or reduced position. Then advance the RF GAIN control until you just start to get self oscillation or feedback and not a received tone. You should still be receiving the zero frequency — if not, readjust your receiver's tuning to zero it. At that point turn the RF GAIN or AF GAIN control down a notch. In this step you have to be very careful to keep the frequency of the radio and generator the same. If the frequency of either were to shift, it would cause a loud commotion.

### Watch Your Ears and Full Speed Ahead

At this point the amplification of everything in the receive path to the speaker is near maximum. Tapping on the boards with the plastic wand will cause an echo-like effect known as

a *microphonic*. You will clearly recognize this in the speaker and it is a normal effect of vibrating the boards by tapping them. With an intermittent, however, the sound from your speaker will sound like three ball bearings rolling around in a tin can. You should not hear a crackly or clunky distorted sound anywhere in the radio with one exception.

The clunky or crackly sound is okay if you hit a can or adjustment coil that is part of the frequency control circuitry for the voltage controlled oscillator. In the '102 these circuits are in six cans on the front of the local oscillator board. In Figure 4 the tuning wand is touching one. As you get farther and farther away from those sensitive points, the clunky and crackling sounds should decrease and then disappear. It is normal for the microphonic effect to persist. With a little practice and attention you will quickly know what is normal and what is not.

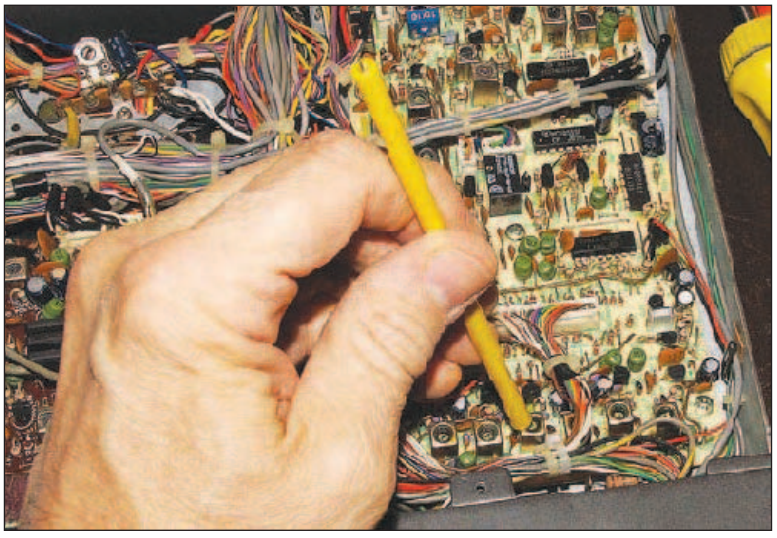

**Figure 4 — Flex the boards and tap the components. Be careful if there is high voltage present as fingers sometimes slip.**

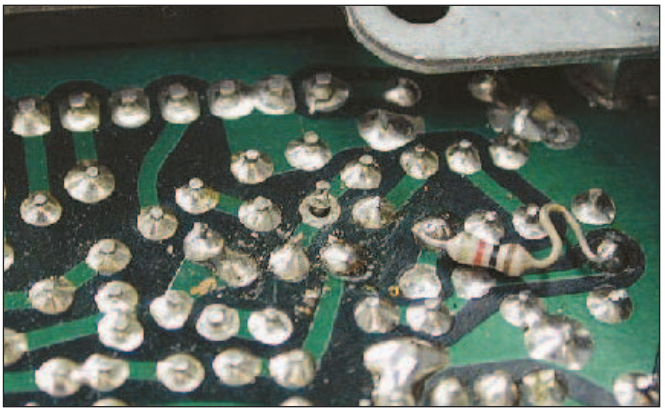

**Figure 5 — Note the witch's hat fracture in the center of the photo. The lead coming from the component side of the board has a circumferential fracture and separation of the solder filet. I have seen these many times. They are usually not as obvious. There are three others in this photo. *Hint — look up*.**

Tap and flex all the relays, boards and wires in the radio as you did before with the plastic wand. Tap the bandswitch shaft and anything else you come across with the plastic wand to see if there are signs of a signal intermittent or loud crackly noises. Be careful not to get shocked. You may not know the danger points and places where high voltage resides so be very careful with tube radios. There should be no danger of shock in 12 V radios, but beware of high current shorts that can cause damage.

Any bad component, dirty bandswitch wafer, poor crimp connection, witch's hat fractures (see Figure 5) or bad relays will, for the most part, be most sensitive at its precise location. If you find a bad spot use lesser and lesser tapping force to narrow the precise area (sort of like playing hot and cold when you were a kid). When you get things localized, check the components and also visually check the trace side of the board after removing it from the radio.

## Step Three

Using a signal generator or calibrator, the procedures so far will check all but one signal path in the receiver section of an FT-102. What remains is comprised of the antenna switching relay and the antenna input circuitry. If you are using an external generator you will not need to do this step as that signal runs through those components. But an internal marker signal is inserted following those elements in many radios, including the '102. The following procedure checks the remaining receive path in the '102.

With the radio off, connect a digital ohmmeter across the SO-239 antenna jack. I use an alligator clip on the ground post for one lead. You need to make good contact or this test will be invalid. I press the other lead of the ohmmeter into the SO-239 central hole and hold it there with solid pressure.

The ohmmeter should read between 8.5 and 9.5 Ω. That represents the impedance of the fuse bulb in the Yaesu FT-102 — your radio may read differently. Then while watching the ohmmeter, use the back of the screwdriver and bang it against the upper back chassis above the transmit cage until you see the loss of conductivity representing relay bounce. In order to pass this test the digital ohmmeter reading should be back to within 0.1 Ω of where it started within two update periods of the digital display. Remember here that a persisting 0.5 Ω difference after hitting the chassis means there is a resistance blockage on the contacts of the relay or on the relay board or its interconnects. With time and changing temperatures this may blossom to an intermittent and perhaps eventually an open circuit. That can easily happen the next time you use the radio.

## The Final Part — The Transmitter Section

We now need to do the same kind of process for the transmit signal path since losses can occur there as well. For this test use a dummy load and apply 20 W of continuous power (key down CW) so that you don't cook anything including the tubes in the '102. Use the same power output for other radios as well as full output here will not give an accurate account of things. If you are technically inclined and can connect the scope to the power output, that is the best way to see output changes. If you are not experienced enough to do, then use a power output meter.

Watch the output of the radio by connecting it to the 'scope or meter. Use 5 ms/division as before for the scope trace and make the vertical pattern about 75% of the full CRT screen. A power output meter will be helpful but it will not be quite as sensitive or immediate as an analog 'scope monitoring the events.

Then get your trusty screwdriver and plastic pen/plastic tuning wand and test the transmitter in the same way as you did the receiver. In this step, as you percuss the test radio, listen to its signal on the second receiver as you watch the 'scope. Remember, watch out for high voltage in unfamiliar surroundings and always use an insulated instrument to apply force.

After the visual testing listen to the transmitted CW signal in a second receiver.

Listen on the zero beat frequency with the receiver set to USB or LSB. Turn the volume of the second radio way up and listen for the microphonics and clunking resulting from stressing the boards and wires with the percussive devices in the transmitting radio. This then completes the whole procedure.

### And Then What?

If you detect a fault, zero in on it until you locate it or isolate it to two or three components. Then examine those and repair or replace them. In addition, check the solder side of the board for irregularities. Use a good magnifier and light as witch hat fractures can be hard to see.

Finally, I call this quadruple stress testing of the transceiver. Please forgive my use of terms but it does convey the message and ideas properly although it is a difference kind of stress.

I believe I have told you more than you wanted to know. But that is how to troubleshoot the '102 or any other ham radio for intermittents, whether from relays (not always the cause) or anything else. If you are careful and meticulous with this method you will eventually track down every cause of signal loss. One last point before we end and you pull your old radios out for testing: In all my years of doing this I have never found an intermittent in a radio using heat or cold where percussion didn't work.

Becoming conversant with these procedures will help make you a competent technician and enable you to repair and rescue radios that other hams would relegate to the scrap yard. It will also give you a feel for radio design and radio principles. I know it did that for me. Good luck and keep the ionosphere warm.

*ARRL member Mal Eiselman, NC4L, has been licensed since 1961 and has been a member of the ARRL for the past 30 years. He currently holds an Amateur Extra class license. He is a trained cardiologist who practiced in Hollywood, Florida for 30 years before retiring in 2003. His love of electronics and ham radio led him to repairing and modifying his Yaesu FT-102 HF transceiver. It is the only radio that he repairs and he has done this for the past 19 years. His Amateur Radio interests include keeping in contact with old friends as well as making new friends on the air on a daily basis. His second interest is making electronic things work better. You can reach the author at 3650 N 55th Ave, Hollywood, FL 33021 or at* **NC4LMal@aol.com**. *Visit his Web site at* **www.w8kvk.com/nc4l**.



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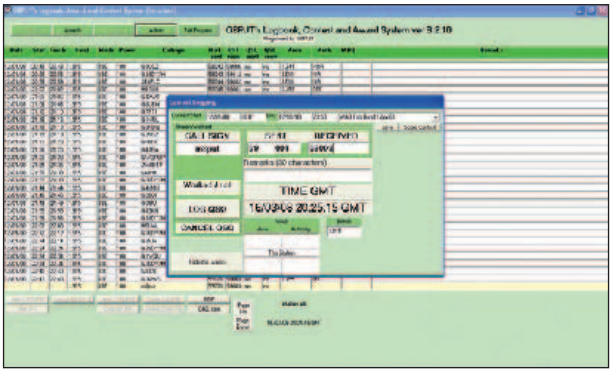


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# See Your Mobile Controls at Night with Superbright LEDs

*This modification lets you use your mobile mic for rig control at night.*

**Dwight Merkley, N7KBC**

I was very happy with my Yaesu FT-8800 mobile VHF/UHF transceiver — until I tried to use it at night. I like to control the radio from the front panel keys while driving and Yaesu did not provide back light for the buttons on the radio. They do offer back lighting of the mic control panel.

I decided to take matters into my own hands. After studying the schematic for the MH48 mic, I realized I could convert the switch that is normally used to LOCK the buttons on the mic to turn on and off a couple of super bright LEDs. I never had used this LOCK switch for its intended purpose anyway. The same mic is supplied with a number of Yaesu radios, so this should apply to others as well, and may be applicable to mics from other manufacturers.

The MH48 mic has 8 to 9 V dc available that could be used to drive our LEDs. I did some experimenting using a 1000 Ω variable resistor and my multimeter set up to measure current. I started with the variable resistor set to maximum and then started decreasing the resistance until I measured 20 mA through two LEDs in series. I then measured the resistance of about 100 Ω. If you do not have a 100 Ω resistor choose the next higher value (do not go lower as this will increase the current flow and possibly damage the LEDs).

## A Note About Light Emitting Diodes

An LED is a semiconductor device that emits light if current flows through it. It will work off almost any voltage a hobbyist is likely to want to hook it up to *if* you limit the current to the limit shown in the data sheet for the LED you choose. This is typically about 10 to 20 mA. Use a series resistor of appropriate value to limit the current. In other words, do not be so concerned about what voltage you are driving the LEDs with, but rather make sure that you limit the current to an acceptable level. See the URL in Note 1 for a handy LED resistor calculator.[1]

As an example, the specification sheet for the All Electronics LED-75 I used shows a forward voltage drop of 3.6 V, so two in series would have a 7.2 V drop. Upon entering that into the calculator at 9 V and 20 mA it tells you to use a 90 Ω resistor. Another way of looking at it is to consider the (9 – 7.2), 1.8 V drop across the resistor. With a 20 mA current, Ohm's law yields (1.8 / 0.020) or 90 Ω. By using a minimum of 100 Ω, we leave a bit of margin.

I chose to install two LEDs but you could probably fit one to three LEDs in the mic housing. You will need to change the value of the resistor if you use other than two LEDs. The LEDs I used work best at 20 mA of current flow according to the data sheet available on the All Electronics Web site.[2]

## You Need to Bring to the Table:

- A large amount of patience. Do not rush it. Take your time, work slowly and carefully and you will be rewarded. This will test your soldering skills as you will be working in close quarters and on very fine circuit traces.
- Some rather fine wire — between 26 and 30 gauge. I used 30 gauge wire-wrap wire.

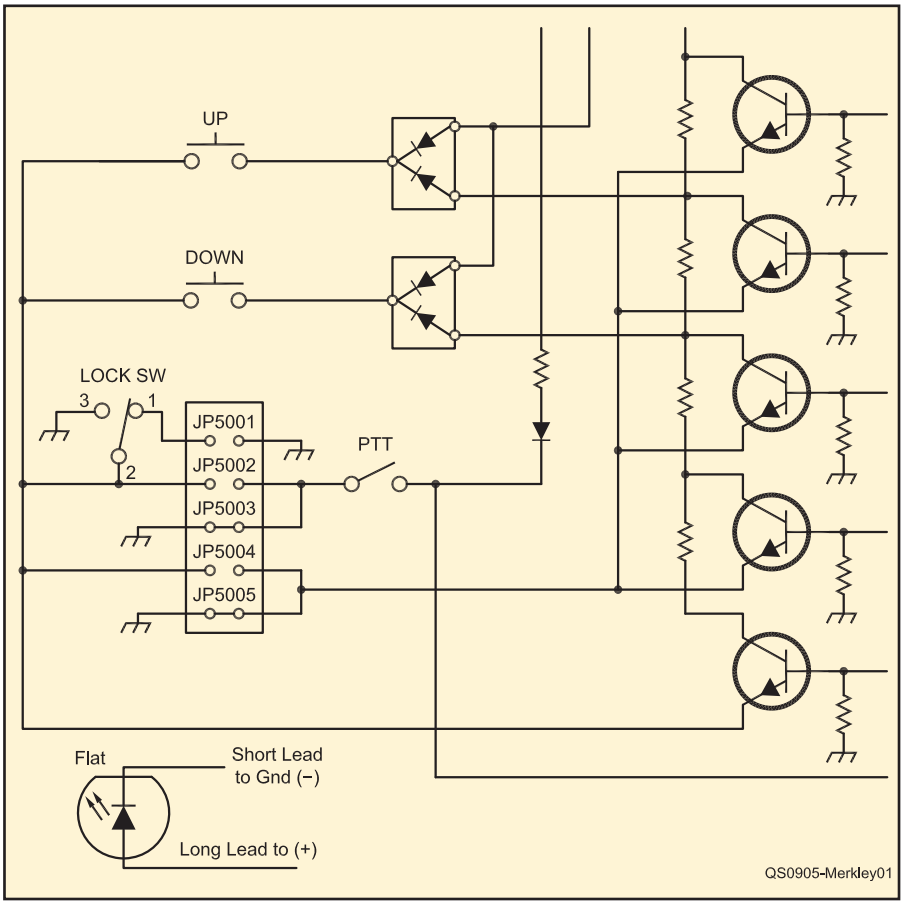



**Figure 1 — A section of the schematic for the MH48 microphone showing the areas of interest.**

[1]Notes appear on page 36.

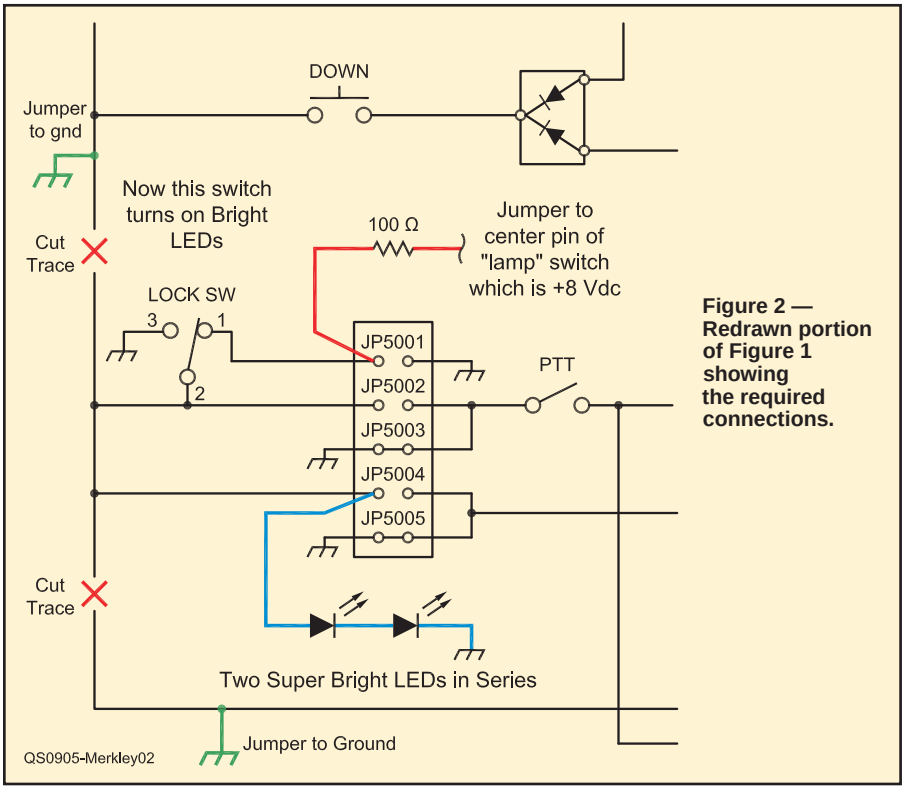



**Figure 2 — Redrawn portion of Figure 1 showing the required connections.**

**Figure 5 — Outside view of the LEDs inserted just beyond flush.**

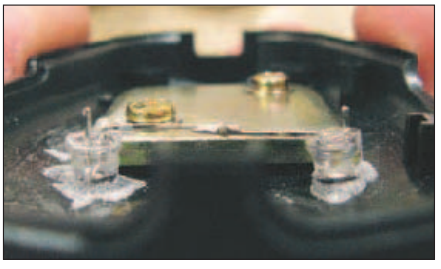


**Figure 6 — Interior view of the LEDs secured with cyanoacrylate glue and baking soda. Note the connection of anode to cathode.**

- One to three superbright white LEDs such as the LED-75 from All Electronics or something similar, at about $2 each.
- The required series resistor. For two LEDs, use a 100 to 150 Ω, ⅛ W, resistor.
- A razor knife, or equivalent tool, to cut the copper circuit traces and scrape away the green solder mask paint.
- A good quality soldering iron with a very fine tip. You will be working on very small traces, so I recommend you invest in one if you are ever going to do much soldering. You won't regret it.
- A magnifying lens or hood or lamp. Something to see what you are doing. Again once you have one of these you will wonder why you didn't get one sooner.

I recommend you read and study this whole document before you begin. When you're ready, follow the steps described with each figure.

## Making it Happen

Figure 1 shows a section of the schematic for the MH48 microphone highlighting the areas of interest. The whole schematic is available in the FILES section of the Internet Yahoo! group (**mh48a6J.pdf**) so you can see how Figure 1 fits into the big picture.[3] Look at the LED details to understand how they hook up.

Figure 2 is a redrawn portion of Figure 1 showing the required wiring changes. Look to the left of the five jumpers, JP5001 to

**Figure 7 — The 100 Ω, ⅛ W resistor prepared with wires, but before optional heat shrink tubing.**

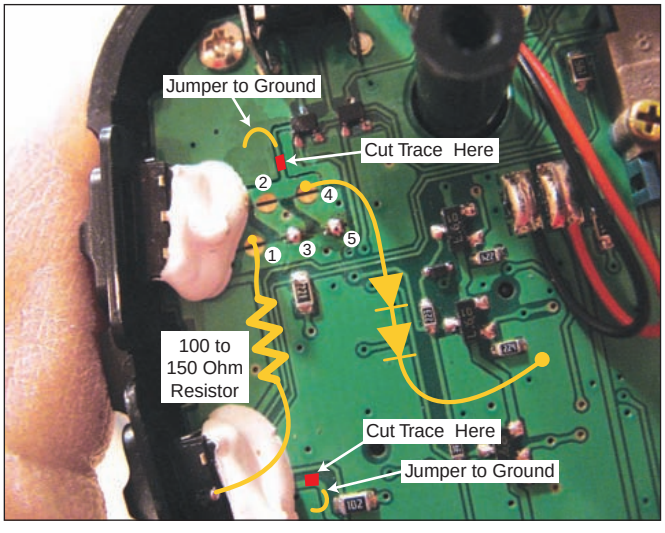



**Figure 3 — An overall view of the whole project. Detailed photos are provided in the *QST* binaries Web site.[4]**

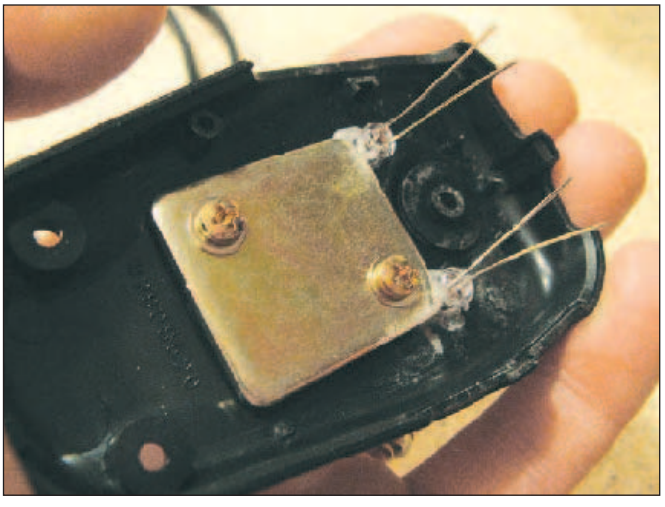


**Figure 4 — The LEDs inserted in their holes in the mic.**

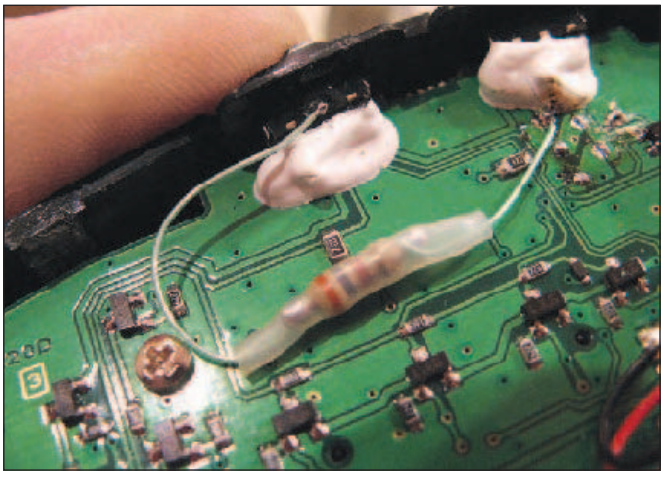


**Figure 8 — The resistor with tubing installed on the PC board.**

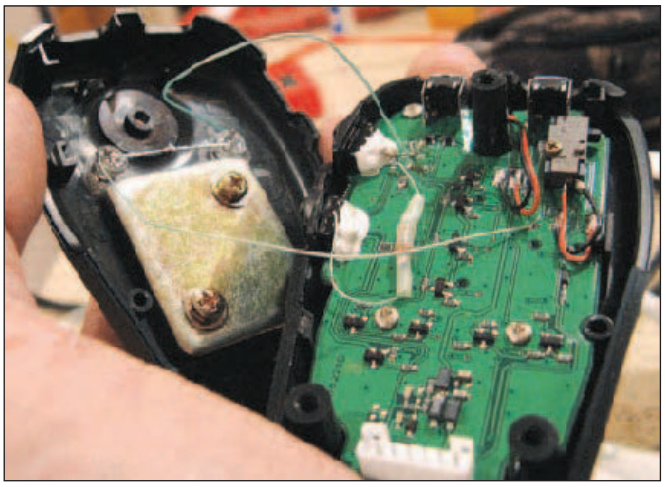


**Figure 9 — The finished mic before reassembly.**

JP5005, to understand how the circuit traces are routed and why you have to cut two traces and install two jumpers to ground.

### *Modifying the PC Board*

Note that the LOCK switch is now going to supply current limited voltage to the LEDs if switched to the LOCK position. You need to install the upper ground jumper so that the UP and DN buttons still work and the lower ground jumper, so the P1 through P4 buttons will continue to work.

Be sure that JP5003 and JP5005 are installed on your mic. And be sure JP5001, pins 2 and 4, are not bridged. The jumper labels are shown in detailed photos on the *QST* binaries Web site. Note that the LEDs are connected in series. The LED case has a flat spot on one side of the plastic; that side should go to ground. The short lead is the cathode, connect it to ground. The long lead is the anode, connected to the positive source. A photo of the board connections is shown in Figure 3.

Be sure that only solder jumpers 3 and 5 are installed on your mic. If other solder jumpers are installed, you can (and must) safely remove them.

Cut the circuit traces where shown by the red lines on the detailed photos. It is only necessary to cut through the trace enough to separate the copper. Then scrape the green paint where the yellow jumper shows a jumper to ground. You may be able to imitate the copper colored solder jumpers near the switch by scraping a spot on the ground plane next to the spot you scrape on the trace and then just melt a puddle of solder to make a bridge to the ground plane. Move the tip of the iron back and forth where you scraped the paint away while you melt some solder and you should be able to get the solder to bridge the gap. If needed, use a small piece of wire to complete the bridge.

Note that in order to solder to the traces and ground plane (most of the large areas of the circuit board are ground) you *must* scrape away the green solder mask paint so the solder will adhere properly.

### *Installing the LEDs*

First drill a test hole in a piece of scrap wood or plastic to check the fit of your LEDs and determine the required drill bit size. Carefully drill holes for the LEDs in the clamshell half as shown in Figure 4. Make sure you provide adequate clearance for the metal weight as shown in the figure. I wanted the LEDs to just barely protrude from the plastic so I inserted them just beyond flush as shown in Figure 5.

I used a combination of cyanoacrylate glue and baking soda to attach the LEDs. Just glue each LED in place and then instead of waiting for the glue to dry, take a pinch of baking soda and sprinkle it on the wet glue. It will instantly set up. Then blow away the excess baking soda. It makes a very strong support surface. Keep building up layers of glue followed by baking soda until you have the thickness you want. The results are clearly seen in Figure 6.

Solder one leg of each LED together as shown in Figure 6. Solder an anode to a cathode (flat side of one LED to the round side of the other) then be sure that the remaining flat side of one of the LEDs is the one you wire to the ground plane. The remaining round side of the other LED is soldered to the upper half of JP5004. See Figure 3.

### *Final Steps*

Prepare the 100 Ω, ⅛ W resistor with insulated wire leads, as shown in Figure 7. Insulate the resistor body and connections with heat shrink tubing and solder to the PC board as shown in Figure 8. The resistor runs from center pin of the LAMP switch (that's the switch that turns on the red back light for the mic keys) and the upper half of JP5001.

You should now have the pieces ready for reassembly as shown in Figure 9. Reposition the clam shell halves and bolt together being careful not to pinch the added wires.

## How's it Play?

This project works great and gave me a great sense of satisfaction. After I finished I was very pleased with the outcome. In addition to being able to read the front panel, I now have a multipurpose "flashlight" available at all times in my vehicle which can be used to light up the button labels on the radio, read a map or help me look for whatever I drop on the floor.

I find that the letters on the buttons are easier to read if you hold the mic light so the lighting comes from a low angle. You can move the light around to get the best view from where you sit.

**Notes**

[1]**www.metku.net/index.html?path=mods/ledcalc/index_eng**.
[2]**www.allelectronics.com**.
[3]Posted in the FILES section of the FT-8800R Yahoo! group: **groups.yahoo.com/group/FT-8800R/**.
[4]**www.arrl.org/files/qst-binaries/**.

*ARRL member Dwight Merkley, N7KBC, was first licensed (along with his wife, Julie, N7KBP) in 1987 as KB7CVW. He currently holds the Amateur Extra class license. Professionally he supervises the maintenance on a 17 hop microwave radio system for an electric utility. In his spare time, when not devouring the latest issue of* QST, *he enjoys flying his ultralight aircraft and riding motorcycles with his wife. He lives in Vernal, Utah with his wife and three children and can be reached at 2841 E 2500 St, Vernal, UT 84078 or at* **n7kbc@arrl.net**.

# How I Installed a Ham Shack in My SUV and Fixed the Noise

*If your job has you on the road, why not take ham radio along for the ride?*

**Dave Wilson, KU4B**


My job changed slightly from 1997 to 2003, from maintenance at an industrial operation, to a project manager, to a broadcast engineer. Having worked in the broadcast business in the past, I knew I would be on the road quite a bit. As I was leaving the project manager position for a conveyor company, I bought a new 2002 Nissan Xterra four wheel drive vehicle. While I was at the car dealership looking around, I found one with the antenna mount already in place (they thought it was a trailer hitch). I traded in my somewhat tired pickup with something over 500,000 miles on it and took the new vehicle to the house.

**Figure 1 — View of antenna mounted on trailer hitch.**

## Disclaimer

If you happen to use some of my ideas, I do not accept liability for any of your actions. I would be interested in hearing what your suggestions are and how you tackled some of these problems. If these ideas make your corn flakes soggy they are still your corn flakes. I can't speak for Nissan, Yaesu or any other company mentioned. This was intended to help others find solutions to some of the problems along the path to installing two-way equipment in a mobile environment.

## Equipment to be Installed

I wanted to put a number of things in the new vehicle aside from tools. An HF, VHF and UHF radio was part of the plan. The other thing that I wanted to have was APRS capabilities. I bought a Yaesu FT-857 all band transceiver to support all these applications. Automatic tuning capabilities for the HF antenna, along with a combo VHF/UHF antenna and a separate antenna for automatic packet (or position) reporting system (APRS), were required. The HF antenna chosen for the job was the Hi-Q 4/80 RT from Hi-Q-Antennas. I chose the

2 foot long extension with a top hat and an additional whip. It was all I could fit under a bridge. (See Figure 1.)

## Mounting the Equipment

The instrument panel has a small area just below the broadcast radio that was sufficient for a small control box for part of the APRS equipment and the HF antenna control switches (see Figure 2). I wanted the ability to control the HiQ 4/80 RT antenna manually along with being able to put it into automatic control mode and push a button for automatic tuning. The Tiny Track 2 (now replaced by the Tiny Track 3) was installed along with 4 LEDs to show the status of what is going on with the APRS equipment. A Garmin ETrex was used for the GPS receiver.

**Figure 2 — The control box for part of the APRS equipment and the HF antenna control switches.**

The APRS transmitter chosen was an older Yaesu FT-470 handheld transceiver. I installed it in the side compartment of the rear of the vehicle. I found a small plastic trash enclosure and cut it to fit in the rear side wall of the Xterra. Velcro holds the top of the plastic enclosure in place. I added a fuse to the enclosure for the handheld. A dc filter replaced the battery in the battery pack feeding power to the handheld. Power was taken directly to the battery connections on the handheld. The Tiny Trak was powered through a 5 V (7805) regulator mounted on the APRS box. The APRS module interior is shown in Figure 3, while the external indicators and fuse are shown in Figure 4.

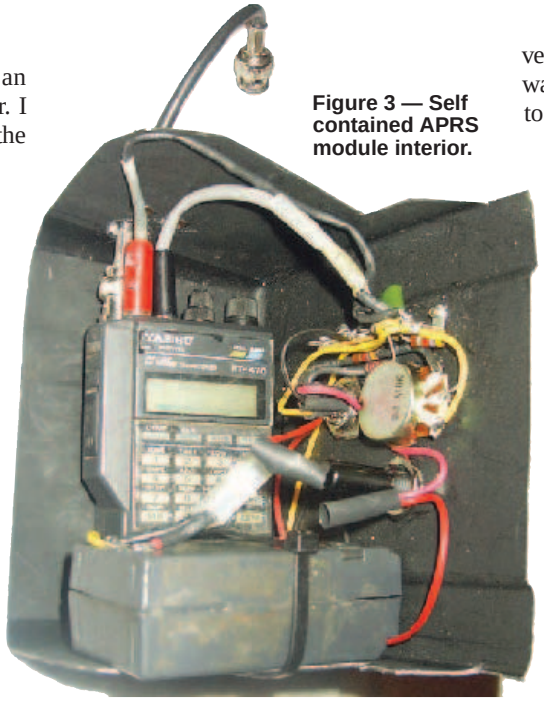


**Figure 3 — Self contained APRS module interior.**

The FT-857 and Antenna Boss electronics were installed below the driver's seat. Feed lines were run away from the area of the vehicle control computer to the extent possible. The FT-857 control head was mounted just below the air conditioning controls on the dash. Mic connector and a push button to start the automatic antenna controller was mounted to the right-hand side of the center of the dash, along with an LDG Electronics FT Meter above the mic/one touch tuning switch box. The HF antenna was mounted on the trailer hitch with the Giant Quick Disconnects (GQD) and other mounting hardware from Hi Q Antennas. (See Figure 5.) The arrangement of the antenna mount is such that it does not interfere with use of the hitch. Power was distributed using a West Mountain Radio Rig Runner 4008 panel located next to the driver's door on the floor.

**Figure 4 — "Front panel" of APRS module with external control, connector and fuse.**

## DC And Other Wiring

DC wiring was run directly from the battery through the firewall, then follows some of the vehicle wiring harness underneath the doorway. Every piece of equipment is fused for the proper current. Wiring was kept away from the vehicle wiring when possible and run under the carpet in areas where wear would not be a problem. The APRS radio was powered from the dc jack available in the back of the vehicle. Power for the HF radio and antenna tuning hardware is individually fused at the Rig Runner.

Power feeding the HF antenna goes through a few turns on a toroid core and a 4-pin quick disconnect at the antenna mount. Eight conductor shielded wiring was used between the APRS radio in the back of the vehicle and the Tiny Trak hardware. I didn't want to have to pull the small control box out to adjust volume settings for audio for the APRS signal, so I put a VOLUME control on the panel that the handheld radio was mounted in. I ran RG-214/U coax cable to all of the antennas. Having a hole punch the proper size for the roof made installing those two antennas much easier and didn't leave any marks. Although RG-214 is not the easiest cable to run, it is quite rugged and the loss is a bit less than that of RG-8X.

A coil was added to the base of the HF antenna mount (see Figure 5) to make it possible for the antenna to tune correctly on 40 and 80 meters. Instructions for how that was done can be found on the Hi Q Antennas Web site.[1] I opted for adding the capacitive hat and whip to this antenna to raise the center of radiation as much as practical. For 80 meters the best place for the hat would be at the top of the antenna; however, for obvious reasons that doesn't work here.

## HF Noise Found

The VHF and UHF equipment all worked fine. With a decent antenna on the roof I can usually work them if I can hear them. HF was another matter. I noticed several noise problems and had to do some snooping to find out where the noise was coming from. Many years ago I had a vehicle that had ignition noise. This one was quiet enough it may not have been necessary; however, I decided to add the fix I used several years

[1]www.hiqantennas.com/.

**Figure 5 — The HF antenna mounted on the trailer hitch with mounting hardware from Hi Q Antennas. There is a toroid core with the motor wiring lines wrapped around it behind the mounting bar. The added shunt matching coil can be easily seen.**

**Figure 6 — Shielding wires wrapped around ignition wires to help suppress ignition noise.**

ago. I wrapped some wires around the spark plug wires and took them to ground near the distributor cap as shown in Figure 6.

I also bonded the tail pipe to the frame with some heavy braid near the end of the exhaust pipe. I put a strap from the hood to the frame near one of the hinges to make sure there was no noise getting through there. The only substantial engine noise I find on the low bands is during heavy acceleration.

The other noise generator that proved to be a problem was the fuel pump. I found out later that there was a recall on the sending unit assembly. I used some 0.05 µF, 100 V, ceramic disk capacitors in parallel with 0.1 µF 100 V mylar capacitors to bypass both leads of the fuel pump power supply lines to ground points near the tank as shown in Figure 7. I also ran braid, taken from a few inches of coax, to ground the cover over the fuel tank and the bypass caps as shown in Figure 8. Originally the cover over the fuel tank was floating above ground. Noise from the fuel pump would be radiated by the floating cover above the tank.

I ran a few inches of 6 gauge stranded THHN house wire from the mount for the HF antenna to the hitch and vehicle frame. That took care of some noise from the hitch hardware moving around while in motion.

Noise has almost completely disappeared with a couple of exceptions. If the car radio is turned up loud, it generates a hash that shows up on the low bands. I don't know if that might be a grounding or bypassing problem in the broadcast radio itself or some type of generated problem internally. Under heavy acceleration I hear some noise related to the engine. Most of the time the worst noise is from external sources such as leaky cable lines, noisy ac lines, noisy cars (RF wise) passing by and BPL are the usual suspects.

**Figure 7 — Details of fuel pump connections ready for bypass capacitors. This is accessible via a small port under the rear seat.**

**Figure 8 — Ground strap and bypass connection for the fuel pump. The strap must be long enough to attach to the passenger body.**

## Station Operation

The control box LED indicators show the status of the APRS equipment. If depressed, the white switch puts the antenna under manual control. The black rocker switch causes the remote tuning to move down or up while in manual mode. The small black switch on the mic connector starts the automatic tuning sequence. The radio transceiver is easy to operate on all bands from the driver's position, and the APRS takes care of itself.

## Results

Most of my operating for the past few years has been from the vehicle. VHF and UHF operation has always worked fairly well. I have had many different HF installations with quite a number of HF antennas. The Hi Q antenna is far better, especially on 40 and 80 meters, than any other mobile antenna I have ever tried. This antenna is also significantly larger than many I have used before. I have found HF mobile operation to be a challenge, especially on 75 and 80 meters. It is interesting to be able to hear and work stations while on the road that I could only hope for in the past.

*ARRL member Dave Wilson, KU4B, holds an Amateur Extra class license and is employed as an engineer for The Cromwell Group in Nashville, Tennessee. He is the system administrator for WWNS (***wwns.com***) and can be reached at 425 Robertson Dr, Smyrna, TN 37167 or at* **david@wwns.com**.

# A Cell Phone Headset Adapter for Amateur Radio

*Get more bang for the buck by using your cell phone headset for other applications.*

**Geoff Haines, N1GY**

A few months ago, I wrote about an adapter I cobbled up to make use of inexpensive PC headsets for use with ham radios.[1] The article was published by *QST* and I got some feedback indicating that some hams were building similar devices. One respondent asked if it would work with a cell phone headset. At the time, I replied that I was unsure, but it sounded like an idea that was worth pursuing — someday.

## Someday is Here

As luck would have it, recently I found a cell phone type headset in a local discount store at a price ($3) that was too good to pass up. The purchase was made and the project quickly followed. I have since built three more adapters and purchased so-called "universal" headsets (or "earsets," if you like) at prices from $2 to $7 found in both discount ("dollar") stores and electronic retailers such as RadioShack.

## Making it Happen

After getting no help at all from the cell phone manufacturer, or from the supplier of the headset, a little careful disassembly of the first headset determined that the mic element was connected to the *tip* of a 2.5 mm stereo plug. The earphone was wired to the *ring* and ground for both was the shaft or *sleeve* of the connector. This was verified with a different headset. It appears that most "universal" cellular headsets use this wiring method.

I was able to use the same basic circuit as the PC headset adaptor with one change. The only change required was to tie both the mic ground and the chassis ground together. This left only three wires to go to the jack for the headset. One comes from the junction of the resistor and capacitor for the electret element and goes to the tip connection on the jack. The second comes from the audio feed from the connector that goes to the external speaker jack on the radio. The third goes

[1]G. Haines, N1GY, "A Simple Headset Adapter for the IC-706 Series Radios," *QST*, Jul 2007, pp 50-52.

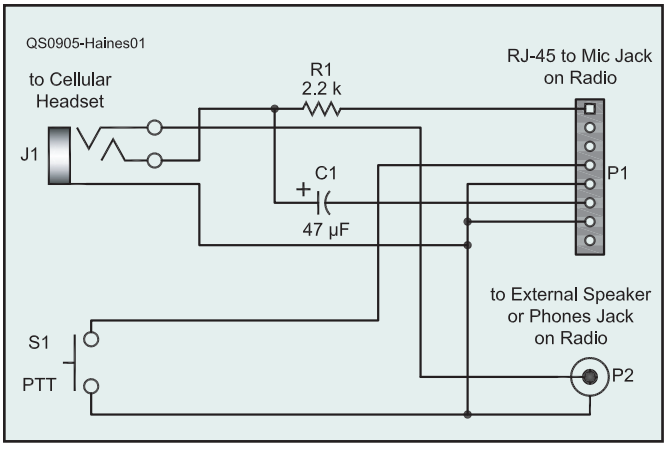



**Figure 1 — Schematic of the adapter for an IC-706MkIIG. J1 in all versions is a 2.5 mm stereo jack from RadioShack (part #274-245).**

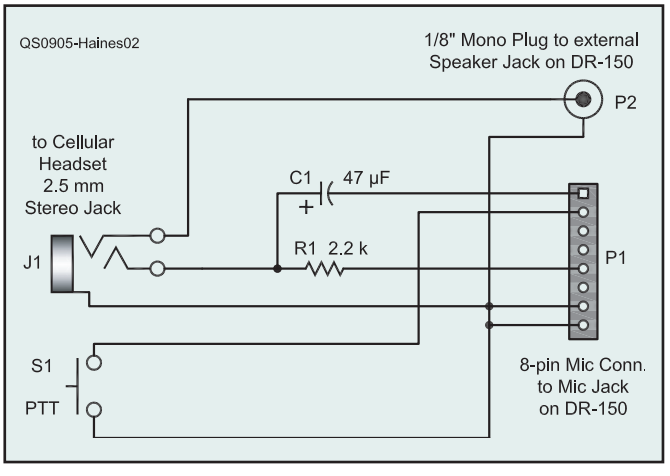



**Figure 2 — Schematic of the adapter for the Alinco DR-150.**

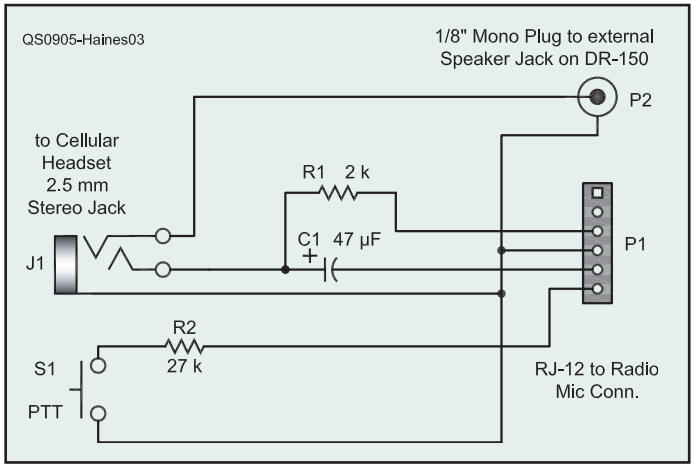



**Figure 3 — Schematic of the adapter for the Yaesu FT-7800R series of mobile transceivers.**

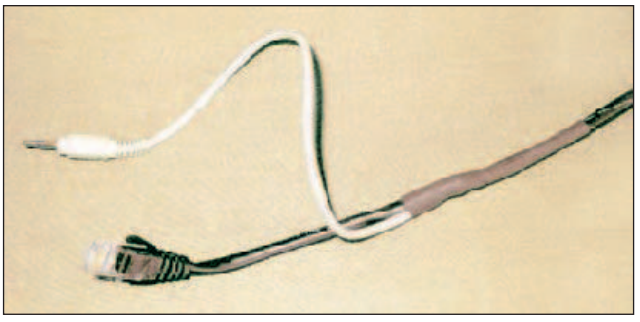


**Figure 4 — Here you can see how the audio cable is spliced into the CAT-5 cable. The heatshrink tubing covers and supports the splice, making for a neat and clean look. The ⅛ inch phone plug on the end of the audio cable can be stereo or mono, depending on the needs of your radio. If a stereo plug is used, both the tip and the ring of the plug are connected to the same wire.**

from the point where the chassis ground and the mic ground tie together to the ground connection on the jack. Looking at the circuit diagrams will make it all clear.

Figure 1 is the schematic of the adapter for an IC-706MkIIG. I have also wired this adapter to suit the Alinco DR-150 (see Figure 2) and the Yaesu FT-7800R (Figure 3). The pin-outs will vary by manufacturer and extra components may be needed for some. The FT-7800R (and the FT-8800 and FT-8900 as well) will need a 27 kΩ resistor in the PTT line. The DR-150 and the IC-706 series radios do not need the extra resistor.

The whole thing terminates in an Ethernet CAT-5 type cable of the appropriate length, along with a cable for the external speaker connection. I did not bother adding the UP/DN buttons to the adapters since I rarely use them anyway. I used the extra wires in the cable for feeding the audio from the EXTERNAL SPEAKER or PHONES jack on the radio to the headset. This requires only minor surgery to the CAT-5 cable about 3 to 6 inches back from the MIC connector, slitting it enough to locate and expose the extra wires. These wires are cut and the wires past the cut point away from the RJ-45 are spliced onto the two conductors for the connection to the external speaker connector as shown in Figure 4.

This splice causes no weakness in the cable, if suitably insulated and supported with heat shrink, and it reduces the cabling to the adapter to one CAT-5 ca2ble plus a short two conductor *tail* to go to the PHONES jack. The same procedure can be used with wires 1 and 2 in the CAT-3 cable needed for the FT-7800 series radios, since they are not used with this adapter. For most radios the audio connector is a ⅛ inch mono plug. The IC-706 uses a stereo plug, but I just wired the tip and the ring in common so it still uses only two conductors for the tail wire.

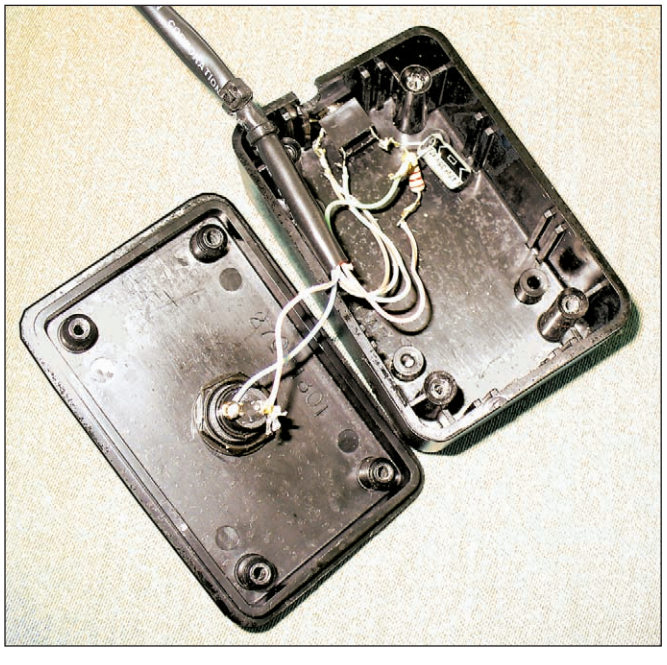


**Figure 5 — A view of the interior of the adapter shows only two components, a 2.2 kΩ resistor and a 47 µF polarized capacitor, both available from RadioShack or many other suppliers. The jack for the headset is part #274-245 from RadioShack as is the enclosure, part #270-1801. The cable to the radio is one half of a standard CAT-5 jumper with a two conductor audio cable spliced in as noted in the text.**

## Wire it Correctly

Careful adherence to the correct color coding of the wires in the cable will avoid problems. Be aware that there are at least two main color codes for CAT-5 cable, T568A and T568B. They are not identical but they are similar enough that care is warranted. Also, be aware that I have found that some aftermarket cables have been mismarked as T568A when they are in fact built to the B code. Always check the color code at the connector. Figure 5 shows the interior construction and wiring.

Rather than install a new connector on bare cable, I use a five or seven foot CAT-5 jumper cable, cut in half. The connector is already installed so all you have to do is wire the cut end to the adapter. The same method works for CAT-3 six conductor flat cable. Cables for the radios that use the 8-pin round connector will have to be fabricated from scratch, unless you can find an old 8-pin mic that you don't need any more.

Although this adapter was designed originally for the ICOM IC-706 series of radios, and modified slightly for the Alinco and Yaesu brands, there is no reason it could not also be built for other radios that use an electret mic element. A microphone connector is a microphone connector whether it is an RJ-45, RJ-12 or the more traditional round 8-pin type. The pin-outs may be different for different connectors or brands of radio, but the circuit still works once those pin designations are accounted for.

## Can You Hear Me Now?

Now that the unit has been constructed, the big question is "How does it work?" The answer is "amazingly well." Reports of audio quality have been remarkable with

**Figure 6 — Three different universal cellular headsets are shown here. One has the foam sock removed to show what it looked like when purchased. The foam sock is from Tower Electronics at www.pl-259.com. RadioShack lists this headset on their Web site for less than $20 but I have purchased them at discount stores for as little as $4.90.**

some operators saying that it equals my Heil Traveler headset. Comments like "full range audio" and "sounds fantastic" made my ego swell, however anecdotal they may be. I do not have the facilities to do audio quality testing or analysis, so I will be satisfied that hams who have heard me use the stock ICOM mic, the Traveler headset, the PC headset and now the cell phone headset say the cellular headset is the full equal of any of the others.

In addition to the low cost, the much smaller size of the typical cell phone headset makes it more comfortable to wear for long nets. It is much lighter, and since the mic element and its little wind cap are beside my cheek instead of in front of my face, it doesn't interfere with the occasional sip of an icy beverage during the time spent in front of the radio. Some other headset possibilities are shown in Figures 6 and 7.

## Your Mileage May Vary

I should note that while I had success with the same values for the resistor and capacitor as were used for the PC headset electret element for both the '706 and the DR-150, you may have to adjust the value for the capacitor to achieve best audio response from your mic. The resistor value is usually found by looking at the specs for the radio in question. Use the same value as the stock mic impedance. The need for the PTT resistor is also specific to the FT-7800R series because of its unique mic wiring. In some radios it may not be needed at all. Just review the stock wiring of the hand mic that came with the radio to see if it is required and if so, what value it should be. Circuits for the FT-817, '857 and '897 are available on my Web site at **www.n1gy.com**.

The enclosure for the switches and components is up to you. I have used RadioShack project boxes, candy mint tins, film canisters, electrical boxes and the like. Use whatever fits the budget and works.

## The CAT's Out of the Bag

I will make one last comment about the use of CAT-5 cable and RJ-45 connectors for this and other projects. I have heard some operators say that they would not use them because the standards are different, the shielding is inadequate, and other criticisms. All I can tell you is that I have been using very inexpensive CAT-5 cable and connectors for years with my two ICOM '706s (one mobile), my two Alinco DR-150s and my two Yaesu transceivers (also one mobile) and have yet to have any problems at all. Maybe the problem is not the cable or the connectors, but the excessive RF in the immediate environment. Proper grounding techniques and good construction practices will keep the stray RF in check. Keep building, that is what makes Amateur Radio so special.

*Geoff Haines, N1GY, has been licensed since 1992, is an ARRL member and holds an Amateur Extra class license. He retired after a career in respiratory care. He currently holds several ARRL appointments in the West Central Florida Section, including Technical Coordinator, Technical Specialist, Official Bulletin Station, Net Manager, Official Emergency Station and Official Relay Station. He is the President of the Manatee Amateur Radio Club, a member of the Manatee ARES group and member of the Bradenton ARC, the Yale University ARC and the Meriden CT ARC. In his spare time, he enjoys homebrewing antennas and accessories for his Amateur Radio operations. Geoff can be reached at 904 52nd Avenue Blvd, W Bradenton, FL 34207, or* **n1gy@arrl.net**. QST

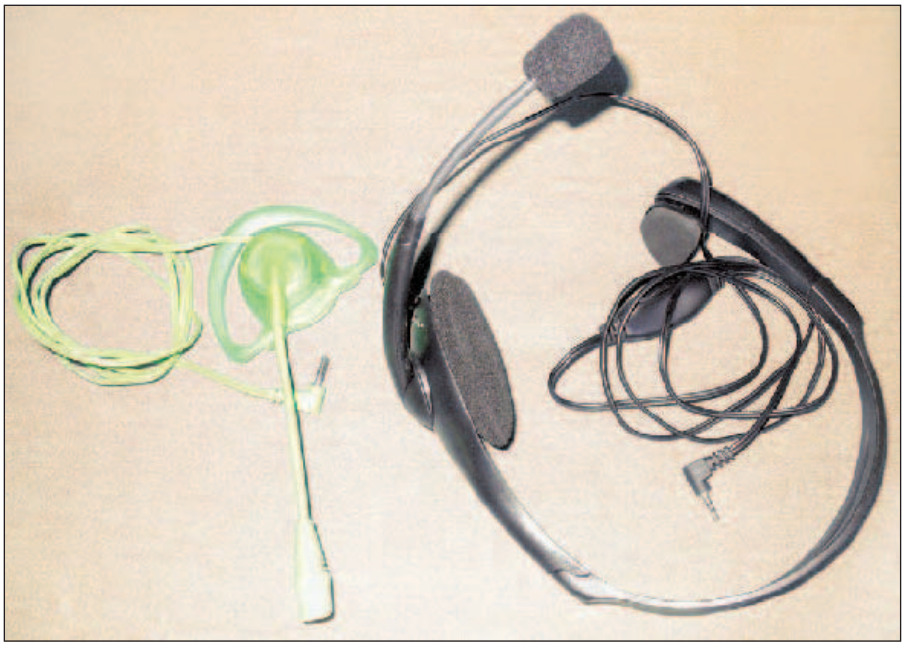
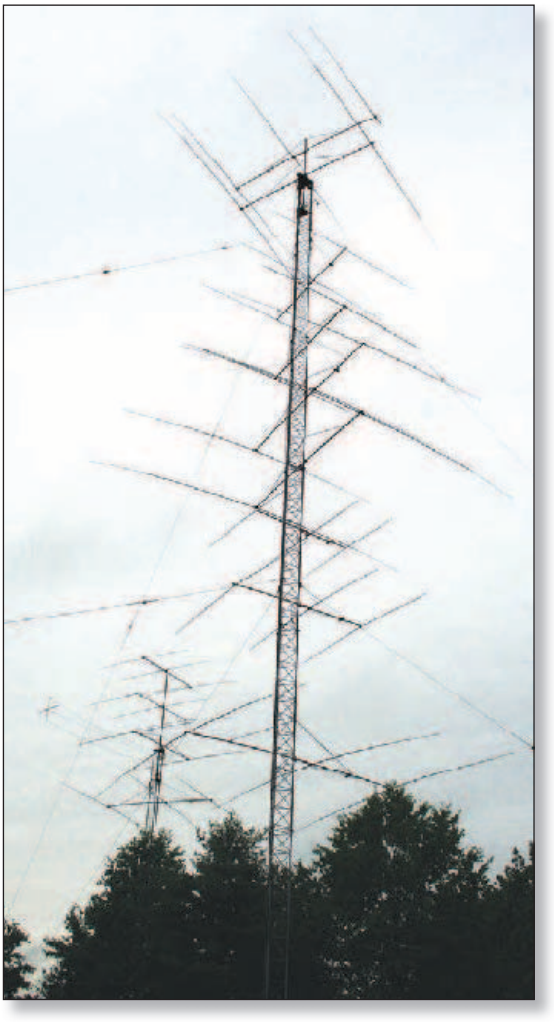


**Figure 7 — These two headsets will also fill the bill. The black unit, very similar to a PC headset, but with the cell phone connector, was the first one I purchased, for the lofty cost of $3. The almost fluorescent green one cost only $2 from the same retailer.**

# What's the Best Height for My HF Beam?

*Height matters if you want the optimum angle of radiation from horizontal antennas.*

**Steve Hunt, G3TXQ**



I wish I had a pound for every time I've been asked that question. My stock answer used to be "the higher the better," but now my better informed (though less helpful) answer is "It all depends!" Ideally, we would choose a height for the beam so that its take-off angle best matches the arrival angles of signals of interest, but because those angles depend on the path we are trying to work, the operating frequency, the time of day, the season of the year and the point in the sunspot cycle, that's not easy.

## Perhaps There's a Way

While trying to find an objective answer to this "best height" question, I came across a valuable resource — the elevation angle propagation statistics published by the ARRL.[1] These show, for a particular path and band, the probability that signals will arrive at any given elevation angle. They are an average taken over the daily, monthly, yearly and 11 year cycles that affect propagation. An example is shown in Figure 1 for the UK to Europe path on 20 meters.

The percentage of time that a particular elevation angle can be expected is shown against the right hand vertical axis. In this example, elevation angles vary from as low as 6° to as high as 35°, with signals most often arriving at 7° for 16% of the time. Statistics such as these can form the basis for objective decision making about antenna height.

## Case in Point — the Small Yagi

Let's assume that we have an HF beam, in this case a Hexbeam, at a height of 40 feet, and we want to know how well it matches these propagation statistics. We can determine the gain of the antenna at various elevation angles using a modeling tool such as *EZNEC*, and then superimpose those gains on top of the ARRL statistics, as shown by the red curve in Figure 2. This gives us a useful, visual impression of how good the match is.

Suppose we now wonder if we could do better by raising the antenna to 80 feet. We model the vertical response at 80 feet, overlay the results on the statistics again, and get the green curve of Figure 3. Notice that there is now a primary lobe that peaks at about 11° and a secondary lobe 2 dB lower at 38°.

### *So What's it All Mean?*

We now ask the question, "Is the antenna better at 80 or at 40 feet" for this particular path on 20 meters? Subjectively we might expect that it is better at 80 feet — after all, the antenna response peaks at elevation angles that are statistically the most common; however, there is also a null in the response at elevation angles between 22° and 26° from which signals arrive for a significant fraction of the time. The 40 foot response has no such null; on the other hand it is "falling off" at the most common elevation angles. So, which is better?

Rather than rely on a subjective assessment, I developed a quantitative analysis technique that tells us which height is better, and by how much. This technique takes each elevation angle in turn and multiplies the probability of its occurrence with the antenna's gain at that point; summing the answers will give us an "average gain" for that height/band/path combination. We can't just take an average of the logarithmic (dBi) gain figures, however, and expect to get sensible answers — we need to convert to linear units first. After averaging we can convert back to logarithmic units in order to get numbers we are more familiar with.

### *A Single Figure of Merit*

I refer to this average gain as a height figure of merit (HFM). It can be interpreted as the gain of the antenna averaged over a sunspot cycle, for signals over a particular path and on a specific band.

Expressed mathematically it is:

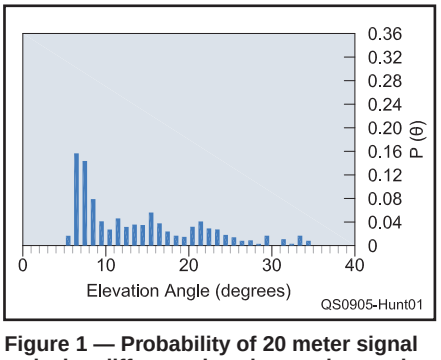



**Figure 1 — Probability of 20 meter signal arrival at different elevation angles on the UK to Europe path.**

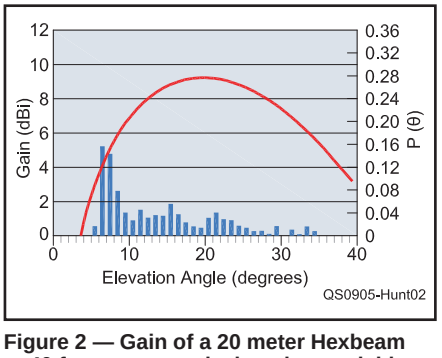



**Figure 2 — Gain of a 20 meter Hexbeam at 40 feet versus arrival angle, overlaid on Figure 1.**

[1]Notes appear on page 44.

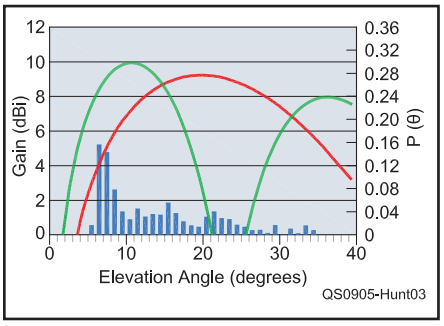



**Figure 3 — Gain of a 20 meter Hexbeam at 40 feet (red) and 80 feet (green) versus arrival angle overlaid on Figure 1.**

$$HFM = 10 \times \mathrm{Log} \sum_{\theta=1}^{90} 10^{(\mathrm{Gain}(\theta)/10)} \times P(\theta)$$

where

θ = the elevation angle,

gain(θ) = the antenna gain (in dBi) at elevation θ and

P(θ) is the probability of the signal arriving at angle θ, taken from the ARRL statistics.

Put in nonmathematical terms, for each elevation angle between 0° and 90° we convert the antenna gain into linear units, multiply it by the likelihood of a signal arriving at that angle, sum the answers, and convert back to dB units. Although it sounds a bit complex, it's very easy to implement in a spreadsheet.

If we do the sums for our earlier Hexbeam example we get an HFM of 7.3 dBi at 40 feet, and 8 dBi at 80 feet. This approach gives us the clear-cut answer that 80 feet is the better height, and it also allows us to judge whether the expense involved in lifting the antenna from 40 feet to 80 feet is worth an average improvement of 0.7 dB.

### *The Big Picture Emerges*

In practice, of course, we are likely to be interested in several bands and more than one path, so we would calculate the HFMs for the bands and paths of interest and plot them against a range of heights. An example is shown in Figure 4 for a multiband Hexbeam at heights between 20 and 100 feet, for the 20 and 10 meter bands, and for three paths between the UK and Europe, USA and Oceania. Note that the shape of a Hexbeam's vertical response is very similar to that of other modest gain beams, and to that of a dipole, so the chart is widely applicable provided the left hand axis is treated as a relative figure of merit.

## And the Answer Is

Now that we have this data, we are in a position to make informed, quantitative assessments rather than merely subjective observations. Clearly, there is no single "best height" for our antenna. For example:

On the long haul UK to Oceania path there is no substitute for height. As we lift the antenna from 20 to 100 feet, we get a 10 dB improvement, both on 10 and 20 meters; and the shape of the curve suggests that more height would bring further dividends. But note that half of that 10 dB improvement has been achieved in lifting the antenna from 20 to 40 feet.

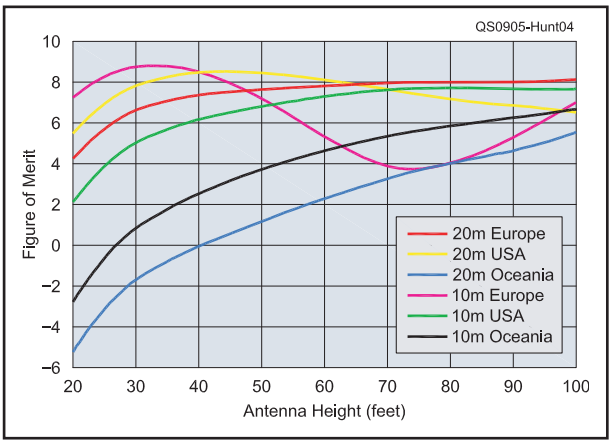



**Figure 4 — Figure of merit of small Yagi antennas versus height on multiple paths for 20 and 10 meters.**

On the intermediate UK to USA path, 50 to 60 feet looks to be about optimum. Anything higher produces a degradation in the 10 meter HFM. On 20 meters, the HFM is within 1 dB of its peak.

On the short haul UK to Europe path, the optimum height is between 30 and 40 feet. If we go much higher, the 10 meter performance drops significantly. But notice, if we could get the antenna up to 100 feet, the 10 meter performance would recover again because the elevation of its second vertical lobe would begin to match the high arrival angles on this path.

For those of us constrained to use a single multiband antenna mounted at a fixed and modest height, the results offer some encouragement. If we can get the antenna up to around 40 or 50 feet we will be within 1 dB of the optimum height for short and medium haul paths on all bands 20 through 10 meters. We will probably accept the half S-unit penalty that our modest height suffers on the long haul paths.

If our antenna is presently at the 20 foot mark, the effort and expense required to lift it to around 40 feet looks well worthwhile — we will see improvements ranging from 1 to 5 dB, depending on the path and the band.

For the "serious" operator who is able to justify the expense and engineering challenges of lifting the antenna to 80 feet or more, the results show that significant benefits will accrue on the long haul paths; but the ability to switch to a lower antenna under certain propagation conditions becomes increasingly important, particularly at the highest frequencies.

If we have the luxury of being able to mount two antennas at different heights — for example 75 and 35 feet — we will sometimes see more benefit by being able to switch between them than we will by combining them as a stacked array although the stacking gain is generally worthwhile, particularly on the higher bands.

## Averages Aren't the Whole Story

Finally, a note of caution — even though an antenna may have a reasonable HFM, it can at times perform worse than one with a lower HFM, even though it will be better in the long run. For example, we saw from Figure 3 that the antenna at 80 feet produces a reasonable HFM of 8 dBi on 20 meter short haul paths. However, during the 25% of the time that signals are arriving in the range 22° to 26° this antenna would under perform one at 40 feet with a HFM of 7.3 dBi. So don't be surprised if a nearby ham with a lower antenna than yours occasionally gets a better signal report from a particular DX station. It's at this point you may want to crank down your tower. Still, on most occasions, especially on lower bands, the higher antenna will outperform the lower on the often desirable long haul path.

So there it is — a quantitative way of assessing the benefits of different antenna heights. Most hams have to make compromises between the antenna height they would like, and what is financially and environmentally acceptable. This technique allows you to make those tough decisions with a degree of objectivity.

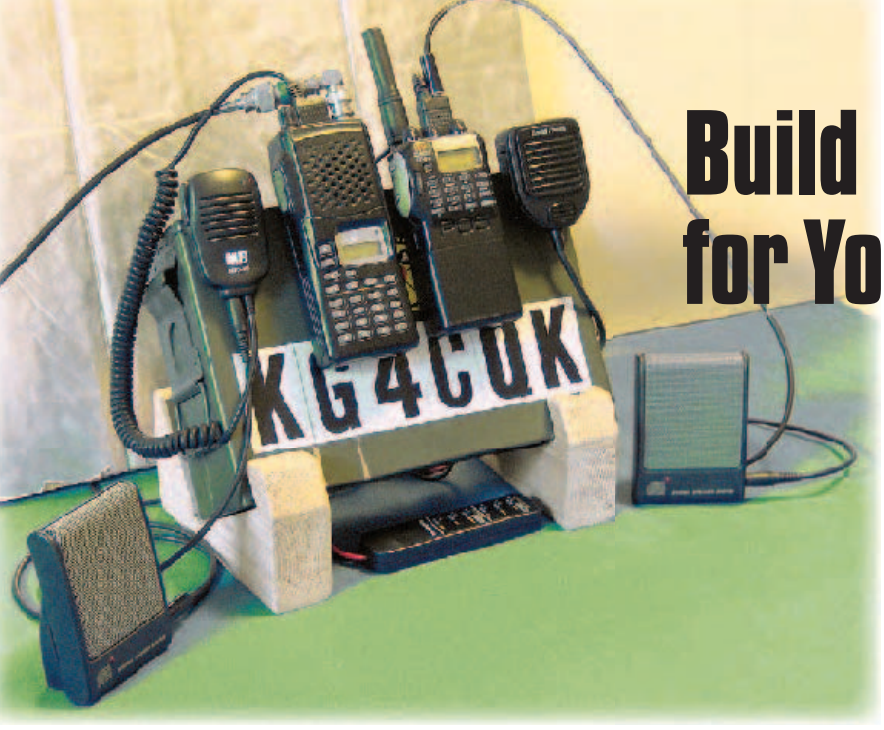
**Notes**

[1]**www.arrl.org/notes/antbook/yt files.html**.

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

*Steve Hunt, G3TXQ, has been a radio amateur since 1965 when he got "hooked" on the hobby building crystal radios as a schoolboy. Steve graduated from UK's Birmingham University with a Master's degree in Information and Systems Engineering and spent a career in radio design with the British Broadcasting Corporation, the UK Ministry of Defense and the UK Foreign and Commonwealth Office. An ARRL international member, Steve is now retired and lives in Northamptonshire, United Kingdom. His radio interests are experimenting with antennas and designing low power (QRP) equipment.*

*You can reach Steve at 21A Green St, Milton Malsor, Northampton NN7 3AT, UK or at* **steve@karinya.net**. QST




# Build a Docking Station for Your Handheld

*Your portable carry case can be transformed into a handy operating position.*

**Frank Ingle, KG4CQK**

Some of us have been around long enough to remember laptop computers that had docking stations. The idea was that you could slide your laptop into a mating tray on your desk and automatically connect all the cables that allowed it to function as a desktop computer.

That concept inspired me to come up with a similar tool for handheld transceivers. All of the bells and whistles crammed into today's handhelds make them the equivalent of a mobile or base rig in every respect other than power and ergonomics. In Duval County, Florida, we are fortunate to have several repeater systems that offer near county wide coverage for handhelds. In other words, one can key these repeaters from almost anywhere with only 5 W of output power.

That means that the only thing keeping a handheld from being an ideal radio for an ARES shelter callout or operating event is its ergonomics. The handheld has plenty of power; it just doesn't do very well in a desktop environment. My project set about to provide a remedy for all of those remaining issues and package the solution in a form that would take up a minimum of space in my go-bag. Hence the motivation for the handheld docking station.

It might also be worth pointing out that this inexpensive project would enable a newcomer to get on the air on VHF and UHF from a desk at home without undertaking the expense of a base or mobile rig. All that would need would be a handheld and this kit. (See Figure 1.) As more funds became available a magnetic mount $\frac{5}{8}\lambda$ antenna could be added to the setup. This would extend the reach even farther.

## No Tipping Allowed

The first problem with a handheld in a shelter or a ham shack is that connecting an external antenna makes it likely to tip over. Ideally, you would want your handheld held securely on your desk in a position that would enable you to see the display and reach the controls easily. My solution was to use the belt clip on back to secure the handheld to the lip of a military surplus ammo box. (See Figure 2.) The ammo box I chose was a waterproof steel box for 7.62 mm NATO cartridges, available at surplus stores or hamfests for about $5. (See Figure 3.) The lid may be removed easily and set aside during operation.

**Figure 1 — Docking station setup for operating. The 2 meter handheld on the left uses an external antenna and the 70 cm handheld on the right uses its flexible antenna.**


**Figure 2 — Close-up of two handhelds held in place on the ammo box by belt clips.**


**Figure 3 — A military surplus ammo box is the heart of the docking station.**

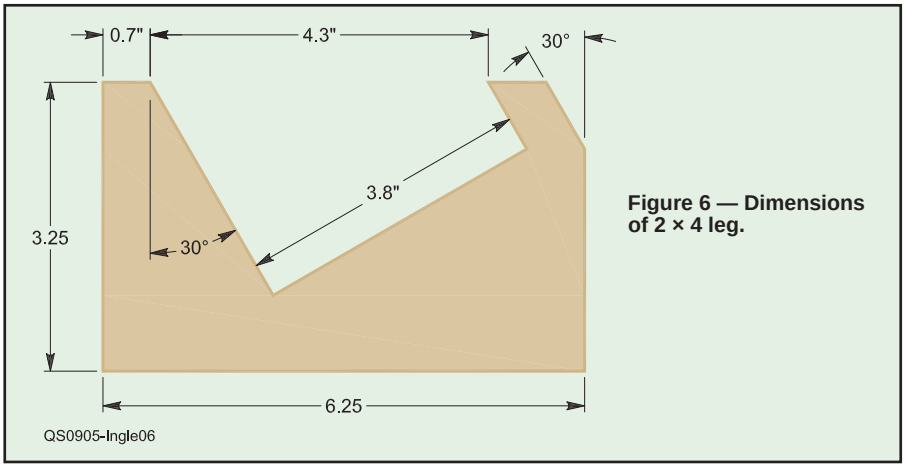



**Figure 6 — Dimensions of 2 × 4 leg.**

**Figure 4 — Framing lumber 2 × 4 scraps were cut to make legs for the box so that it tips back around 30°.**

**Figure 5 — Close-up of one leg cut from a piece of 2 × 4. Both legs fit inside the ammo box when not in use.**

## Seeing is Believing

In order to make the handheld display easy to read, I cut legs for the box out of pieces of 2 × 4 lumber. These hold the box tilted back at about 30°. (See Figures 4, 5 and 6.) In order to keep the box and handheld from being pulled by the microphone cord, I needed to make the box heavy. At the same time, I wanted to provide enough power to operate all day. The perfect answer turned out to be a 12 V, 8 Ah, sealed lead acid battery.[1] The battery fits nicely inside the ammo box and provides just the right weight. There is also room in the box for the legs while they are not being used.

## Power to Go All Day

I happened to have just such a battery with a nice nylon zipper pouch. It was intended to provide power to a portable video camera and lights. The pouch makes the battery a snug fit inside the box and keeps it from sliding around. (See Figure 7.) In the absence of a nylon pouch, the same thing could be accomplished by wrapping your battery with a layer of thin bubble wrap held in place with a little duct tape.


**Figure 7 — Battery with case and wiring harness.**

It is essential that your battery have a fuse in the wiring harness if you want to avoid serious injury during a wiring mishap. I would suggest you use an automotive fuse and holder, available at auto parts stores. (See Figure 7.) A 5 A fuse should do just fine for up to two handhelds. Our ARES® group has selected high current Molex connectors as a standard for 12 V power supplies, but Anderson PowerPole connectors would work just as well. Note that my wiring harness has two output connectors to support two handhelds at once.

The last step in furnishing power is to fabricate an adapter cable that mates with your handheld. The easiest way to get a perfect power cable for your handheld is to cut the power cable from your own handhelds ac power adapter about 2 feet from the handheld end, and then install mating Molex or PowerPole connectors on both ends where you made the cut. (See Figure 8.) That will enable you to use the ac adapter when you like, or use the last 2 feet of the cable with your docking station.

Most handhelds use the same kind of coaxial power connector that is popular with

**Figure 8 — Power cord for handheld was liberated from an ac supply and a Molex connector was installed to mate with 12 V battery wiring harness.**

[1]Lead-acid batteries are so heavy that shipping tends to offset any bargain you can find online. Check your phone book for a local Systems Depot distributor. I bought this battery for $12.70 after I identified myself as an Amateur Radio operator. Otherwise, look in the Yellow Pages for Batteries. Systems Depot also carries the charger parts.

portable consumer electronics these days. If you would rather not cut your original power cable, see if you can find an old wall wart with the right kind of connector. You can liberate the last couple of feet of the power cord. Alternatively you may be able to find the right connector at RadioShack in the DIY bin.

While many handhelds can work on 12 V, not all do. Some require a lower voltage (the ICOM IC-T2H Sport shown on the left in Figure 2 is an example). If yours requires a lower voltage, you'll need to come up with

**Figure 9 — RadioShack part #270-1562 voltage regulator provides power to handhelds not designed for 12 V operation.**

**Figure 10 — Portable speakers were originally intended for use with a Sony Walkman.**

## A Charger for that SLA Battery

If you put together a docking station, you will want to keep your sealed lead acid (SLA) battery fully charged. It is not difficult to fabricate a minimal trickle charger from an old wall wart, but it must be monitored while charging, and cannot be left on for extended periods. That means you have to remember to use it frequently, and invest some time and attention every time you do.

The ideal solution would be a two or three stage battery charger that would top the battery off and then keep the battery fully charged. Although these are available commercially, they are a bit pricey. The project I will outline here allows you to build your own charger from a simple kit for about $35 — a fraction of the cost of a commercially available charger.

The heart of the system is a battery charger/power-supply circuit intended for use with building alarm systems. In normal use it acts like an uninterruptible power supply (UPS) for an alarm system. It provides 6, 12 or 24 V to the attached equipment while maintaining a full charge on the SLA battery. LEDs indicate when ac and dc power is present. If the ac power fails, it switches over seamlessly to provide power from the SLA.

The power supply includes solid state overload protection, so it will shut down automatically if excess current is drawn and reset as soon as the problem is resolved. The power supply is rated for a 1.0 A continuous output or 2.0 A peak current at 12 V. This should be plenty to run a 5 or 6 W handheld for normal talk cycles. I have found that the heat sink does get warm to the touch while operating, but never hot enough to give you a burn.

You can use this as a simple battery charger or to operate your handheld from ac power, and keep your battery topped up. If mains power fails, the handheld will keep on working until your SLA battery runs down.

The charger circuit is provided already assembled on small PC board. All you have to do is hook up a power transformer, furnish wiring to connect your battery and handheld and provide a suitable case. The circuit is Elk Catalog number P624 (**www.elkproducts.com/products/elk-p624.htm**, or can be purchased from SafeMart at **www.safemart.com**). To keep a 12 V SLA battery charged, you will need to connect a 16.5 V ac transformer, rated at 40 VA or higher. If you don't have one in your junk box, you can buy it there too. The transformer is Elk TRG1640 (also available from Elk or SafeMart).

I was not out to impress anybody with my charger, so I used quick, dirty and cheap construction techniques. (See Figure A.) I assembled my charger using a piece of plywood for a base, and installed a low profile duplex receptacle on one end. The receptacle has an SPST power switch on the side, is powered by a PC power cord from which I cut off the female end. The transformer (wall wart style) plugs into the receptacle, and is held in place with a tie-wrap.

The charger circuit is fastened to the base on the other side, and held in place with screws and stand-off insulators. The lead that connects to the battery has a male Molex connector, and the lead that connects to the handheld has a female Molex connector.

I usually leave this charger at home, but if I need to carry it, I put it in a small plastic tackle box.

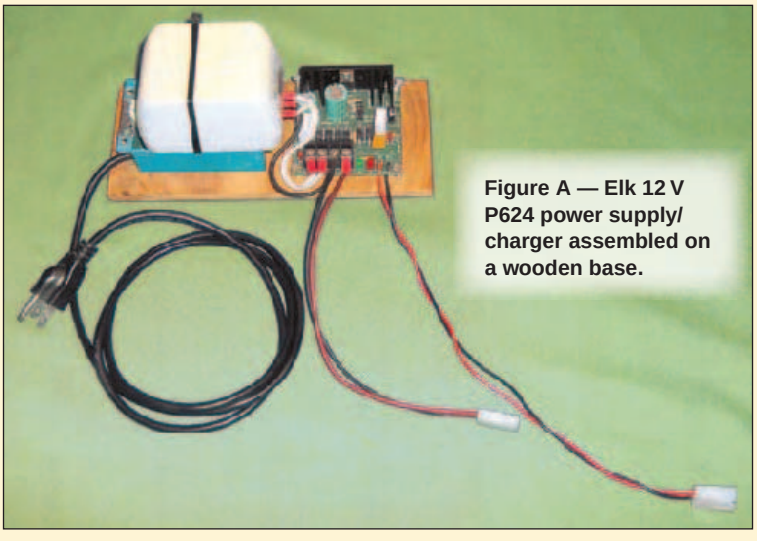


**Figure A — Elk 12 V P624 power supply/ charger assembled on a wooden base.**

Figure 11 — LED 12 V battery tester.

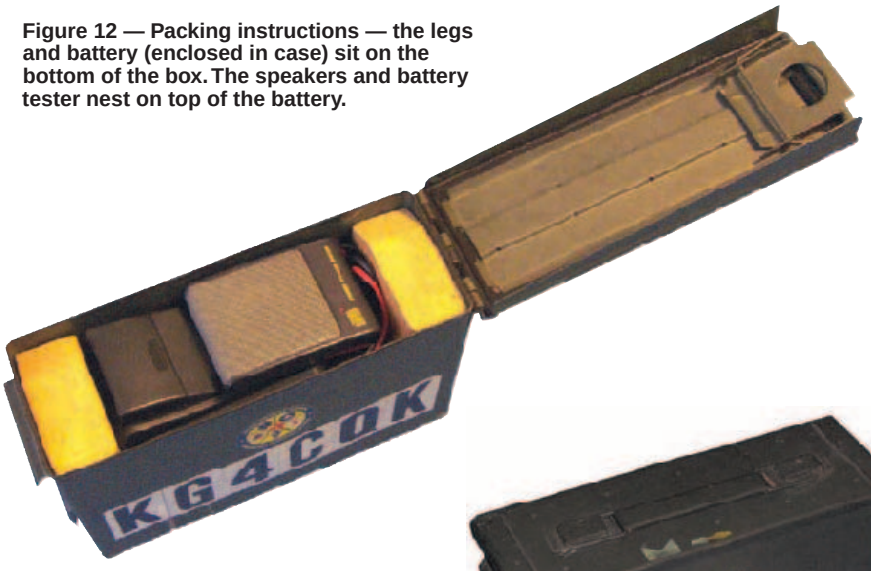



Figure 12 — Packing instructions — the legs and battery (enclosed in case) sit on the bottom of the box. The speakers and battery tester nest on top of the battery.


Figure 13— The docking station is just the right size to fit in a milk crate.


Figure 14 — The ammo box is made presentable with a little artwork.

a voltage converter. As usual, RadioShack can set you up. Catalog number 270-1562 can furnish 6, 9 or 12 V of regulated power from your 12 V battery. (See Figure 9.) Once again, you would want to install a Molex or PowerPole connector in place of the cigarette lighter plug.

## Talking and Listening

The next problem would be using the built-in microphone. Fortunately, handheld microphones for handhelds are easy to come by. Most manufacturers offer accessory combination speaker mics, or aftermarket units are available from MFJ and Pryme. The microphone can be clipped to the ammo box with its collar clip when not in use, or just laid on the desk top.

The next challenge for desktop handheld use comes when the operator needs to hear a transmission without getting a crick in his neck. The tiny speakers in a handheld are great for use close up, but don't do a very good job when the operator wants to sit at a desk. My solution was to use a pair of speakers designed for use with a Walkman. (See Figure 10.) Each speaker has an audio amplifier built in, but I have found the amplifier really isn't necessary for this application. I just leave the batteries out of the speakers, and plug them right into the earphone jack on the handheld microphone. I had to fabricate two cables with 3.5 mm phone plugs on each end to hook them up. Each cable is about 3 feet long. Similar speakers are available for iPods.

## Power Monitor

My last enhancement came from experience: During one drill, my battery ran dead because it did not start out with a full charge. I needed a simple way to keep tabs on the state of my battery. A volt-ohm-milliameter (VOM) would have done the trick nicely, but there wasn't room in the box for one. Instead, I settled on a 12 V battery tester with an LED display from RadioShack (see Figure 11). Although RadioShack no longer lists this item, other similar units may be available from Harbor Freight at **www.harborfreight com**; see ITEM 46972-0VGA. See the sidebar for information on chargers.

## Closing it Up

Now for the cool part: All of this gear (except the handhelds, mics and voltage regulator) fits nicely into the ammo box. When the lid is in place, the box is waterproof, and has a nice carrying handle on top. (See Figure 12.) When closed, it is just the right size to fit snugly into a milk crate, along with the boxes holding my handhelds. (See Figure 13.) I have similar plastic boxes for each of my handhelds that hold the radio, microphone, headset, flexible antenna, antenna connector adapter, chargers, extra batteries, manuals, voltage regulators and other odds and ends.

## Dressing for Service

It wouldn't do to have the docking station be mistaken for just an ordinary ammo box, so I dressed mine up with my call sign and our ARES team decal. (See Figure 14.) Once you've added the finishing touches, you handhelds should be set for extended service in your shack, a shelter or your next public service event.

*Photos by the author.*

*ARRL member Frank Ingle, KG4CQK, holds a Master's degree in Electrical Engineering, and owns a consulting firm specializing in computers and communications. He is co-inventor of a computer system used in hospitals. He holds an Amateur Extra class license and has been a ham for 10 years. His publications include articles in* Portable 100, PCM, Access *and* QST. *You can reach Frank at 2580 Park St, Jacksonville, FL 32204 or at* **kg4cqk@comcast.net**.

## PRODUCT REVIEW

# Kenwood RC-D710 Control Head/TNC

*Reviewed by Gary Pearce, KN4AQ*
*ARRL Contributing Author*
**kn4aq@arrl.net**


I killed packet radio.

Which is too bad, because I really liked packet. Back in the early '90s, when I got my first terminal node controller (TNC), it was exciting to get up early, stumble into the shack and connect to the local packet bulletin board system (PBBS). I could collect and read mail and bulletins from hams across the state, country and world.

I was far from an early adopter — packet had been around for more than a decade by then. This was before the Internet became mainstream, years before e-mail took its increasingly big bite out of our time. Back in the day, packet had passionate advocates and devotees spending money and time, building, learning, playing, arguing.

But like many of you (my co-conspirators in packet's demise), as the '90s wore on and the century turned, I gradually stepped away from packet. The Internet and e-mail were faster, easier and bigger. I stopped checking the local PBBS every day, or every week. I moved radios around, then moved to a new house, and somewhere along the line just never hooked the TNC back up at all. Last time I tried to use it just out of curiosity, it wouldn't boot up. I'm not sure why.

My experience was duplicated by hams around the world. PBBS systems that had been lovingly crafted — with maddeningly obscure parameters finally figured out, antennas raised higher… and a little higher… node stacks built, more radios added, links and paths for traffic hammered out — one by one had their plugs pulled as traffic and interested dwindled. And all just as things were about to really happen, too. Just as networks were being built and tuned that could really carry some traffic. Ham radio was on the verge of having a very cool system for public service that could fill in when this new Internet went *poof*!

### New Life for Packet

I am aware that packet never totally died. Bob Bruninga, WB4APR, has almost single-handedly rejuvenated it with the Automatic Packet Reporting System (APRS, which is *not* a vehicle position tracking system, he insists, but we know better, don't we?). Kenwood helped, with mobile and handheld radios that had built-in TNCs and software specifically designed for APRS (the, ahem, vehicle tracking function in particular, I think). Yaesu is stepping in with packet-enabled handhelds with optional GPS. DX spotting networks, *Winlink 2000* e-mail systems and such are hanging in there, too. There are even some PBBSs still around (using the Internet to move their traffic). A few states or regions still have packet systems dedicated to emergency communications. But it's not what it could have been. At its peak, packet never quite reached critical mass among the hams who were otherwise engaged in talking on repeaters, working DX, ragchewing on HF and whatever.

It's too bad, too, because we need that alternate Internet (can I coin the term *Alternet*? I didn't think so — Google shows I'm not that original). Sure, 1200 bits per second (bit/s) is pretty weak compared to the 6 megabits per second I can use to pull YouTube videos through my cable modem. But it beats the *zero* bits per second I got last time a hurricane blew through here, or an ice storm took all the lines down.

I have a theory about why packet radio died, besides Internet competition: It was too hard.

At the risk of sounding like an *appliance operator* (which I am, but a very good one) and bringing down the wrath of the *true believers*, I think packet was just too difficult for many hams to get into enough to start having fun. Those of us who achieved some degree of success tried to pass our knowledge and experience on, but newcomers faced not just a strange new concept with unusual equipment (TNC?) and an array of obscure abbreviations and acronyms (TNC?). A few steps in they were confronted with a bewildering array of software settings and adjustments. Manuals, articles, tutorials and meeting programs all tried bravely to bridge the knowledge gap. But beyond the first steps, the learning curve appeared more like a wall. Those who persevered often accepted the default settings and got on the air. And we did have fun until the Internet came long and bled all the other users away.

I wasn't the last to leave, but I held out longer than most. But not as long as the diehards who just never gave up. And the newcomers who pretty much only know packet as APRS. For a few weeks, at least, I'm back.

### Wasn't This Supposed to Be a Review?

Which brings me to the device I'm looking at now, Kenwood's RC-D710, um, device. Its manual calls it a "Control Panel." Kenwood's Web site calls it "The APRS upgrade for your transceiver." That's colorful, but I was puzzled about this device I had to review, and it took some digging for me to understand it! That's why I haven't really told you what it is yet. Here's what I found.

Kenwood offers two dual-band VHF/UHF FM transceivers. The TM-D710A does all the usual voice radio stuff, plus it has a 1200/9600 bit/s TNC built into the control head with firmware and on-screen display capabilities for APRS and DX PacketClusters. *QST* reviewed this radio in February 2008.[1]

### Bottom Line

Kenwood's RC-D710 upgrades the TM-V71A transceiver to add packet radio and APRS capabilities identical to Kenwood's TM-D710A transceiver, and it can be used with other radios as a stand-alone TNC.

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

The TM-V71A is one step lower on the food chain, a full-featured dual-band mobile with some stuff for *EchoLink* and easy cross-band repeat, but no TNC. It was reviewed in the November 2007 issue.[2]

My review project, the RC-D710 is essentially the control head/TNC from the TM-D710A radio. It is designed to plug into the TM-V71A, "upgrading" that radio to full TM-D710A capabilities. That "V71A plus the upgrade" ends up costing more than just buying the TM-D710A in the first place, but there still may be some advantages. If you already have the 'V71A and decide you want to add APRS/packet, the new control head is a good way to go. It's priced competitively with other full-featured TNCs. And because the control head doesn't physically mount to either radio — it's always stand-alone — pairing it with the 'V71A gives you the flexibility to have either a single, self-contained radio (minus packet), or the packet-capable combo with detached control head.

But that's still not why we're here. The control head's operation as an integrated TNC is covered in the TM-D710A review. If you're interested in the capabilities of a 'V71A plus the control head, just read the TM-D710A review. I will note that when I first tried the RC-D710 on the TM-V71A that came with the review unit, it was dead! No lights, no noise. It did light up when connected to a separate interface box that I'll talk about in a minute, so I knew it wasn't completely dead. I hunted on the Kenwood Web site until I found software to update both the 'V71A and RC-D710. That cured the problem.

## The RC-D710 as a Stand-alone TNC

We're here today because the RC-D710 is also a stand-alone TNC that can be used with many other FM radios, Kenwood or not. You have to add the optional PG-5J interface box. With that, you get the ability to use some APRS and DX PacketCluster functions using the control unit display — *without* a computer attached. That is the selling feature over any of the other TNCs out there. You can also connect a computer to the RC-D710 for more routine packet operation.

Connecting everything is easy. The PG-5J comes with a cable terminated with an RJ-45 connector that runs to the control head. A 6-pin mini-DIN cable runs to the "standard" data connector on most current FM mobiles. With that connection to the appropriate radio, the RC-D710 will do both 1200 and 9600 bit/s packet. I put quotes around the word "standard," though, because I first tried to use the Kenwood control unit with my ICOM IC-2820 and ID-800 mobiles, only to find that they both have an *eight pin* mini-DIN on the back. So I pulled my old packet radio, an ICOM IC-207H, off the shelf and plugged it in. Success. Eventually.

Note that when it's connected to a TM-V71A radio, the RC-D710 controls *all* of the radio functions. You remove the 'V71A's original control head, and the RC-D710 takes over with dual-band frequency readout, and all parameter adjustments (frequency, volume, squelch and so forth). It does *not* do that with other radios, even other Kenwood radios. When booted up from the PG-5J interface, the RC-D710 comes up with just the packet display.

I tried the obligatory "what can I do before I read the manual" exercise. I got action before I did any more than plug it in, turn it on and set the radio for 144.39 MHz (the nationwide APRS channel). I heard a packet *braaap*, then the control unit beeped and the display changed to show me the call sign and some other information about the station that had sent the APRS beacon. That's pretty satisfying.

I worked through some menus and figured out how to enter my call sign, coordinates, an APRS "icon" and a few other functions, and tried to send a beacon to my local digipeater. It ignored me. I listened to my packet signal on another radio, and the audio level sounded a little low. There was no way to increase the level in the IC-207H. Ordinary TNCs usually had a level adjustment, but that didn't seem to be an option with the RC-D710. Maybe there was an adjustment in the PG-5J? It was closed up tight. Time to break out the manual.

### Thorough Documentation

That would be three manuals. There's a printed manual, which initially looks thick (actually it's two volumes), but that's because the same limited set of instructions comes in six languages. And there's a PDF version of the manual on CD that has more information (but doesn't cover the basics of the printed manual). The information was not all that well organized, but after enough time, the manuals guided me through the various capabilities of the control unit and I became pretty familiar with it. But they didn't tell me how to increase the transmit audio level.

An Internet search led me to Kenwood's Web site and a really useful TM-D710A "In Depth" manual in PDF format. It covers the whole TM-D710A radio, so a lot of it applies only when you pair the RC-D710 with the TM-V71A. But it also has background information on APRS, along with more RC-D710 info that's not in the other two manuals. Go to **www.kenwoodusa.com/Support/AMA_Radios**, look for Amateur Radio Manuals and select the RC-D710.

That manual told me that I had to download the *MCP-2A* control software and connect the RC-D710 to my PC. That's the only way to adjust the transmitted audio level. I did, and it worked. I was digipeated, and I showed up on the various Internet APRS lookup sites such as **FindU.com** and **aprs.fi**.

At this point, the RC-D710 provides the same packet functions to other radios that it does to the TM-D710A, and many of those are covered in the TM-D710A review. So I'll just hit some high points.

## APRS Mode

The display defaults to a list of station types (digipeater, weather, mobile and so on), and it tallies up the number of stations of each type that it's heard since you last flushed the list (Figure 1). When an APRS packet comes in, the display changes to show details about that station. There are three more "pages" of details behind the initial display. You access them by pushing the DETAIL button, and then pressing the LEFT ARROW and RIGHT ARROW keys. Figure 2 shows some information

[1]H. Robins, W1HSR, "Kenwood TM-D710A Dual Band Mobile Transceiver," Product Review, *QST*, Feb 2008, pp 45-48. *QST* Product Reviews are available on the Web at **www.arrl.org/members-only/prodrev/**.

[2]H. Robins, W1HSR, "Kenwood TM-V71A Dual-Band Mobile Radio," Product Review, *QST*, Nov 2007, pp 71-74.

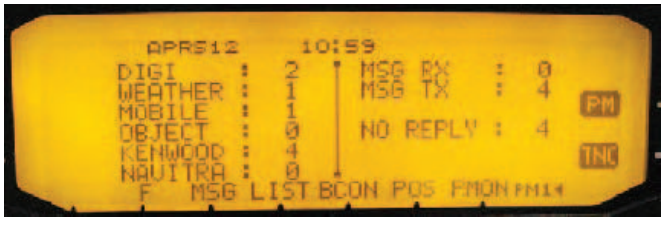



**Figure 1 — This display shows how many beacons of each APRS "type" have been received.**

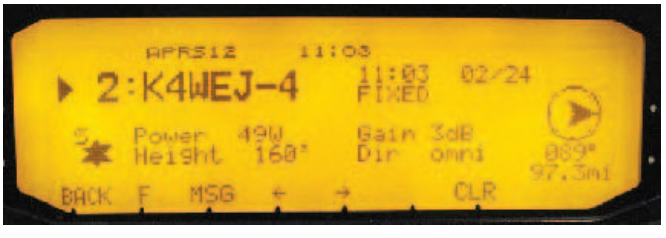



**Figure 2 — Pressing the DETAIL button scrolls through screens of information available for each APRS station received. This screen shows information from a digipeater — power, height and antenna info.**

about a local digipeater and Figure 3 shows some information about a mobile station.

You have some options to configure how those pages look, but it's basically the call sign, a message, an arrow that points toward the station from your current location and the distance from you (if you've programmed your location, or connected a GPS to your control unit). If you receive a packet from someone who has a weather station, you can see what the weather's like in their backyard. You can connect a Davis or Peet Bros weather station directly to the RC-D710 and let everyone know what's happening in your backyard, too.

As you monitor, the RC-D710 builds a list of up to 100 stations. It ignores packets that duplicate information it already has, so the list is 100 unique stations. The list can be sorted and filtered in several ways. You can sort by call sign, by age of the packet and by distance from you. You can filter the list by any of the parameters Kenwood defines (such as digipeater, weather, mobile), or a final OTHER category that's just "everything else." Those options cut the list down to size when you want to keep tabs on something specific.

To send your own position, you can program your coordinates for base station use (it holds five sets of coordinates, in case you move the radio between locations), or you can connect a GPS receiver for operation on the move. The cord from a GPS receiver plugs into a subminiature (3/32 inch) stereo jack on the side of the control unit. That's not exactly standard for GPS connections — most PCs accept 9-pin serial or USB. Kenwood provides a cable with the little plug on one end, and bare wire (very small, wispy wire that challenged my soldering skill) on the other. The manual shows a picture of a GPS that looks an awful lot like an antique Garmin GPSIII, which I just happened to have. So I connected that. The manual doesn't say anything about connecting some of the newer USB style GPS receivers. And the RC-D710 doesn't provide power for the GPS. Fortunately, my Garmin cable had separate power leads. I clipped off the old plug and attached my now-standard Anderson PowerPoles.

My Internet research turned up a couple of GPS units designed specifically for the Kenwood D710 (radio or control unit). I haven't played with them, so I'll let you search them up yourself. Just be aware that they exist.

There are several options for sending out your position beacon. For fixed stations, once every half hour or more should do. For mobiles, "SmartBeaconing" sends more beacons when you're moving quickly or turning than when you're moving slowly.

Weather stations (Davis or Peet Bros) also plug into the GPS port, so you have to choose. Okay, who has a weather station in their car? I know two hams who do!

## You've Got Mail?

But remember that Bob Bruninga, WB4APR, reminds us that APRS does a lot more than just vehicle tracking. At the ARRL/TAPR Digital Communications Conference last September, Bob said that APRS should be *the* message channel for Amateur Radio. If anything is happening in your area, there should be bulletins about it on APRS.

The RC-D710 supports APRS messaging. Anytime someone sends a bulletin or message directed to you, it's right there on your screen. And you can dial back to read messages that flew by, until they become the 101st on the list and vaporize.

It's easier to *read* a message than it is to *send* one, as the unit lacks a keyboard. To enter a message, you use the dial to scroll through the alphabet — upper and lower case, numbers, punctuation and special characters — letter by letter to compose your message. See Figure 5. This is tedious, and not something to try while driving. There is some memory to compose and store a few routine messages.

## DX PacketCluster Operation

There is no question that APRS is the killer app that the RC-D710 is aimed at. But along for the ride is the ability to monitor (but not connect or send packets to) DX PacketClusters. Punch the DX button on one of the menus and you can collect a list of DX spots transmitted by your local cluster. Unfortunately, I couldn't get a strong enough signal from my local PacketCluster to test this feature.

## No Mailbox

An optional cable connects an 8-pin mini DIN on the back of the control unit to a 9-pin serial connector on your PC. With this you can use just about any packet program for non-APRS operation such as bulletin boards, DX Cluster connections and APRS programs with maps, such as *UI-View* and *APRS+SA*. My PC has such a connector, but many do not, so you may need a serial to USB adapter.

One thing that the RC-D710 *doesn't* have, that most "full-featured" TNCs *do* have, is an internal mailbox. With a mailbox, other stations can connect to your packet station, leave and even retrieve mail. Some PBBSs can automatically connect to your mailbox and deposit mail that arrived via the packet network. I'd miss that feature. I used to enjoy surfing to other mailboxes and dropping a message. I don't think we called it surfing back then, but we would have if we had thought of it.

## Packet Made Easy?

I said earlier that the packet learning curve quickly becomes a wall. The Kenwood system makes entry easier, but the RC-D710's TNC still has 100 individual parameters to set. You can leave most of them at the default setting and get by okay, but they are still there, begging the question: why? The manual provides a cursory explanation of each, but gives no clue about what changes you might want to make, and why. Some of

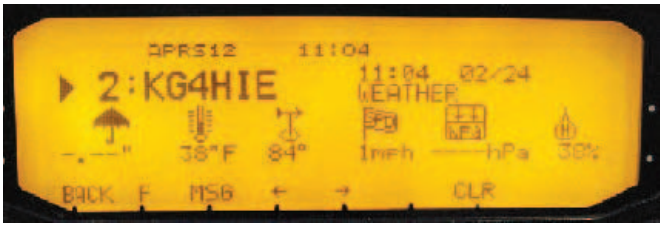



**Figure 4 — This is what you see from a station with a weather station connected.**

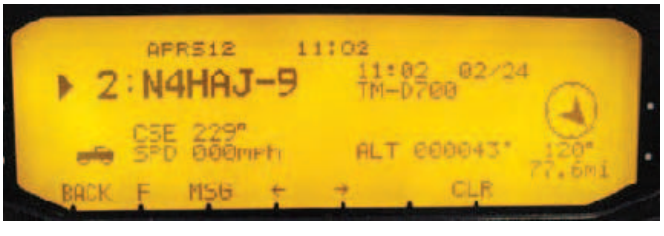



**Figure 3 — Here's info on a mobile in motion (though his speed is zero, so he's sitting still). It shows the direction he's headed (229°), his altitude (43 feet) and that he's 77.6 miles southeast of me (the arrow pointing to 120°).**


**Figure 5 — I've composed a message that I want to be sent via Internet e-mail. It's very tedious to select each letter using the dial.**

the answers are on the Internet, or in some of the textbooks available for packet radio. Perhaps you'll be interested enough to acquire this education.

The problem with reviewing equipment is that you end up wanting one of just about everything you review. I enjoyed my foray back into packet, and before I send this unit back, it's going "balloon hunting" this weekend as I help chase a high-altitude balloon that's scheduled to float over Raleigh. After that, I'll probably try to resurrect my old TNC, but it won't be the same as having the information readily on display.

Please, Mr Editor, don't send me any $6000 HF radios.

*Manufacturer:* Kenwood USA Corp, 3970 Johns Creek Ct, Suite 100, Suwanee, GA 30024; tel 310-639-4200, fax 310-537-8235; **www.kenwoodusa.com**. *Price*: RC-D710, $350; PG-5J interface kit, $85.

# Portable Dual-Lever Keyer Paddles

*Reviewed by Bruce Prior, N7RR*
*ARRL Technical Advisor*
**n7rr@arrl.net**

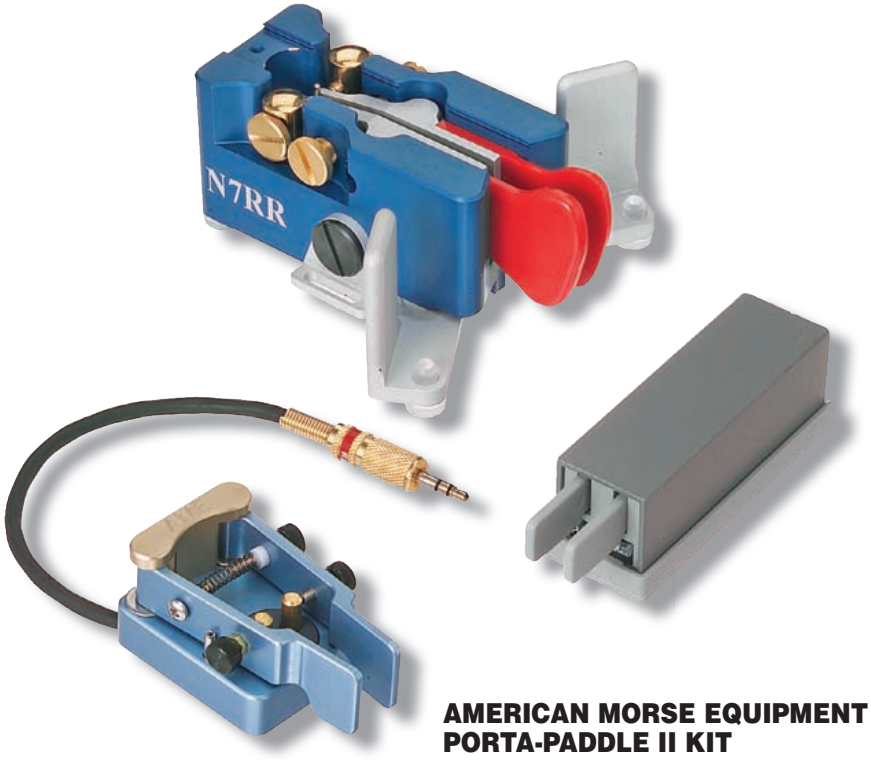
In March *QST*, I reviewed six high-end dual-lever keyer paddles that you might consider for use in your home station.[3] This time we'll take a look at three dual-lever paddles intended for portable operation away from the comforts of home.

## Meeting the Challenges of Portable Operation

Operating CW in portable situations poses special challenges. The operating surface can be less than ideal — picnic tables, tailgates, tent floors, boulders and bare earth are seldom smooth, and your body position can be awkward. Prolonged exposure to the elements and significant changes in temperature can promote moisture accumulation and corrosion on some paddle contacts.

Indoor paddles are usually made heavy to help keep them in place while operating. Paddles for portable operation need to be less bulky and lighter in weight for easy packing and transportation, but light weight requires special attention to keep the paddle steady during use. Portable paddles sometimes are subjected to rough treatment, so they need to be robust. Operating with gloved hands in cold weather may require adjusting the paddles for wider contact spacing and heavier tension than normally used at home. The best portable paddles are designed to meet these requirements.

The three paddles reviewed this month are designed specifically for portable use. All three paddles have ways of attaching themselves solidly to a makeshift portable operating position. Not included in the review are some quality paddles that are scaled down versions of larger paddles, but make no special accommodation for portable operating situations or transportation.[4] Two others can be retracted into protective covers, but they do not have facilities for mounting or attaching them to a stable surface.[5] We'll start with two tiny portable paddles, and then examine one that's a bit larger and heavier.




[3]B. Prior, N7RR, "High-End Dual-Lever Keyer Paddles," Product Review, *QST*, Mar 2009, pp 49-52. *QST* Product Reviews are available on the Web at **www.arrl.org/members-only/prodrev/**.

[4]These include as the I1QOD Mini Iambic Portable (**www.i1qod.it**), the N3ZN ZN-qrp (**www.n3znkeys.com**) and the Vibroplex Code Warrior Junior (**www.vibroplex.com**).

[5]The Scheunemann Portable 3X Blue Line paddle (**www.scheunemann-morsetasten.de**) and the GHD GH-GM701 Travel Paddle can be retracted into protective covers, but they have no facilities for mounting or attaching them to a stable surface. Both Scheunemann and GHD paddles are marketed in the USA through Morse Express (**www.mtechnologies.com**).

### Bottom Line

Each of the dual-lever paddles reviewed here offers special features for portable operation under challenging conditions. Each paddle takes a distinct approach, so give some thought to how you will arrange your gear.

## AMERICAN MORSE EQUIPMENT PORTA-PADDLE II KIT

I have owned an American Morse Equipment (AME) Porta-Paddle for some years now. The big advantages of the Porta-Paddle are its light weight and its mounting versatility with available options. Designer Doug Hauff, W6AME, is an experienced machinist and manufacturing engineer.

For this review we purchased the latest Porta-Paddle II version, elegantly simple and attractive. The paddle is easily assembled from a kit of parts with well-illustrated instructions — thanks to Stan Schmidt, N7OC, for assembling the kit and offering his comments. Instructions are available from the AME Web site, so you can see what's involved before purchase.

### Design and Construction

The Porta-Paddle levers pivot on two vertical brass rods. Unlike my early model, the current version includes a gold-anodized aluminum retainer that mechanically reinforces those pivot pins.

The Porta-Paddle's action works well and is smoother than that of the Palm Radio Mini Paddle despite its lack of race bearings.

**Table 1**

**Portable Dual-Lever Paddle Summary**

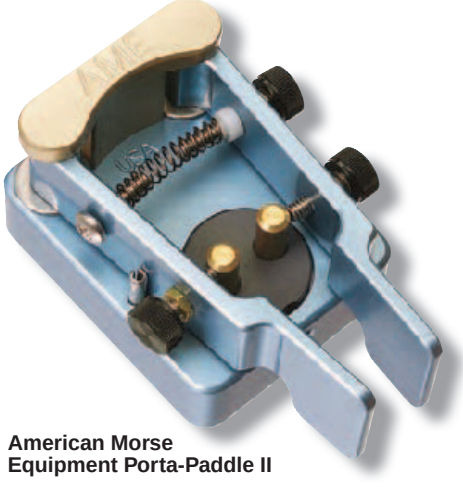
| *Model* | *Return, Bearings and Base* | *Hardware and Contacts* | *Fingerpieces* | *Weight (oz)* | *Price* |
|---|---|---|---|---|---|
| American Morse Equipment Porta-Paddle II Kit | Compression spring return; Brass cylinder pivots; Anodized aluminum base; Steel base optional | Stainless steel finger screws, locknuts; Brass cylinder contacts | Square extension of aluminum levers; 0.3 to 0.8". above operating surface | 2.7 | $69* (incl s/h) |
| Palm Radio Mini Paddle | Compression spring return; No bearings; Aluminum base and cover with quick mount bracket & mounting magnets | Relatively inaccessible hex head adjustment screws; Gold contact points on circuit board | Long white, gray or black plastic on flexible circuit board levers; 0.6 to 1.1". above operating surface | 3.3 | $95** (plus s/h) |
| Begali Magnetic Traveler Light | Repelling magnetic return; Two sealed race bearings; Aluminum alloy base; Plastic case | Micro-threaded brass screws; Short, light alloy levers; Convex-to-convex solid gold contacts | Rounded aluminum or black or red plastic; 0.5 to 2". above operating surface† | 18.6 | €226 (incl s/h) |

*Options: Steel base (20.2 oz), $23; leg mount bracket, $28; quick mount plate, $15.
**With Quick-Mount and patch cord. Options: Magnets for Quick-Mount, $5; extra Quick-Mount, $5.
†Aluminum fingerpieces are available in various colors. See manufacturer's Web site for details.

The fingerpieces are not separate components; they are extensions of the anodized aluminum paddle levers, making for simple construction. A disadvantage of aluminum in cold weather is that it is cold to the touch. Although the paddle pivots sit far to the rear, the aluminum levers are light weight, so little mass is moved while operating.

The keying contacts are stainless steel thumbscrews that strike against cylindrical brass dit and dah posts. Long-term exposure to the elements may corrode those brass cylinders, so outdoor users should pay attention to regular maintenance. A machined channel on the bottom enables soldered connections with a hefty three-conductor keyer cable to be nicely hidden without interfering with any mounting surface, including conductive metal.

Return tension for both Porta-Paddle levers is provided by a single compression spring. Spring tension and contact spacing are adjusted by finger-screws and secured with small locknuts that require a thin wrench supplied with the kit. (The wrench is made of soft metal, so a gentle touch is required or the wrench sides can bend outward.)



**American Morse Equipment Porta-Paddle II**

## Versatile Mounting Options

The Porta-Paddle II can be mounted on a heavy optional powder-coated steel base. That's what I employ while using the paddle in my home station. The Porta-Paddle II weighs 22.9 ounces while mounted on the optional steel base. On a normal laminate operating surface, it takes 4.9 ounces of pressure on a fingerpiece to dislodge the paddle. Using a thin high-friction pad between the steel base and the surface, that increases to 6 ounces.

AME also sells an optional powder-coated aluminum leg mount bracket. The Porta-Paddle can be fastened to the bracket either straight or cocked slightly to the left or right with two furnished pan-head screws. Although the leg mount works fine strapped to a thigh, on backcountry trips I like to use the bracket to secure my paddle to a backpack or other convenient object. Since I operate a paddle with my right hand, I've also used the leg mount bracket on an automobile passenger-side door handle, keeping the paddle nicely separated from the portable transceiver resting on the front dashboard. The leg mount system renders the Porta-Paddle essentially immovable.

In addition, the Porta-Paddle may be mounted via an optional anodized aluminum Quikmount plate attached to the paddle with two furnished machine screws. Two strips of 3M Dual Lock hook-and-loop fastener material attach to the bottom of the Quikmount, then mate with matching strips on any flat surface such as a transceiver case. The paddle and mount are very light weight, so it is helpful to choose something heavy to stabilize the paddle while operating.

The Quikmount system is remarkably solid, not requiring any supplemental fastener such as a cinch-cord. AME furnishes eight ½ × 1¼ inch Dual Lock strips, sufficient to mount the paddle on three surfaces. It takes a most impressive 7 pounds of lateral pressure on a fingerpiece to dislodge the paddle using this system and a solid surface. The product, which 3M claims is five times as strong as other hook-and-loop fasteners, is sold in some hardware stores packaged in small quantities under the Scotch brand.

An insulated plastic cable sleeve provides strain relief when the paddle is fastened to a surface. That works fine if the Porta-Paddle is almost always mounted to one thing, such as the steel base or the leg-mount bracket or the Quikmount plate. If you change mounting options regularly, use the extra screw on the bottom of the paddle to affix a strain-relief clamp.

The anodized lever/fingerpieces of the Porta-Paddle droop down, providing a vertical range from 0.3 to 0.8 inch above the mounting surface. Mounting the paddle to the optional steel base adds 0.6 inch to that range above the actual operating surface.

My original Porta-Paddle is flawless. The base and the pivot-pin retainer of the review unit appear not to have been deburred properly before they were anodized. Those minor aesthetic flaws do not affect its operation.

The Porta-Paddle is small enough and light enough (2.7 ounces) to be carried in a backpack, but it is also responsive and attractive enough to be used at a home station with the optional steel base.

*Manufacturer*: American Morse Equipment, Unit F2, 200 Suburban Rd, San Luis Obispo, CA 93401; **www.americanmorse.com**.

## PALM RADIO MINI PADDLE

The German-made Palm Radio Mini Paddle arrived double-packaged from US distributor Morse Express via Priority Post three days after I ordered it. The palm tree logo on the box includes GERMANY spelled out in Morse dots and dashes.

The Palm Radio Mini Paddle is solidly

built and well-protected in its extruded aluminum tunnel enclosure. The fingerpieces slide out one end of the enclosure for use, and back in for storage and transportation. The cover and base stay connected, so the enclosure pieces won't get lost. The whole Palm Radio Mini Paddle weighs only 3.3 ounces, including its enclosure, mount and patch cord. As long you have devised a means of attachment to some other piece of gear during use, it's well adapted to the rigors of backpack Amateur Radio.

### Mounting Options

The Palm Paddle's Quick-Mount bracket offers a couple of options for securing the unit. Screw holes allow the bracket to be installed permanently on another piece of equipment or operating surface. The attachment can be on a surface below, above or on either side of the paddle. Extra Quick-Mounts are available, so you could transfer the paddle among several different setups. I found that the Palm Paddle is so firmly attached to the Quick-Mount, however, that removing it is not a trivial process. I was able to dislodge it only by prying the strong clasps simultaneously with two screwdrivers.

Another arrangement uses two powerful neodymium magnets designed to fit in nests on the Quick-Mount bracket, allowing the paddle to be attached to any magnetic metal surface. The magnets are an option that I ordered with the Palm Paddle. Seating them took a lot of force with a wooden dowel — they're there to stay. With the magnets installed, it takes 11.3 ounces of lateral pressure to dislodge the paddle from a steel surface. One common technique is to glue a small piece of sheet steel to an aluminum transceiver cabinet, so the Palm Paddle can use that transceiver as its base.

Unlike the other two paddles reviewed here the Palm Paddle is not designed to be secured with a leg-strap. A useful enhancement would be a specially designed Quick-Mount with slots built in to accommodate a leg strap.

**Palm Radio Mini Paddle**

### Design and Construction

Instead of bearings, the levers of the Mini Paddle consist of thin bendable circuit boards, with gold contact points. The single-spring return tension and contact spacing are adjustable, but the adjustment hex screws are not accessible when the paddle is installed inside its aluminum enclosure, so those adjustments cannot be made on the fly. The keying action is utilitarian, which isn't bad for a portable paddle. When attached to the Quick-Mount bracket, the Palm plastic fingerpieces sit 0.6 to 1.1 inches above the operating surface.

A supplied patch cord plugs into the rear of the Palm Paddle and is terminated with a 3.5 mm stereo plug for the keyer or radio. The left paddle controls the tip contact, which is the correct orientation for a right-handed operator who paddles dits with the right thumb. Reversing that polarity is possible, but it would be tricky in the cramped interior of this well-designed, but tiny paddle.

*US distributor*: Morse Express, 10691 E Bethany Dr, Suite 800, Aurora, CO 80014; **www.mtechnologies.com/palm**.

## BEGALI MAGNETIC TRAVELER LIGHT

Pietro Begali's principal goal for the Traveler Light project was to produce a paddle with excellent operating characteristics that could withstand unscathed the tender loving care of airport security inspectors. At 1.2 pounds, the paddle is less than half the weight of the Begali Sculpture reviewed in March *QST* but by far the heaviest paddle in this review.

My Magnetic Traveler Light paddle arrived from Italy thoroughly packaged 61 days after I ordered it. I had specified a blue base, which was out of stock and had to be back-ordered. As with the Sculpture, the Traveler Light has a 3.5 mm stereo jack in the base for the keyer patch cord. In the Sculpture review, I mentioned that it would be helpful if customers could specify which lever controls the tip of an inserted 3.5 mm stereo plug. At order, I specified that the left paddle should control the tip contact to match my equipment, but the Traveler Light arrived with right paddle connected to the tip. I carefully re-soldered the stereo socket after reversing its leads and it works fine.

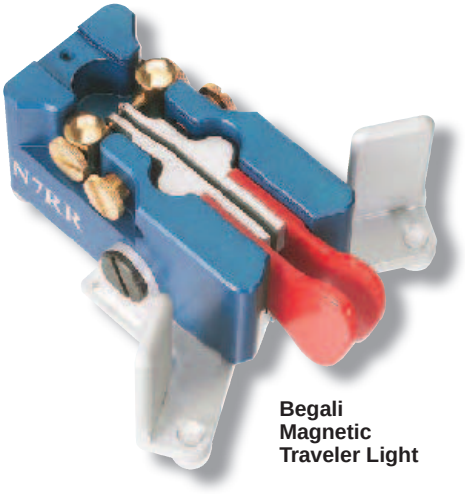
### Design and Construction

The Traveler Light doesn't look much like other dual-lever paddles. Its "wings" fold around the paddle to protect it and make it less bulky for transportation, rather like those of a naval jet nestled in the bowels of an aircraft carrier. The paddle is large for a portable unit. When folded up it is 1.9 inches high, 2.6 inches wide at the leg-strap brackets (with the main body 1.7 inches wide), and 4.5 inches long. The paddle makes up for its relatively light weight, compared to most paddles designed for stationary operation, with its sprawling footprint of 4.2 inches when deployed. As shown in the photo, the back and the two wings form a sort of tripod base, because its two back feet are spaced much closer together than the two front ones when the wings are spread out. This structure makes it work well on an uneven portable operating surface. A detachable pair of leg-strap brackets and a leg strap are standard.

When Begali first released the paddle, gold contacts were an option. On the current version of the Traveler Light, 14 karat gold contacts are standard, preventing corrosion when used outdoors. Accompanying the paddle was a 0.03 mm metal gauge for setting the contact spacing. That proved to be too wide for my taste. Both contact spacing and repelling magnetic return tension are easy to adjust on the fly with fine-threaded brass finger-screws. Locknuts are not necessary. A removable sliding transparent plastic dust cover fits into grooves across the top of the base, allowing access to the alloy levers, gold contacts and repelling neodymium magnets, but protecting them while the paddle is in action.

The paddle can be ordered with either a blue or black aluminum base and red or black plastic fingerpieces. Aluminum fingerpieces are also available as options in various colors. The fingerpieces range from 0.5 to 2 inches above the operating surface, a wider range than on the Sculpture.

My original order was for the aluminum fingerpieces. They have the same disadvantage as the aluminum fingerpieces of the Porta-Paddle II for cold-weather operation. I also noticed a very slight vibration when paddling. I then ordered a pair of black plastic fingerpieces, and Bruna Begali sent a red pair as well as the black pair. With the plastic fingerpieces installed, I noticed that no vibration was evident. (Thanks to Pete Hoover, W6ZH, who observed that his Traveler Light with plastic fingerpieces produces no obvious



**Begali Magnetic Traveler Light**

vibration while paddling.)

The sealed race bearings are identical to those used in the Begali flagship Sculpture paddle. The two Traveler Light levers are supported by only one race bearing each, situated on the bottom of each pivot. Each lever assembly can be removed easily by loosening a hex screw with the supplied wrench. The levers must be removed to install alternative fingerpieces. (Thanks to Bob Hallock, K7TM, for his advice about disassembling the Traveler Light.)

### A Portable Paddle?

When placed directly on my home station operating surface, the Traveler Light moves with just 2.8 ounces of lateral force on the fingerpieces. Supplemented with a thin high-friction shelf pad, 5.3 ounces of force is required to move the paddle from its original place — not as stable as the Porta-Paddle on its optional steel base. Since the stability of the Traveler Light on most operating surfaces is not impressive, operators may prefer to take advantage of the leg-mount brackets and use straps to secure the paddle to an operating position.

A portable paddle? The race bearings place the paddle's smooth action in a class superior to any other portable paddle I've used, and comparable to the finest paddles designed for stationary use. At about half the Sculpture price, the Traveler Light is a very fine paddle, indeed. An even heavier version with a steel base is available for operators who are not concerned about weight and want a paddle that's more stable without being strapped down.

Does the Traveler Light belong in a backpack? If you intend to make only a handful of contacts, the answer is probably "no." For a backpacking expedition, such as a trip to a rare grid square where many hours of operating are contemplated, then a high performance paddle that's comparable in weight to a pint-sized beverage may be worthwhile. The Traveler Light is a superb choice if you're traveling by vehicle rather than on foot, although you may want to find a way to strap it down using its leg-mount brackets.

*Manufacturer*: Officina Meccanica Pietro Begali, Via Badia 22, I-25060 Cellatica, Italy; **www.i2rtf.com**; e-mail **pibegali@tin.it**.


**IN THE MARCH/APRIL 2009 ISSUE:**

■ Gary Steinbaugh, AF8L, introduces us to "A Cybernetic Sinusoidal Synthesizer." The initial part presents some interesting history and theory of feedback control. The system includes an oven-stabilized crystal-controlled oscillator, a PLL frequency synthesizer with a low phase noise sinusoidal output, a variable gain RF amplifier for automatic power level control and an RF power meter with a digital readout in dBm and an analog voltage output. Subsequent articles will describe these circuits in detail.

■ Ron Skelton, W6WO, takes us "Exploring Near-End-Fed Wire Antennas" by modeling his design using *EZNEC*, and then building a 40 m version to verify the modeled performance.

■ Ken Grant, VE3FIT, describes "A Versatile Two-Tone Audio Generator for SSB Testing. This handy piece of test gear could be a valuable addition to your test bench.

■ Thomas Alldread, VA7TA, continues to describe his "NimbleSig III" dual output DDS RF generator. This circuit provides signals over a range from 100 kHz to 200 MHz, with 1 Hz resolution. In this part of the series we learn about the control software design, computer interface, MPU programming and initial testing.

■ Rudy Severns, N6LF, presents more of his research in "Experimental Determination of Ground System Performance for HF Verticals." Part 3 compares the performance of antennas using ground-surface radials and those using elevated radials. If you use vertical antennas on HF, or have thought about using vertical antennas on HF, you will want to read all the article in this series.

■ Roger Monroe, K7NTW, introduces the process of programming a microcontroller in "Some Assembly Required." As a practical application, he describes how he used a microcontroller in the design of a QSK amplifier keying interface for use between his Ten-Tec Omni IV+ radio and his Heath SB-220 amplifier.

■ Ray Mack, W5IFS, continues his software defined radio column. In this installment of "SDR: Simplified," Ray looks at signals in the time domain and the frequency domain, and introduces the concept of Fourier transforms. He also explains the Nyquist criterion for sampling signals in analog to digital conversions as well as the filtering requirements for digital to analog conversions.

■ Mark Spencer, WA8SME, has been sending results of his further data collection based on his article, "SID: Study Cycle 24, Don't Just Use It" from the Sep/Oct 2008 issue of *QEX*. The "Tech Notes" column in this issue includes some graphs of Mark's data, as well as a redesigned SID receiver and interface.

■ The "Reader's Page" includes photos of two different GPS-derived frequency standards. Readers are encouraged to submit photos of their projects, to show off their handiwork.

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## Feedback

◊ In "Where is Bob?" [Apr 2009, pp 51-53] the author's reference to the programming language should be spelled *PERL*, an acronym for *practical extraction and reporting language*. For more information, including a version that will run on most operating systems, see **www.perl.org**.

◊ In Figure 5 of "Superior Audio from a $5 Boom Arm Mic" [Apr 2009, pp 78-80] the negative side of the battery should be shown connected to the shield of the cable going to the electret mic element.

◊ Several readers questioned the Blocking Gain Compression and IMD Dynamic Range test results reported in Table 1 of the Product Review of the ICOM IC-7700 [Oct 2008, pp 41-47]. The review transceiver was no longer available for testing, but here are results from another IC-7700, s/n 0201390. At 14 MHz, 500 Hz bandwidth:

| | |
|---|---|
| Noise floor (MDS), preamp off/1/2 | –126/–138/–142 dBm |
| Blocking Gain Compression | |
| 20 kHz spacing, preamp off/1/2 | 133/139/132 dB |
| 5/2 kHz spacing, preamp off | 120/108 dB |
| Two Tone IMD Dynamic Range | |
| 20 kHz spacing, preamp off/1/2 | 104/108/104 dB |
| 5/2 kHz spacing, preamp off | 99/87 dB |

Compared with the results shown in the review, the Blocking Gain Compression numbers are significantly higher. IMD Dynamic Range numbers are somewhat lower. The modified data table is included at the end of the IC-7700 Product Review on the ARRL members Web page.

# TECHNICAL CORRESPONDENCE

## "OVER CLOCKING" YOUR TRANSCEIVER

♢I operate a small business repairing ham equipment and with 4 out of 5 rigs I repair, the transmit power is set too high. I like to call it "over clocking." Over clocking is a practice used by computer gamers, in which they speed up the microprocessor to get an extra 10 or 20 MHz of clocking speed. This can cause high current and heat on the motherboard, which can overload the power supply. It can also damage the microprocessor. Like computer gamers, hams "over clock" their radios by increasing the transmit power to a point where they can damage the power amplifier and overload the power supply.

For the most part, transceivers that I repair have blown finals or other components in the RF path. Capacitors on the filter board, diodes in the directional coupler, or components in the auto tuner are damaged because the finals are operating beyond the manufacturer's specifications.

Other complaints are "distorted sideband audio," "My rig still transmits when I un-key," "There's smoke coming out of my rig" and "I'm only getting 5 watts out." Many hams don't know that if you increase the output power beyond the design limits, you're actually moving the RF power amplifier out of class AB mode. It can cause single sideband "flat topping" or modulation distortion, and the power amplifier can break into parasitic oscillation. To stay within class AB mode, you have to increase the idle current, but too much idle current can cause thermal runaway.

I also noticed that some "over clocked" transceivers can transmit high levels of spurious signals above and below the center frequency, and these signals are sometimes out of band. The transceiver can fail to meet FCC specifications.

I blame this problem on Web sites and other sources that list radio modifications, and that include directions and detailed drawings on how to set the power levels on various makes and models. What they don't show are the problems that these "adjustments" can cause, including damage to your radio, the possibility of getting a "pink ticket" from the FCC, and the expensive repairs that you may encounter. In an attempt to protect the Web site owner, there are disclaimers but, when your radio goes up in smoke, that won't protect you.

Here are some typical repair costs.

1) Blown finals: $175 to $300.

2) Shorted capacitors on the filter board: $125 to $150.

3) Customer complains that the USB and LSB signal is distorted: $135.

4) Damaged diodes on the filter or automatic tuner boards: $155.

5) Parasitic oscillations during transmit: $150.

The estimates don't include shipping. With today's fuel prices it can cost $75 to ship a 65 pound radio one way from San Francisco to Chicago.

### *The ALC (Automatic Level Control) Circuit*

The ALC circuit on most modern ham rigs limits the output power to a maximum power level that is set by the manufacturer. Components in the power amplifier, such as the low pass filter and auto tuner are designed to withstand the power requirements. The power amplifier normally transmits the second harmonic at a level higher than the FCC specifications allow. Therefore, a low pass filter is needed to reduce the second harmonic to a safe level. The low pass filter has relay-switched filters for each band, and is controlled by the microprocessor.

When the ALC is adjusted beyond the manufacturer's limit, the harmonics are also increased. The power amplifier stage can break into self-oscillation and cause spurious signals across the spectrum. The out of band power in the harmonics can create reflected power in the amplifier and low pass filter section, and increase the dc current in the power amplifier stage. It can overheat the final transistors, inductors in the low pass filter section and even damage parts in the auto tuner. Figure 1 is a block diagram of the sections that the transmitted power flows through.

Figure 2 is a simple schematic of an ALC circuit. Manufactures normally use op-amps to compare the forward power from the directional coupler to the ALC set point. The ALC line is connected to a low level RF amplifier, typically a dual gate FET, where one gate is the level control and the other gate is the RF input. If the dc level from the directional coupler exceeds the set point, the op-amp output decreases the ALC level and the RF power decreases. The ALC circuit is used as a safety feature to control the RF power and protect the finals by limiting the RF drive level, keeping the direct current to the finals at a safe level. There is also an op-amp that protects the finals from high SWR, but for this discussion, that circuit is not applicable.

Remember when we had to "dip and load" the old tube rigs? The only protection from too much current was to watch the current meter and set the load control to 250 mA. But you could go a little higher and maybe get 125 or even 130 W out of a pair of 6146s. But who cares? Back then 6146s were cheap, and you could easily change them yourself. That's not true with the transistor finals of today. It's very difficult to change a pair of MRF150s, and a matched pair cost about $125. It requires a shop full of test equipment and the proper de-soldering and soldering tools. The SRF J7044 MOSFETs that were popular in some rigs that were manufactured in the '90s are now obsolete, and are not available in the US. If you blow them, your transceiver is now a receiver!

### *The APC (Automatic Power Control) Circuit*

I once repaired a radio where the ALC circuit was not working and the RF power level was 150 W. The ALC set point wasn't tampered with and the final transistors were okay. Even if the ALC was tampered with, there is a second protection circuit that saves the finals. The APC also limits the direct current to the final transistors.

Normally there is a 0.1 Ω shunt resistor in series with the 13.5 V feed to the final transistors. Both sides of the resistor connect to a divider network and then to an op-amp. When transmit power increases, the dc through the shunt resistor increases, and causes a voltage increase across the resistor. Remember Ohm's law? The op-amp is connected to the ALC line through a diode, and limits the RF power by sensing voltage across the shunt

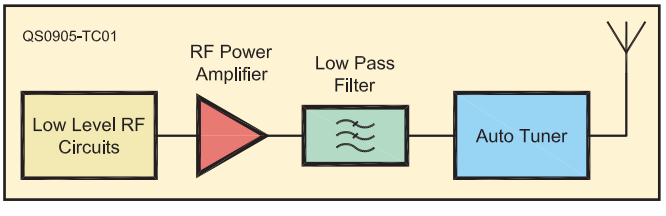



**Figure 1 — This block diagram shows the main transceiver sections through which your transmitted output signal will flow.**

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

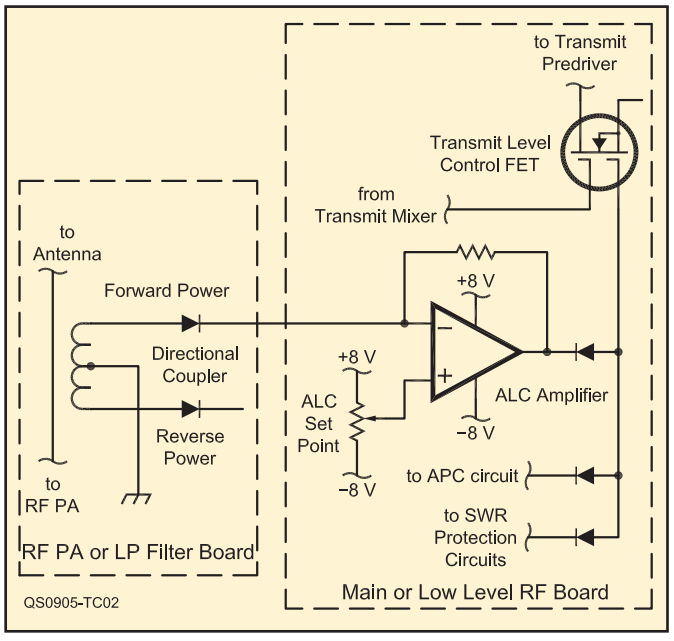



**Figure 2 — This partial circuit shows how a transceiver automatic level control (ALC) circuit samples the forward power from a directional coupler and compares that to the set-point voltage to control the transmitter output power.**

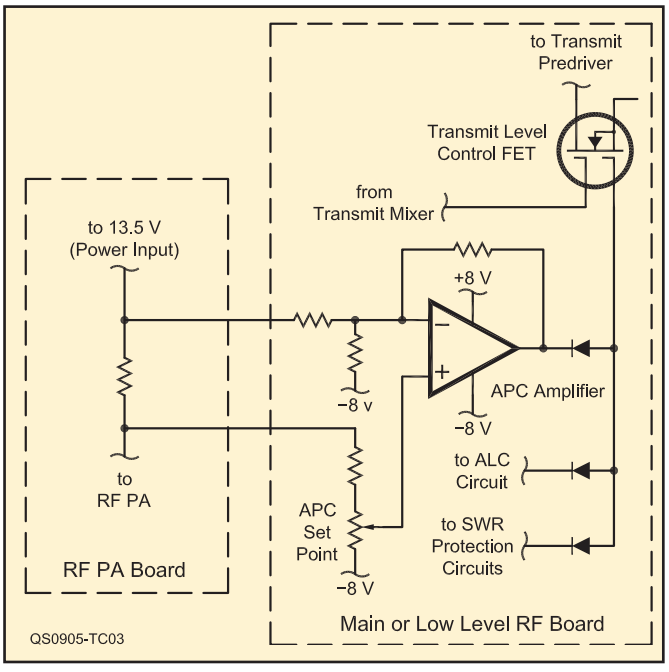



**Figure 3 — The automatic power control (APC) circuit is very similar to the ALC circuit. In this case the circuit samples the voltage across a shunt resistor in the 13.5 V input to the power amplifier. If the sampled voltage exceeds the set point voltage, the circuit reduces the transmitter power.**

resistor. If for some reason the ALC circuit fails, the APC circuit will protect the finals by limiting the dc input. Like the ALC circuit, there is an APC set point potentiometer. In a 100 W rig, most manufacturers recommend 20 A. If the ALC, along with the APC, is adjusted to its maximum level (normally fully clockwise), the final transistors in most cases will self-destruct and that only takes a few microseconds. That's one adjustment you do not touch!

### *Bottom Line*

Before the transceiver can be sold in the US, it is tested by an independent testing laboratory to meet FCC requirements. Then why are hams boosting the transmit power to an unsafe level, and risking damage to the rig? If increasing output power on a 100 W rig to 150 W makes very little change on a 20 over S9 signal, then why not drop the power to 90 or 80 W? If you want more power, buy a linear amplifier!

I don't recommend "over clocking." You risk the chance of damaging your radio and spending $200 or more getting it repaired. You also risk the chance of getting a call from the FCC. Over clocking is good for my business and bad for you! — *73, Jack Albert, WA9FVP, 3408 Avondale Ln, New Lenox, IL 60451;* **repair@willcoele.com**

## THE UNIVERSAL KEYING MODULE (NOV 2008 *QST*)

♢Whenever I see a Mike Bryce, WB8VGE, article in the table of contents of my *QST*, I immediately flip past everything else and heat up the soldering iron! After reading his article on the "Universal Keying Module" (Nov 2008), I knew I had to build one before sweepstakes weekend so I could key my rig using the N3FJP logging software running on my computer.

One modification I would like to recommend is to convert this project to an "Isolated Universal Keying Module." As the circuit stands, the grounds of the computer, keying module and rig are tied together. Any noise generated on the ground of any of the devices would get into everything. This includes RF and computer hash. The module and computer $V_{CC}$ lines would also be connected via the diode in the optoisolator. Isolating the rig from the computer would eliminate ground loops, and prevent noise from being coupled between the keying module and the computer. For those who mix computers and radios at Field Day, isolation could also prevent a shocking experience at the keyboard, or some toasted equipment.

The modification is simple. It involves breaking the ground and $V_{CC}$ connections between the interface and the computer.

1) Disconnect R1 from $V_{CC}$ and connect it to the computer RTS or DTS signal. (I assume this would be done via a 9 pin D-connector connected to one of the RS-232 COM ports. RTS = pin 7, DTS = pin 8.) The N3FJP program toggles one of these signals to generate Morse code. One of the program menus selects which signal is used.

2) Connect the ground from the computer (9 pin D-Connector, pin 5) to the point labeled "Key In" that is connected to the cathode side of the LED in the optoisolator.

3) Don't connect anything to the grounded side of the "Key In" input.

The rig is now isolated from the computer. When the computer toggles the output signal at the COM port, it forward biases the LED causing it to light and that causes the transistor in the optoisolator to conduct, keying the rig. There is no physical electrical connection between the radio and computer.

Hats off to Mike for another excellent project. I can't wait for the next one.

[The Dec 2008 issue of *QST* included a Feedback item on this article. Pin numbers 1 and 2 are reversed on U1, the optoisolator. Also, Q1, a PNP transistor as indicated in the parts list, is incorrectly shown on the schematic diagram with the symbol for an NPN transistor. — *Ed.*] — *73, Brian Cieslak, K9WIS, 29119 Manor Dr, Waterford, WI 53185;* **k9wis@arrl.net**

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

Materials for this column may be sent to ARRL, 225 Main St, Newington, CT 06111; or via e-mail to **tc@arrl.org**. Please include your name, call sign, complete mailing address, daytime telephone number and e-mail address on all correspondence. Whether praising or criticizing a work, please send the author(s) a copy of your comments. The publishers of *QST* assume no responsibility for statements made herein by correspondents. QST

W1ZR

# THE DOCTOR IS IN

**Q Dave, K1KUZ, asks: My limited space requires me to use an end-fed antenna system. I have heard about a number of different types, including a 66 foot long horizontal wire fed with 40 feet of 450 Ω window line into a tuner with only one side of the line connected to the antenna. Will a system like this really work and will I have RF in the shack from such an arrangement?**

A A 66 foot long horizontal wire fed with a λ/4 length of 450 Ω window line is a classic *end-fed Zepp* for 40 meters and will definitely work. It is similar to the popular VHF J antenna except that the transmission line is perpendicular to the axis of the antenna, and that you are using your antenna tuner as part of the matching section.

The length of transmission line is not critical, although it is good to avoid lengths that will result in impedances that are hard to match to — perhaps beyond the range of the tuner. The traditional Zepp would use a λ/4 line to transform the high impedance at the end of the half wave antenna to something close to your 50 Ω coax impedance. That only works if you are about 30 feet from the end of the antenna, and it won't work well on other bands. Your 40 foot length avoids resonances on all bands and is a good choice, but other lengths are useful if the height doesn't line up to 40 feet.

This antenna became popular in the day when our bands were harmonically related and we had bands at 160, 80, 40, 20, 10, 5 and 2.5 meters. The antenna length could be chosen to be half a wave at the lowest band you wanted to work — 66 feet lining up with 40 meters, in this case and then multiples of half a wavelength on the higher band. At integral multiples of λ/2, the wire will have a high impedance and minimum current at the end, so it can be fed by the transmission line with one end not connected.

At antenna resonance, the current on the feed line should be balanced and radiation should be minimal, outside of a foot or so from the line. As you move away from resonance, the currents on the line will no longer be balanced and thus the difference current will radiate from the transmission line. If the line is in the clear, this may actually be helpful, partly filling in some of the antenna pattern nulls of the end-fed horizontal wire (different on each band). Unfortunately, if the feed line runs past phone or fire alarm wiring it might cause problems. RF safety is another concern.

If you have those issues covered, having a solid RF ground at your tuner and inserting a choke balun and transition to a short coax run should make it all come together for all bands. In summary, it will work well as a horizontal antenna on 40, 20, 15 and 10 meters and work almost as well as a combination horizontal and vertical antenna on 30, 17, 12 and 6 meters — if you can deal with the potential RFI and RF safety issues.

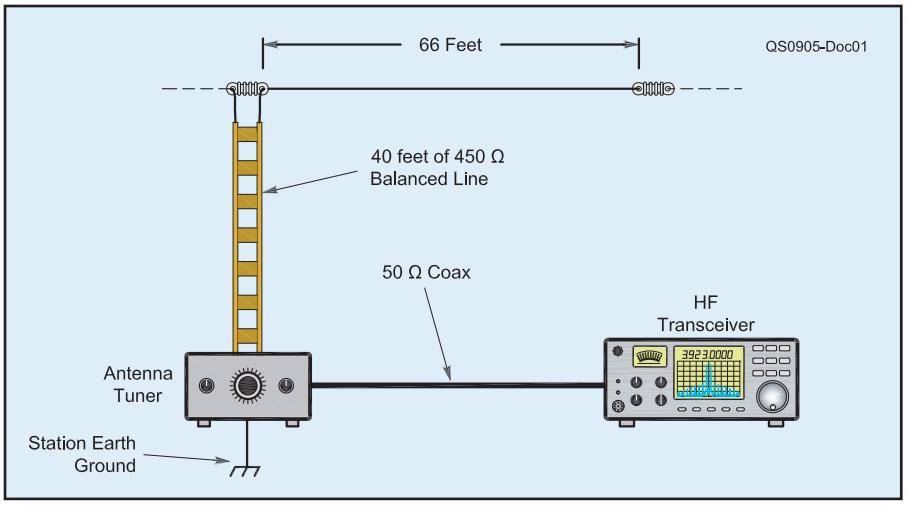



**Figure 1 — End fed antenna system considered by K1KUZ.**

**Q Henry, W3DNY, asks: I wish to be able to connect my VHF handheld transceiver to an outside antenna. This radio has an SMA type coax connector. I purchased an SMA to BNC adapter at my local RadioShack for $20 and it doesn't work. How can I make this happen?**

A In looking at their online catalog, my guess is that you purchased the 1.64 foot (0.5 meter) SMA female to BNC female RG-316 cable, model: 278-011 for $19.99. For those who have an antenna connection with a UHF type PL-259 connector, they also list the 278-012 for the same price that has a UHF female SO-239 on the far end. Unfortunately, your radio also has a female antenna connector, so the SMA connector won't fit — gender does matter.

The good news is that you're almost there. RadioShack also offers a double male SMA coupler, part number 278-009 for about $7. That should fit on both the radio and your cable, so all is not lost.

The other option is to make the jump in one step. ICOM offers the AD92SMA SMA (male) to BNC (female) adapter intended for this purpose for about $20. This should be available from your amateur equipment supplier.

You may actually prefer the use of your RG-316 cable arrangement since it moves the antenna cable away from the possibility of stressing the radio's connector.

**Q Mike, AC7OF, asks: I have always connected my 100 W HF, VHF and UHF transceiver directly to my vehicle battery. I now have a Toyota Prius gasoline/electric hybrid. What is the best way to wire to the Prius for mobile operations?**

A I don't have much experience with the Prius (other than watching them go by while I'm filling up). My office neighbor, Assistant Editor Steve Sant Andrea, AG1YK, has one, however, and he reports as follows:

*The Prius has two battery systems. The traction battery that powers the electric motor is a 200 V pack. There is also a nominal 12 V battery. In my 2008 Prius it is mounted in a well below the trunk floor at the right rear. The 12 V battery is only about ⅔ the size of a standard auto battery since it is only used for the 12 V accessories in the car, not for starting. The traction battery is used*

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

*to start the gas engine, when needed.*

*I have a multiband transceiver similar to yours with a removable faceplate. I mounted the faceplate in the front and mounted the main body of the radio in the rear. On the left side of the car's trunk is a plastic "bucket" that is meant for storage. I removed the bucket and mounted my transceiver's remote body to the metal floor using the metal support for the bucket. It is then a simple matter to run the power leads across the back of the trunk and connect directly to the 12 V battery.*

*Power-wise the system works fine. The Prius 12 V system seems to have enough charging capacity to handle the extra load. I operate at 100 W and I haven't had any problems with it. Unfortunately my experience is that there is a lot of RF noise while operating any AM-type modulation. FM doesn't seem to have this problem. My transceiver's internal DSP noise reduction helps some, but the Prius is still a* very *noisy car.*

**Q Scott, W3MEO, asks: I am fairly new to SSB and CW on VHF and was surprised during the September ARRL VHF contest to work W2SZ, the RPI Amateur Radio Club station on Mt Greylock in Massachusetts. I was running 2 W CW to a homebrew four element beam 20 feet off the ground. The boys on the mountain were running a lot bigger station than I was.**

**This station was well over the horizon. I wonder what propagation mode supports this beyond line of sight (LOS) communication? I worked several other stations that were also well over the horizon.**

A The propagation mode is most likely either troposcatter, in which VHF signals are scattered by the troposphere, or tropo ducting, which acts like a temporary waveguide. The troposphere is the lowest region of our atmosphere extending up about 7 miles to the border with the stratosphere. Troposcatter is in common use by the military and some commercial users for paths up to a few hundred miles — generally using high power and high gain antennas. It is also the mode that results in a commonly occurring type of long distance TV transmission. W2SZ uses big power and antennas from a fantastic location, making this mode a common occurrence. You can find out more about troposcatter and the other propagation modes supported by the troposphere at **www.oe1cwj.com/literature/troposcatter.htm**.

**Q Bob, K5ZOL, asks: I have a question that I'll bet lots of other hams would like to know the answer to — or it could be that I'm the only one that hasn't figured it out. One can make or buy 600 Ω ladder line or buy 450 Ω window line. Then they sell you a 4:1 balun to match the 50 Ω unbalanced coax to it.**

**Seems to me 50 Ω transformation through a 4:1 balun wants to see 200 Ω, resulting in a 2.25:1 SWR for 450 Ω or 3:1 SWR for 600 Ω line. Why don't they make 9:1 baluns for 450 Ω line and 12:1 for 600 Ω line? Finally, when do you need a current balun instead of a voltage balun?**

A You must have been saving up — you actually have a couple of questions in here:

■ You are quite correct — the usual 4:1 balun is designed to transform a 200 Ω balanced system to a 50 Ω unbalanced one. It is also true that other transformation ratios are available. I have used 9:1 baluns for my rhombic antenna end terminations. You can fabricate your own baluns at different ratios, and learn more about how they work from Jerry Sevick's excellent book or purchase commercial baluns in different ratios.[1] Commercial baluns at these transformation ratios are available from Amidon, **www.amidoncorp.com**, in 1.5:1, 2:1 and 12:1 ratios and from DX Engineering, **www.dxengineering.com**, in 1:1, 2:1, 4:1, 6:1, 9:1 and 12:1 ratios. So if you want a matched system, chances are you can find just what you want.

■ On the other hand, many people use window or ladder line precisely because the low loss allows them to operate them as a mismatched system without much penalty. This is the case with the popular center-fed Zepp antenna. It can show impedances from around 50 to 3000 Ω depending on the band and length, and is commonly fed with exactly this kind of line and a balun into a tuner.

The actual impedance of the system as it hits the balun is very different from the balun design point on most bands. Unless the balun gets hot, most folk happily use the system in spite of the fact that the balun will only actually act as a 4:1 transformer over a limited portion of the range. Thus, in this system there is nothing magical about having the balun match the $Z_0$ of the line, since that won't be the impedance at the balun anyway.

■ A balanced load is one in which the two sides are at the same impedance above ground. For example feeding the non ground end of two 100 Ω resistors (see Figure 2) that have the other end grounded will result in a balanced 200 Ω system. In such a case the voltage on each side will be the same magnitude but 180° out of phase. The currents on each side will also be the same since the voltages and resistances are equal.

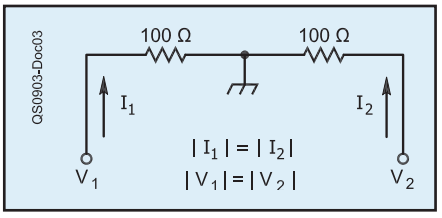



**Figure 2 — Perfectly balanced load. Both the current and voltage on each side will be in balance.**

A balun is used to force a transition from an unbalanced to a balanced termination. If the impedances on each side are equal, as in the above example, both voltage and current will be balanced. In a real case, the impedances probably won't be quite equal so you can force either the voltage or current, but not both, to be equal and the other will be whatever it is by Ohm's law.

By forcing the currents to be equal in the transition from coax to a balanced load, the coax currents will only be differential mode — that is, completely inside the coax and equal and opposite without any net common mode current. It is the common mode current that rides on the outside of the coax and causes various difficulties including RFI and RF in the shack. A common mode choke serves as a 1:1 current balun by forcing the common mode current to zero.

**Q Ralph, AA8RK, asks: The radio station at the Ann Arbor Hands On Museum, WA2HOM, just received a donation of a fine example of a top performing 1980s HF transceiver. We are all going through a learning curve with it and were wondering about the function that allows selection of Upper CW (UCW) and Lower CW (LCW) modes. Most of us are scratching our heads.**

A A CW signal, as you point out, is just a carrier turned on or off. In order to hear it, one places a BFO signal typically 800 Hz above or below the carrier. Some receivers just offer one choice. This radio offers the choice of either, one corresponding to above, one to below the signal frequency.

Depending on the filter width (these were often options in those days) and position of the carrier in the filter bandwidth, one side may be better at eliminating interference from a nearby signal than the other.

[1] J. Sevick, W2FMI, *Understanding, Building and Using Baluns and Ununs*, available from your ARRL dealer or the ARRL Bookstore, ARRL order no. 8982. Telephone 860-594-0355, or toll-free in the US 888-277-5289; **www.arrl.org/shop/**; **pubsales@arrl.org**.

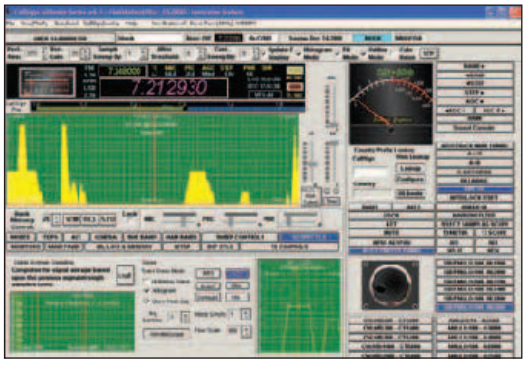
**Do you have a question or a problem? Ask the Doctor! Send your questions (no telephone calls, please) to "The Doctor," ARRL, 225 Main St, Newington, CT 06111; doctor@arrl.org; www.arrl.org/tis/.** QST

# SHORT TAKES

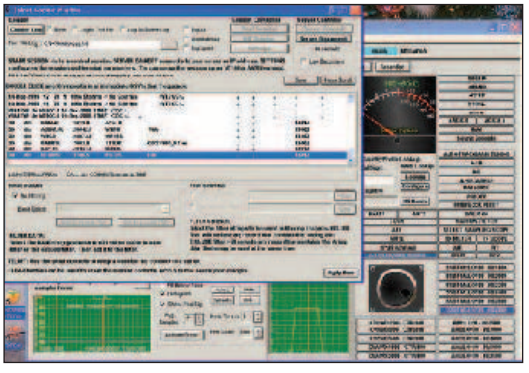
## HamStationUltra

Many modern transceivers, even so-called "low end" models, now include computer interfacing of one sort or another. At one end of the spectrum you have radios that allow external software to edit the contents of their memory channels (handheld and mobile VHF+ transceivers are typical examples). At the other end you have rigs that bare their electronic souls to the software developers, making every function accessible to computer manipulation.

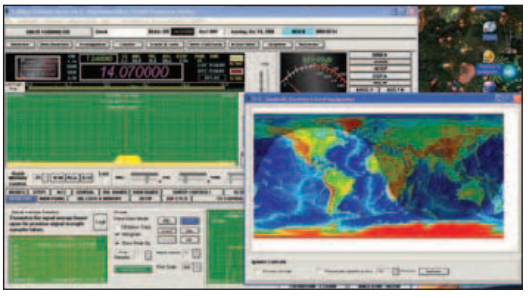
The *HamStationUltra* package for *Windows* is designed with soul-baring radios in mind, specifically the Kenwood TS-2000, Yaesu FT-2000 and Ten-Tec Jupiter/Pegasus transceivers. *HamStationUltra* doesn't simply control a handful of functions, it *completely* takes over the operation of the transceiver. With *HamStationUltra* running on your PC, your rig might as well be sitting on a shelf in a nearby closet.



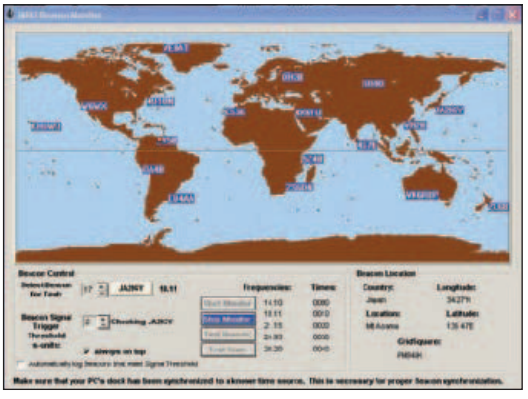
**The *HamStationUltra* main screen.**



**This pop-up window allows Telnet access to your favorite DX Cluster.**



**Opening a colorful grayline real-time map display.**



**The NCDXF/IARU beacon monitor steps your rig through all the HF beacon frequencies, listening and noting the signal levels.**

### Boot Up and Go

The software begins by having an RS-232 "conversation" with the radio, reading the transceiver information, loading configuration settings and so on. This dialog between my station computer and TS-2000 transceiver lasted about a minute. Once the loading was complete, I was presented with an amazing display — buttons, dials and meters everywhere. The screen captures shown in this review really don't do justice to the plethora of features.

An incomplete feature list includes an enhanced receive *and* transmit scope display, propagation monitoring, NCDXF/IARU beacon monitoring, DX cluster monitoring, built-in logging, call sign lookup, triple band-stacking registers and a versatile sound recorder. Despite the richness of *HamStationUltra*, and the load it places on the CPU, my old 2 GHz Pentium computer running *Windows XP* seemed to keep pace nicely.

*HamStationUltra* doesn't make your transceiver do anything it can't do already, but it brings the complete transceiver functionality to your computer where the software can enhance and improve the experience. For example, to access receiver audio equalization in the TS-2000, I would normally have to dig into its multilayered menu system. With *HamStationUltra*, altering an EQ setting is as easy as clicking a mouse, plus I have the flexibility to alter the individual settings.

Speaking of mouse clicks, you can tune the transceiver VFOs virtually with the animated on-screen knob, or open the direct-frequency-entry window. But if you prefer the real "knob experience," *HamStation* is compatible with the Griffin Technologies USB PowerMate knob (**www.griffintechnology.com/products/powermate**).

### Who is *HamStationUltra* For?

This software is designed for hams who want to seamlessly integrate their transceivers and computers. *HamStation* doesn't offer Internet remote-control capability, but I was able to do so by accessing my station computer using Symantec's *PCAnywhere* software. *HamStation* responded a bit sluggishly in that environment, but that is to be expected.

It may go without saying, but should be said anyway, that *HamStationUltra* is a complex piece of software. This program seems best suited to the computer "power user," someone who is fairly conversant with personal computer technology and terminology. Even if you feel confident in your computer skills, I'd strongly recommend spending plenty of quality time with the manual before wading into *HamStationUltra*.

Its complexity notwithstanding, *HamStationUltra* is a powerful, impressive package.

*Manufacturer: Callsign Software, PO Box 652, Merrimack, NH 03054-0652;* **www.callsignsoftware.com**. HamStation Ultra *for the TS-2000 and FT-2000: $149.99; for the Ten-Tec Pegasus and Jupiter: $99.99. System requirements:* Windows XP *or* Vista, *1 GHz minimum CPU with 1 GB RAM and 100 MB available disk space.* QST

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

W1ZR

# GETTING ON THE AIR

# A Quick Look at Radio Frequency Interference

> ***RFI doesn't have to be black magic, or keep you off the air.***

Radio frequency interference (RFI) has been a consideration for hams from the beginning. When I got my first license in the mid '50s, the big problem was interference to receivers in the then-new television broadcast service — TVI. During this period, hams and equipment manufacturers had to take a crash course on harmonics, shielding and filtering as well as public relations. It wasn't a one way street — hams also suffered with interference *from* TV sets, now called ITV. Battles raged for a time, but better engineering of amateur equipment and TV sets eventually resulted in compatibility in most areas — helped in large measure by the migration from over-the-air to cable TV, as well as the move from transmitters with harmonic-prone class C amplifiers to transmitters using linear class A, B or AB amplifiers.

## That was Then, Now is Now

While the problems with TVI have certainly improved, the typical household is now filled with far more potentially RFI prone devices — both those that emit signals and those that amateur signals can interfere with. Some are in our own household, and some are on neighbors' property — and each has its own set of characteristics and suggested methods of avoidance.

This article can't provide the complete story — there have been many books on the topic — but we will try to give some background to help the beginning ham understand the issues and perhaps help deal with some.[1]

## Interference to Other Equipment

Sometimes operation of amateur transmitters results in interference to other equipment in the household or neighborhood. There are a few ways to divide up the problem and one that I like is to make a distinction between equipment designed to receive radio signals and equipment that is not designed to do so.

### *Equipment* Not *Designed to Receive Radio Signals*

If something that isn't radio equipment receives your transmissions, it clearly is not acting the way it should. The kind of effects we're talking about here range from someone listening to your transmission via the mythical filling in a tooth to noise on a telephone, flashing computer screens or lights coming on and off. As a rule, this is due to equipment deficiencies and no changes to your transmitter can be expected to solve the problem. Although reducing power and/or relocating antennas can often eliminate the problem, they shouldn't have to.

In real life, however, if it is a family member trying to work or study at the computer, even though it might not officially be your problem, it quickly becomes your problem, nonetheless. Sometimes one must accept the responsibility, if only to preserve a happy home. The cure usually is to keep the RF energy from your station from getting into the device being interfered with.

RF energy can typically get from your radio to other devices in one or both of two ways. One way is direct radiation from your antenna to the ac power or interconnecting wiring going to the household equipment. This wiring includes telephone wires, speaker wires, TV antenna or cable connections, and often ac power wiring. Higher frequency signals can

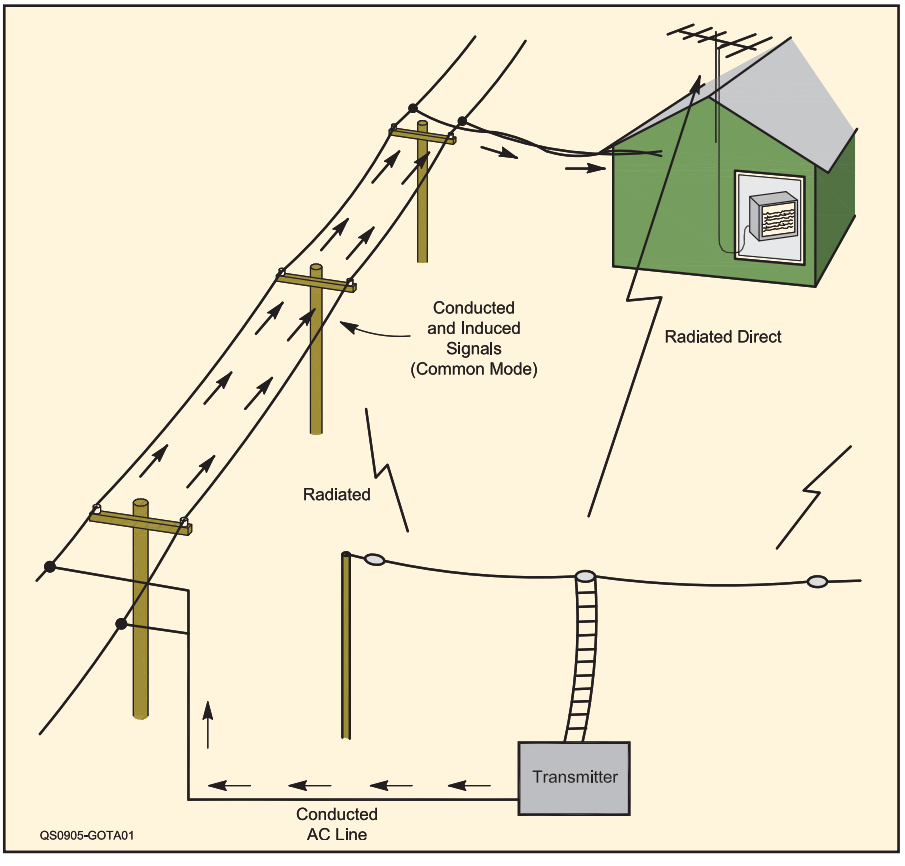



**Figure 1 — Illustration of conducted and radiated RFI from an amateur transmitter.**

[1]A good resource for amateurs is the ARRL Lab Technical Information Service Web site at **www.arrl.org/tis/info/rfigen.html**. Also see *The ARRL RFI Book*, available from your ARRL dealer or the ARRL Bookstore, ARRL order no. 9892. Telephone 860-594-0355, or toll-free in the US 888-277-5289; **www.arrl.org/shop/**; **pubsales@arrl.org**.

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

**Figure 2 — Typical RFI suppressing common mode choke formed by wrapping turns of a signal or power pair through a ferrite toroid.**

sometimes get picked up by the short wires or other conductors inside some equipment. The other way is through conduction. Your transmitter not only puts its RF energy into your antenna, but also can put some into household ac or ground wires from which it gets conducted into the ac wiring going to the interfered equipment. Figure 1 gives an idea of the ways coupling occurs.

The good news is that in either case, the problem can be reduced — and often eliminated — in the same way. Filtering of the connections going into the unit displaying the symptoms will often go a long way toward elimination of the problem.

### *There's Filters and Then There's Filters*

In most cases, the signal picked up on power or parallel signal lines in close proximity will be picked up on all lines together. This results in pickup of a *common mode* signal, compared to the *differential mode* signal, between the wires, that we're most used to. Depending on the termination within the equipment, sometimes this signal is converted into a differential mode signal, for example if one side is grounded, as is often the case with speaker wires. Still, by keeping the common mode signal out we resolve much of the problem. The filter should thus focus on having a high impedance to common mode currents at the frequency you are transmitting on. For best results, the filter should be located as close to the affected equipment as possible, since any coupling into the wires between the filter and equipment will not be reduced by the filter.

Commercial units are available that perform both common and differential mode filtering. We have tested a few good ones in the ARRL Lab, but don't assume the "filters" in the usual consumer grade power strips will be helpful.[2,3]

It is also possible to fabricate your own common mode choke using available ferrite products. The usual "clamp on" ferrite beads allow insertion without disconnecting anything. These are often helpful at VHF, but quite a few are required to do much good at HF. A better solution for HF and VHF interference is to use a ferrite core such as the FT 240-43 type (available from Amidon, **www.amidoncorp.com/categories/7**). This donut shaped structure will provide an inside diameter of 1.4 inches, which should allow the connectors to fit through as you wind. While 12 turns is perhaps optimum for HF, get as many as you can without removing the connectors and see if you have solved the problem. Figure 2 shows a typical toroidal choke.

### *Equipment Designed to Receive Radio Signals*

Equipment designed for radio reception can suffer from the same types of interference problems as equipment that isn't designed for that task, so the above filters or chokes should be tried first.

If the interference is still there, we have to investigate the possibility that your transmitted radio signal is getting into the problem radio receiver. If the radio were tuned to your frequency, as a shortwave set could be, we would certainly expect to hear your signal! If the listeners don't want to hear you, they could just tune to another frequency and be done with it. Unfortunately, it is not that simple!

We again have two possible situations to consider — and it is also possible that both are happening:

*Your transmitter is putting out on its assigned frequency*. It is possible for your transmitter to be doing exactly what it's supposed to be doing — but by putting out such a strong signal, it is overloading the front end of the problem receiver. This is often the case if the transmit frequency is close to the receiver frequency — often a problem with a transmitter on 6 meters (50 to 54 MHz) and a TV receiver tuned to Channel 2 (56 to 60 MHz), particularly if the TV is using an outside antenna. The input filter of the TV is not sharp enough to keep your signal from clobbering the receiver.

There are only a few things you can do in this situation — besides changing bands or TV channels. You can reduce your transmitter power, but of course this can also reduce your transmit range — not good if you are collecting grid squares or trying for meteor scatter communication. You may be able to move your transmit antenna farther from the receive antenna, or at least aim both so they are in each other's nulls. You can also purchase specialty filters with very sharp skirts that will attenuate your signal at the problem receiver. Note that for this case a filter at your transmitter won't help.

*Your transmitter is putting out one or more spurious signals off its assigned frequency*. This is a different kettle of fish. While all transmitters put out a bit of energy on undesired frequencies, a properly designed transmitter usually emits spurious signals too weak to cause problems. On the other hand, it is possible that your transmitter is putting out significant energy on or near the frequency that the receiver is intended to receive. An example of this kind of problem would be if your transmitter were operating on 10 meters and it put out a strong second harmonic. A signal at 28.3 MHz, for example, has a second harmonic at 56.6 MHz — smack within the band that the TV receiver is designed to receive while tuned to TV Channel 2. In this case, there is nothing that you can do at the receiver that won't also reduce the reception on Channel 2. You can, however, add a *low-pass* filter at the HF transmitter that cuts off all energy above 30 MHz, and you may find yourself back on speaking terms with your neighbors and family.

## Interference to Your Equipment

Electronic and electromechanical devices can cause problems with your equipment, too. Most consumer type (unlicensed) appliances and equipment capable of causing RFI are typically classified as incidental, unintentional or intentional radiators under Part 15 of the FCC rules.[4] The FCC specifies absolute emissions limits for intentional and unintentional emitters. The limits are high enough, however, that interference can still occur even if the signals are within the FCC's absolute emissions level standards. This typically occurs if the device is in relatively close proximity to a radio receiver. In the case of incidental emitters, there are no specified absolute emissions limits. Regardless of the emitter type, however, no Part 15 device is allowed to cause harmful interference to a licensed radio service as defined in the FCC rules including the Amateur Radio Service. As with interference to other services, you can be dead right but just as dead if you try to explain to your spouse that the toaster oven is not compliant and it must be kept off while you're operating.

In many cases the interference can be filtered in similar ways to those discussed earlier for conducted radiation. First try filters as close as possible to the offending device. Then try additional common mode filtering on the cables going to your radio.

## Wrapping It Up

While this investigative sequence sounds straightforward, plan to put in some effort. Keep in mind that in some cases you will be dealing with more than one of these effects at the same time. Thus if one "cure" doesn't seem to help, don't immediately remove it — it may be eliminating a part of the problem even though you can't tell yet. Keep at it and know that most such problems can be solved successfully.

[2]S. Ford, WB8IMY, "Short Takes — ICE Model 475-3 AC Line Filter," *QST,* Mar 2005, p 48.

[3]M. Tracy, KC1SX, "Product Review — MFJ-1164 AC Line Filter," *QST,* Jan 2007, pp 68-69.

[4]**www.fcc.gov/oet/info/rules/** — search for "Part 15."

NØAX

# HANDS-ON RADIO

# Experiment #76 — Diode Junctions

## The Basic PN Junction

Pure silicon (or any semiconductor material) conducts poorly, compared to good conductors such as copper and aluminum. It's only when impurities are added that things get interesting. In pure silicon, each atom shares an electron with each of its neighbors, creating bonds that hold the lattice structure together. These electrons are held firmly in the bonds and are not free to move if an electric field is applied, such as from a voltage across the material, so conductivity is low.

When an atom with a *donor* impurity — such as antimony, arsenic or phosphorus that has an extra electron available to form bonds — replaces one of the silicon atoms, the unused bonding electron is free to move about the silicon lattice, especially if there is a voltage across the material. (As long as these *free electrons* do not leave the lattice, the material remains electrically neutral.) This is called *N-type* material because of the free negative electrons. An *acceptor* impurity atom — boron, gallium, or indium — has one fewer bonding electron than silicon so that one of the bonds is not made. This is *P-type* material because the unmade bonds from the missing electron act as positive charges.

Missing bonds are referred to as "holes" because unbound electrons give up energy when they are captured to form the bond. Unbound electrons can come from adjacent bonds in the lattice or they can be electrons released from silicon atoms by thermal or other processes.

But wait, how can a hole move? It's really just a missing bond between two fixed atoms. When an electron in an adjacent bond feels enough force due to an applied voltage, it can move to a missing bond in the direction of the voltage, "filling" the hole and leaving a new hole behind. The net effect is the same as if the hole moved in the opposite direction.

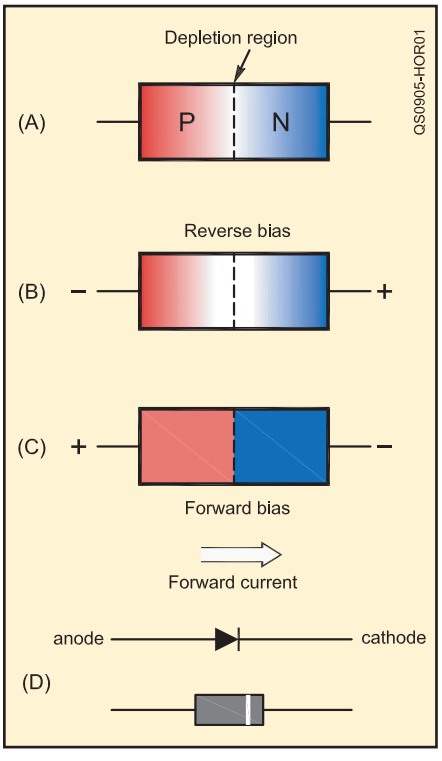



**Figure 1 — At (A), a PN junction forms a depletion region at the interface between the two types of material. At (B), reverse-bias widens the depletion region, while forward-bias (C) causes the majority carriers to recombine at the junction. The symbol and physical appearance for a diode are shown at (D).**

### *Putting Them Both Together*

By themselves, N-type and P-type material can't do much, but when you bring them together, something very interesting happens. As shown in Figure 1A, at the interface between N-type and P-type material, free electrons can move across the interface and "fall into the holes", a process known as *recombination*. This only happens for electrons and holes very, very close to the junction between the materials, creating a region on either side in which the majority carriers have recombined, leaving the material depleted of majority carriers. This is the *depletion region*. It has poor conductivity because there are no carriers to flow in response to voltage. The combination of P-type and N-type material with a depletion region between them forms a *PN junction*.

The depletion region is a very thin (approximately 500 nm) insulating layer, so if a small voltage is applied in either direction across the junction, very little current will flow, even though conductivity of the N-type and P-type material is quite good.

If a *reverse-bias* voltage across the PN-junction is applied as in Figure 1B, the majority carriers attempt to flow *away* from the junction as the electrons move toward the positive voltage and holes toward the negative. This widens the depletion region and reduces conductivity even more, so that only a very small *reverse leakage* current, $I_s$, flows across the junction.

If, however, a *forward-bias* voltage is applied, as in Figure 1C the majority carriers attempt to flow *across* the junction. As they approach the depletion region, the carriers become so close together that they recombine. They are replaced by new electrons injected into the N-type material from the negative voltage source and removed from the P-type material by the positive source. (Remember, this is the same as if the positive conductor were injecting holes into the P-type material.) Thus, *forward current* appears to flow across the PN-junction, although the holes and electrons are actually just recombining furiously in what was previously the depletion region.

## The Fundamental Diode Equation

The *fundamental diode equation* describes the relationship between forward

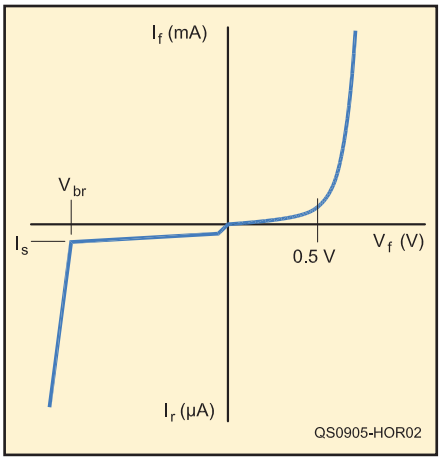



**Figure 2 — A generic I-V characteristic curve for a silicon diode showing the forward and reverse conduction regions. Reverse breakdown occurs when the applied voltage forces carriers across the depletion region in the reverse direction.**

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

voltage across the junction, $V_f$, and current through it, I. (A link to math tutorials on exponential equations can be found at **www.arrl.org/gclm**.)

$$I = I_S \left( e^{\frac{V_f}{\eta V_t}} \right) \text{ or } V_f = \eta V_t \ln(I / I_S)$$

where e is the base for natural logarithms (approx 2.72) and $V_t$ represents a voltage created by the thermal energy present in all materials, about 25 mV at room temperature. $V_f$ is measured from the P-type material (the anode) to the N-type material (the cathode) and is the voltage required for the majority carriers to come together in the depletion region and recombine for a given level of current. A generic diode I-V characteristic curve is shown in Figure 2.

The two remaining parameters depend on the material and method used to make the diode. $I_s$ is the *reverse-bias saturation current* that flows when reverse bias is applied with typical values of pA to μA. η is the *emission coefficient* that depends on material and current level. It is near 2 for silicon at mA current levels and drops close to 1 at large currents. By choosing materials and manufacturing processes, different types of diodes are created.

The depletion region will break down if enough reverse bias is applied. When the reverse breakdown voltage, $V_{br}$, is reached, current flows backwards across the junction and the diode is in reverse breakdown. Limiting the applied reverse voltage to less than the diode's peak inverse voltage (PIV) rating prevents reverse breakdown in which currents can be large enough to destroy the diode.

## Silicon versus Germanium Diodes

Germanium was used extensively in early diodes and transistors, but silicon is much more common today because PN junctions have lower leakage current. Germanium diodes are still used in some applications because of their lower forward voltage, $V_f$. The best example is the 1N34 diode, often used in "crystal" radios as a detector. At milliamp current levels for signal-processing circuits, a germanium diode's $V_f$ is around 0.3 V, compared to near 0.6 V for silicon.

## Zener Diodes

Named for their inventor, American physicist, Clarence Zener (1905-1993), Zener diodes are intended to be operated in reverse breakdown mode with a precisely controlled voltage at which reverse breakdown occurs. Once reverse breakdown is reached, the voltage across the Zener diode is relatively constant over a wide range of current, making it useful as a voltage reference or regulator.

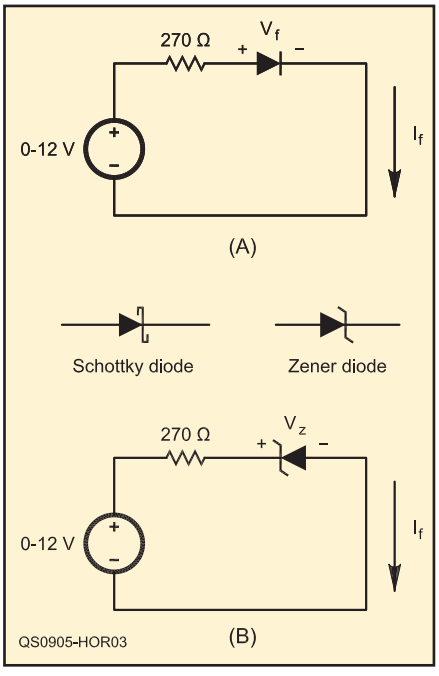



**Figure 3 — Measure a diode's I-V characteristics by applying voltage through a current-limiting resistor. The symbols for Schottky and Zener diodes are shown. (A) shows diodes connected with forward bias. (B) shows a Zener diode connected for reverse-bias to act as a voltage regulator.**

## Schottky Barrier Diodes

A diode's forward voltage causes power to be dissipated, just as in a resistor — $P = V_f \times I$. At the high current levels in power supplies, this can be many watts. The amount of time required for the diode to respond to a sudden reversal of applied voltage and stop conducting is also important, particularly in high-frequency switchmode supplies. Longer response times allow energy to be lost as current flows backwards during the short *recovery period*.

The *Schottky barrier diode* is formed by applying a metal such as gold or platinum directly to N-type material, forming a depletion region at the metal-semiconductor interface. Schottky diodes have a lower $V_f$ for the same amount of current and dissipate less power. They also respond to changes in applied voltage more quickly than PN junction diodes.

## Measuring Diode Performance

Figure 3 shows a circuit for measuring a diode's *I-V characteristic curve*. A variable voltage source, such as a workbench power supply, and a current limiting resistor are connected in series with the diode. Use a pair of digital voltmeters (DVMs) to measure current and voltage and plot it on graph paper. (A three-terminal regulator can be used to make a variable voltage supply as in Hands-On Experiment #70.[1])

Start with a 1N4001 or 1N4148 silicon diode. The graph's vertical axis should span 0 to 50 mA and the horizontal axis 0 to 1 V. Measure current directly with your DVM, or measure voltage across the current limiting resistor and use Ohm's law to calculate current.

Vary the power supply voltage from 0 to 12 V in steps of 0.25 V, plotting $V_f$ and I at each step. You should see a curve that starts at the origin and stays close to the horizontal axis until $V_f$ approaches 0.5 V, at which point the curve will bend upwards as the diode begins to conduct.

Substitute a 1N34 or 1N34A germanium diode and repeat. You will see that the diode's $V_f$ is lower than that of the silicon diode. Repeat with a Schottky barrier diode, such as a 1N5817, to get a third I-V curve. Repeat once again with a low voltage Zener diode, such as the 4.7 V 1N4732 or 1N4732A. It should produce a curve almost identical to that of the first silicon diode.

Turn the Zener diode around so that the cathode is connected to the current-limiting resistor. Make a new graph with the same vertical scale, but with the horizontal axis spanning 0 to 12 V. Measure current and Zener voltage, $V_Z$, while adjusting the power supply voltage in 1 V steps from 0 to 12 V. There will be very little current through the diode until reverse breakdown occurs, at which point current will increase sharply but the voltage across the diode will remain almost constant.

## Recommended Reading

There are many other types of diodes: fast-recovery, PIN, tunnel, hot-carrier, point-contact, etc. Spend some time browsing through *The ARRL Handbook* chapter on "Electrical Fundamentals" and the Wikipedia (**www.wikipedia.com**) entries on these and other types of diodes.[2]

## Next Month

When an amplifier circuit using discrete components, such as a bipolar transistor or FET (or even a vacuum tube) is designed, the graphical technique of load lines is often used. Next month, you'll learn about dc and ac load lines, draw one, and then build the amplifier it describes.

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

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

AG1YK

# HINTS & KINKS

## PSK31 FOR AUDIO MONITORING

◊ Many of the new rigs have the capability to listen to transmitted audio for setting up levels, compression, etc. The problem is that listening to your audio while speaking makes it difficult to judge differences in settings. To overcome this I use my PSK31 interface to connect to the *sound recorder* of my computer. This eliminates the problem of speaking and listening at the same time. When doing this, I actually state into the recording the various levels I have the transmitter set to, then reset them to another value and make another recording. This permits me to listen to the audio files and know what is going out on the air, with different audio levels and settings.

The PSK31 interface is also useful when someone asks how their audio sounds. I simply record it with the *sound recorder* and play it back for them using the PSK31 interface. I often do this and then e-mail them the file. This permits them to hear exactly what I heard without the effect of my rig's audio on the recorded audio I play back. — *73, Steve Ray, K4JPN, 104 Wendell Ct, Warner Robins, GA 31093-1035,* **sbralr@cox.net**

## GROUND MOUNTED LIGHTNING ARRESTOR

◊ When changing my HF antenna to a ground mounted vertical, I realized my lightning/static discharge arrestor was located too far away from the antenna to provide good protection.

My vertical is mounted on a 5 foot long, 1.5 inch diameter galvanized water pipe with 3 feet in the ground. I use an Industrial Communications Engineers (ICE) Model 300 HF Arrestor (**www.iceradioproducts.com**). This is a small unit with SO-239 connections. I found a Bud Industries (**www.budind.com**) cast aluminum enclosure in my junk box to mount the ICE unit in. This keeps the weather out as the arrestor is not rated for unprotected exposure (see Figure 1).

The holes in the sides of the enclosure were made with a ⅞ inch flat paddle drill bit, which is the correct size for a PL-259 outer shell. I used a hand drill and went slowly. The aluminum is very easy to cut. Wherever two metal joints occurred, I cleaned both surfaces and applied a coating of anti-oxidant joint compound. This is available at any home center or bigger hardware store. The joint compound prevents oxidation and ensures a good electrical connection.

I used stainless hardware for everything. The enclosure is mounted directly to the ground pipe, giving a very good ground connection (see Figure 2). I agree a copper clad ground connection would be better, but the galvanized pipe does a pretty good job.

The U-bolt I used is a very heavy duty, stainless steel model from DX Engineering (**DXEngineering.com**). I don't like the muffler clamp type; they don't hold up very well and will corrode.

**Figure 1 — The U-bolt alongside the arrestor mounted in the enclosure.**

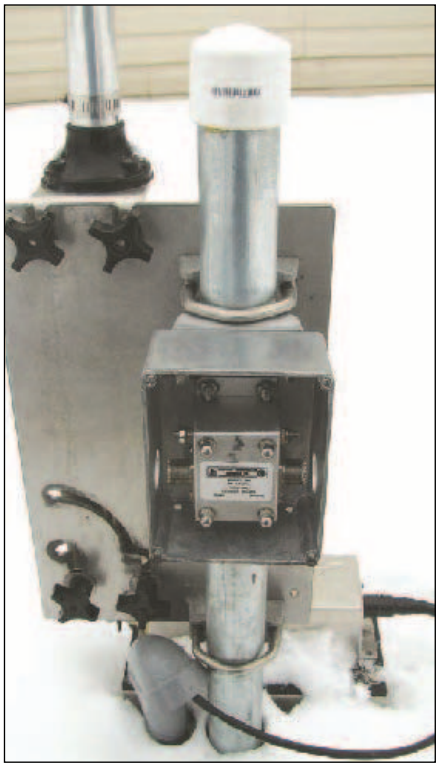


**Figure 2 — A view of the entire antenna base assembly.**

I taped my PL-259s with Scotch 33 electrical tape and ran a bead of silicone sealant around the cable openings (see Figure 3). I also drilled two small weep holes in the bottom of the enclosure to allow any condensation to drain. My enclosure cover did not have a gasket, so I applied silicone sealant around that as well.

This turned out to be a very easy and necessary project. You can use whatever you have on hand to fit your situation. Plus, I think it looks good. *All photos courtesy of the author. — 73, Phillip J. Mikula, WU8P, 10648 Aquarius Dr NE, Rockford, MI 49341,* **wu8p@charter.net**

## CQ RINGTONE

◊ Being an avid CW operator, I thought it would be real cool if my cell phone would ring CQ CQ CQ in CW. My BlackBerry cell phone came with a program called *APPS* used to go online to reach *Access Shop* and purchase various cell phone software downloads. I went to the index and clicked on PERSONAL PRODUCTIVITY and downloaded a program called *VR+Voice Recorder* for $20 from By Share Service, GMBH. The program allows me to record voice messages with my cell phone, then e-mail them in *MP3* format to anyone. The received message can be played back on a PC or any mobile device.

I opened up the *VR+ Recorder* program and set my cell phone near my memory electronic keyer and recorded a series of CQs in the keyer. I flipped the keyer SEND switch while, at the same time, activating the cell phone recorder. After saving the file I played it back to check the sound. The next step was to change my cell phone ringtone to the new one. Cell phones do this differently so you will have to check your

RICK KARLQUIST, N6RK

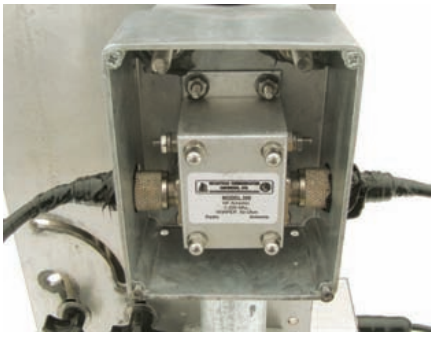


**Figure 3 — A close-up view of the mounted arrestor showing the coax connections and weatherproofing.**

Steve Sant Andrea, AG1YK ♦ Assistant Editor ♦ h&k@arrl.org

phone's instructions. For my BlackBerry I simply went to MEDIA, clicked on RING TONES, clicked on ALL RING TONES and selected the recorded file. I am happy to say that when I hear other cell phones ring I know right away that it isn't mine. When I am out in public and my cell phone rings CQ CQ CQ I get a comment from any ham within range. — *73, Greg Tyre, WXØE, 26673 Oldfield Ln, Lebanon, MO 65536,* **wx0e@embarqmail.com**

## INCREASING RELAY VOLTAGE HANDLING CAPACITY

◊ Using relays for switching antenna feed lines, tuning and matching circuits, loading coils and so on requires that the relay contact spacing be sufficient to withstand the voltages that may be present. The voltages can be quite high and adequately rated relays are expensive. Luckily, garden-variety relays can be made to work well with a little ingenuity. The trick is to increase the voltage handling capability of the relay by modifying the mechanical travel limit when the contacts are open. Open-frame DPST relays, such as the one pictured here, are the easiest to work with. These relays and similar models are sold by McMaster-Carr and many other electrical supply houses.

Remove the NC (normally closed) contact assembly from the rear of the relay, if present. Next, bend the "tail" of the armature outward to allow the armature (the movable contact assembly) to move much farther, increasing the contact gap (see Figure 4).

The resulting contact gap is approximately 0.5 inch and should be able to withstand any voltages the amateur is likely to generate. Make sure any other gaps are of comparable size. The relay still pulls in with voltages as low as 12 V (it is a 24 V dc coil) taking somewhat longer than the unmodified version. The armature spring can also be weakened, if faster pull-in is required.

The result is a very serviceable RF switching relay at a fraction of the cost of a commercially manufactured one. — *73, Rick Karlquist, N6RK, PO Box 2010, Cupertino, CA 95015-2010,* **n6rk@arrl.net**


RICK KARLQUIST, N6RK

**Figure 4 — The modified Potter-Brumfield PRD7AYO-24 relay showing the rear area with the tail bent to permit an increased gap between the relay contacts.**

## GRIPPER PADS ARE REDEPLOYED

◊ I enjoy operating CW on the HF bands. I don't use my straight key too much except for QRP (less than 5 W) operation. Instead, I rely on my electronic keyer and paddle combination. On occasion, I break out the old standby "bug." When using either the bug or the paddles, I find myself repositioning these keys during a QSO due to side-to-side movement, causing them to "walk" across the operating desk. This is due in part to their rubber feet becoming hardened over time. The solution to this problem lay in the kitchen "gadget" drawer.

During a battle with the cap on a jar of olives, I realized I had the solution "in hand" — the rubber gripper pad sold as an aid to open jars. I reasoned that if it could improve my grip on a jar lid, it should be able to solve the dilemma of the "walking bug and paddles." Sure enough, by placing one of these pads under the paddles, the paddle stays put and no longer walks around the desk.

I have found additional applications: a lightweight tuner stays in place when its button is pushed, too-tight PL-259s are easily unscrewed and it's a handy workbench pad, which protects the equipment and keeps small parts and hardware from rolling away. Also, equipment without rubber feet won't scratch table tops when you put one of these underneath. You can cut the pads to size with ordinary scissors. They are sold in larger sizes for lining kitchen shelves or as placemats and are made in a variety of colors. Look for them in department stores and $1 discount stores. — *73, Steve VanSickle, WB2HPR, 3010 Tibbits Ave, Troy, NY 12180,* **wb2hpr@arrl.net**

## PVC ANTENNA SUPPORT SYSTEM

◊ I use this arrangement to support the center of my multiband HF inverted V while also providing an integral center insulator (see Figure 5). It holds the 400 Ω feed line away from the mast and provides strain relief. The support is made from a 10 foot length of Schedule 40 PVC pipe, six T fittings, two PVC end caps and two ⅜ inch eye bolts. The end caps, drilled at the center, fitted with the eye bolts and mated to one of the T fittings with two short lengths of PVC pipe forms the center insulator. The other T fittings are spaced down the mast and fitted with short lengths of pipe to provide the feed line stand-offs. Each of the stand-off pipes is split vertically with a saw about an inch deep on the open end. The whole assembly is glued together with PVC cement. The feed line is slid into the stand-off slots and secured with ultraviolet light resistant electrical tape (see Figure 6).

The PVC assembly slides down over the top of a telescoping mast. The size of the PVC pipe is chosen so it just fits over the mast. A saddle clamp on the metal mast allows the PVC support to slide down about half way, which serves to extend the height of the mast. Finally one extra stand-off is made from another piece of PVC pipe and a right angle fitting and clamped to the mast with saddle clamps just above the roof line. Be sure the center insulator assembly is rotated to the angle you need relative to the stand-offs before gluing it in place. It's inexpensive, no center insulator to buy, no more broken feed line from wind and no problems from the feed line hanging too close to the metal mast. — *73, Tex K. Monroe, KJ4DU, 1226 Algoma St, Deltona, FL 32725,* **tmon2@bellsouth.net** or **kj4du@yahoo.com**

TEX K. MONROE, KJ4DU

**Figure 5 — The complete PVC support mounted on the mast.**

TEX K. MONROE, KJ4DU

**Figure 6 — A close-up view of the mast head and the stand-offs.**

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

# Another Garriott Generates Excitement from Space

**Rosalie White, K1STO**

Richard Garriott, W5KWQ, son of ham radio's first astronaut in space, flew on the International Space Station (ISS) October 12-24 to the extreme delight of hams, students, shortwave listeners and many others worldwide. Hams have not forgotten that Richard's father, Owen, W5LFL, was the first ham to take Amateur Radio into space 25 years ago. Hams all over the world lined up to make QSOs with Richard and to let him know they remembered his father.

## Hams Awaited Flyovers

Richard was surprised that hams around the globe were at their ham stations waiting for the ISS to pass over for a chance to snag him. No matter what time it was for the hams on the ground, midnight, 2 AM, 4 AM, no matter what part of the globe he was flying over, if he called CQ, he got numerous answers. As the ISS came close to being in range of the European countries, people were calling *him* before their signals could possibly be acquired enough for him to make out call signs. Talk about being a sought-after ham — what fun! Most hams courteously kept their exchanges short to give everyone a chance to make a contact. Some hams asked him how the radios were working and others asked him to turn the SSTV camera on himself.

For the 2000+ SSTV images that Richard transmitted from the ISS, on a few rare occasions he did turn the camera around. It looked as if he was having fun. He was!

In addition to ham radio, Richard performed scientific research during his ISS stint. But he stated emphatically, "Ham radio contacts were the most rewarding activity out of absolutely everything I did on the ISS. Hands down! No question."

Richard logged 512 different call signs. He plans to send a personal response to each one and he has a huge pile of mail from hams that he hasn't had a chance to open yet.

**Richard Garriott, W5KWQ, aboard the ISS tests the floating capacity of the explosive bolt from the Soyuz TMA-12 spacecraft that he rode into space.**

**W5KWQ gets weighed in space. In space, you can't just step on the scales.**

## Conversations with Students

The main objective of the ARISS (Amateur Radio on the International Space Station) program is to open the door to educational activities that excite youth about science, technology, space and Amateur Radio. The program is managed through a partnership of ARRL, Radio Amateur Satellite Corporation (AMSAT) and NASA.

Richard summed up his school QSOs as "*Just Fabulous!*" (Richard asked to have those words emphasized!) He heard from many school teachers who said they made sure that their classroom ham radio stations were turned on and that they encouraged their students to listen for him.

He said: "They found me! Sometimes individual hams would say, 'There is a school trying to talk to you.' Several times individual hams were allowing a student to go first and call me before they tried to contact me. That was terrific to hear."

## Were there Educational Outcomes?

From Richard's experience, "Absolutely. Some kids asked some very hard questions. The science questions were depthy — more than I ever expected. I could tell they had studied background material before listening for me. The kids were very excited to be able to talk to someone in space and get answers to questions about things they had researched. Teachers and students put out a lot of work and effort, planning, study and coordination to be able to try to make a QSO with me. So I

Richard says goodbye to hams as he prepares to leave behind hamming from space to return home to Earth.

## Meet the Astronaut

You can meet Richard Garriott, W5KWQ, at the Dayton Hamvention® this year where he will participate in the forums and be available for autographs. For more information, see the 2009 National Convention article in this issue and the ARRLWeb at **www.arrl.org/expo** (follow the link).

tried very hard to make it worth their efforts."

Richard sums up the value of Amateur Radio communications between astronauts and classrooms offered through the ARISS program this way: "Flying in the ISS over a school's location brings astronauts, when they have free moments, right into the school. You could tell from the QSOs and from the correspondence I've received that getting a voice from space into the schools is inspirational to students. There is no question in my mind that ARISS has a powerful impact on the students. Connecting directly with students helps them realize, as well, that anything is possible for themselves."

What feedback from schools has Richard received now that he's returned to Earth? A large number of teachers and stu-dents sent e-mails with comments about science, technology and ham radio. Richard says this proves an ARISS QSO is not just a one-day flash in the pan for students — and it isn't for him either. He wants to do personal follow-ups with schools via e-mail or ham radio. Schools can contact him via the **www.richardinspace.com** Web site or by using **rgarriott@britanniamanor.com**.

### Sharing the Ham Radio Community's Gratitude

As he was settling back into terrestrial life, Richard reflected: "I was impressed with hams from the very first days of my ham radio training sessions, months and months before my actual on-orbit activity. I was impressed with the ham operations from those first days on, all the way to the end of my mission. It was an incredible experience."

The ARISS team thanked Richard profusely for the wide variety of ARISS activities he performed during his short mission. The team also conveyed the pride that Amateur Radio operators have for his father's pioneering ham operations in space and for our being able to call yet another space traveler "one of our own."

Says Richard: "I was honored to be able to 'play in the ham radio world' with you all, and to inspire students. The ham radio operation was the one thing that meant the most to me of everything I was able to accomplish in space." Plenty of thanks to go around!


Richard holds the London *Metro* newspaper prior to his QSO with students in the United Kingdom; the article described science experiments suggested by British students that he was to carry out.

*All photos courtesy of Richard Garriott, W5KWQ.*

*Rosalie White, K1STO, was Field & Educational Services Manager at ARRL HQ for 24 years before leaving in 2005 for her native Indiana where she was first licensed as WN9FJT (1970). Currently, she is ARISS-International Secretary-Treasurer and one of the two ARISS US Delegates. She consults for ARRL as its ARISS Program Manager and shepherds authors through electronic self-publishing at Author Solutions, Inc, in Bloomington, Indiana. She enjoys contesting. She can be reached at* **rwhite@arrl.org**.

# Bicycle Mobile Ham Radio

*Combining bicycle and radio — one ham's method.*

**David R. Pennes MD, WA3LKN**

**Figure 1 — Handlebar mounted transmit/receive switchbox. Two input jacks for the boom headsets are shown to accommodate different wiring schemes of the different aftermarket headsets I use.**

As a cyclist and Amateur Radio operator, I have long wanted to unite my two favorite hobbies and go bicycle mobile. I wanted a bicycle mobile setup that was inexpensive, simple and safe. With these three requirements in mind, I came up with a simple and low cost bicycle mobile setup.

Abundant information has appeared in the ham radio literature, including the current ARRL publication *Amateur Radio on the Move* that deals with the unique requirements of mobile operation.[1] Indeed, Bicycle Mobile Hams of America has a very active membership, newsletter and Web site offering a wealth of information.[2]

## The Radio

The 2 meter band offers the most flexibility and simplicity for bicycle mobile hamming, given the small size of handheld transceivers, the near-ubiquity of repeaters and the universal appeal of this band as the *friendly* band. This band also offers the simplicity of small antennas without the need for loading coils.

The other equipment requirements are also relatively inexpensive, including a mobile 2 meter antenna, a short piece of coax and a boom mic/headset. Push-to-talk (PTT) is probably the simplest way to go and is preferable to voice operated transmitting (VOX) since wind noise will make the VOX trigger incessantly.

A safety concern: When operating bicycle mobile, hams should be aware of their surroundings, especially other bicycle or auto traffic. PTT boom mic/headsets are simple and available off-the-shelf. A safer arrangement would be a transmit/receive (TR) toggle switch mounted on the handlebars (see Figure 1). Most handheld transceiver manufacturers make use of a simple TR circuit in their PTT (see Figure 2).

I tried a throat microphone and received reports that the audio was nearly unintelligible. A boom mic/headset with a large microphone windscreen is the best option.

Over-the-ear boom headsets are preferable to over-the-head headsets since they don't interfere with the bicycle helmet. In fact, the biking helmet straps hold and stabilize the over-the-ear headset. Hams are strongly advised to wear protective head-gear for all bicycling activities. My over-the-ear headset was purchased from a major retailer and is specifically made for my transceiver.[3] Also, you may wish to try an inexpensive cell phone headset often available at dollar stores. I have tried a few and some are compatible with my handheld transceiver, needing only a different plug.

## The Bicycle

Any bicycle can be used for ham radio, but a woman's style bicycle is actually more convenient in mounting and dismounting, particularly with an antenna mounted on the rear.

As an avid cyclist, I own two bicycles, a high performance "road" bicycle and a "hybrid" bike with traditional upright handlebars and fatter tires that is heavier, the road bike.

I felt funny about adding a few pounds

[1]Notes appear on page 70.

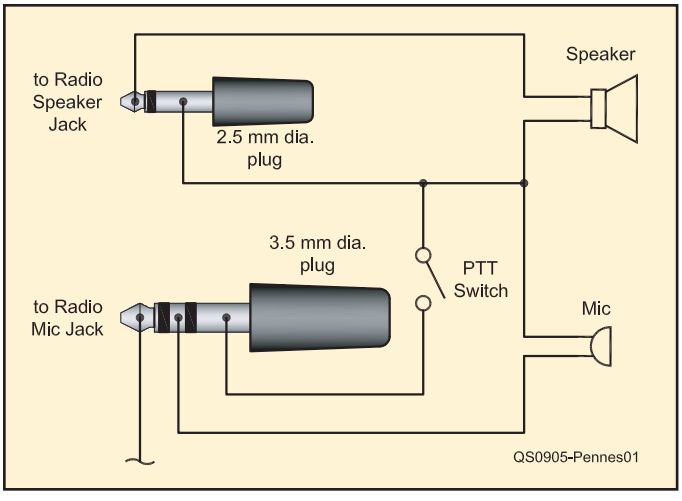



**Figure 2 — Typical PTT circuit used in external speaker/microphones for transceivers.**


**Figure 3 — The transceiver in its cradle mounted on the bicycle handlebars. (The bicycle computer to the right is unrelated to ham radio.)**

**Figure 4 — Universal Citizens Band antenna mount bolted to the seat-post rack. An antenna quick release with a ⅝ wavelength whip antenna is shown.**

to a lightweight road bicycle, so I decided to use the hybrid bicycle for ham radio use. It was already clunky in absolute terms so I figured a few more pounds of ham radio equipment wouldn't hurt bicycling performance significantly. There is also a safety issue. I think it's easier to maintain a safe handlebar grip while manipulating a PTT button with upright handlebars than hunched over racing style handlebars.

## Handheld Transceiver Mounting

The enterprising ham has many options for mounting the transceiver to the bicycle in the forms of water bottle, bicycle light or computer mounting brackets.[4,5] I elected to use a handlebar-mounted water-bottle cage bracket made by Minoura.

I then modified a rectangular plastic handheld transceiver stand and glued it to pieces of Plexiglas cut from an old clipboard. I covered it with pieces of a mouse pad glued in position for vibration dampening. A piece of Velcro held the transceiver as an added safety measure. It was a perfect, snug fit for the transceiver and the piece of Velcro was unnecessary (see Figure 3).

Simply hanging the transceiver on your belt is even simpler but would be harder or impossible to access safely while in motion.

## The Antenna

Any mobile 2 meter antenna will work. I've tried both ⅝ wavelength and collinear-stacked antennas and found that a Hustler CG-144 (**www.new-tronics.com**) had the lowest SWR and the best overall signal reports. This antenna consists of a ¼ wavelength lower section and a ⅝ wavelength upper section with a phasing coil in the middle. It's 7 feet long and is mounted about 3 feet off the ground, so hams going this route need to be cognizant of overhead items. I routinely brush low-hanging foliage with the antenna. Low-hanging overhead live wires are a theoretical possibility. A mobile antenna spring was unnecessary.

## The Antenna Mount

The antenna mount I chose was a seat-post mounted saddlebag carrier, known as a seat-post rack, which clamps to the seat-post with a rubber shim and is electrically insulated from the rest of the bicycle frame. I attached a universal Citizens Band antenna bracket containing the SO-239 connector (see Figure 4).

I electrically grounded the rack to the bike frame with a short piece of wire, using the entire bike frame and rider as a ground plane. I used a piece of RG-58 coax with the appropriate 90° hardware. I'm sure this antenna setup has an asymmetrical radiation pattern and a SWR of 2:1 was the best that could be achieved using the CG-144 antenna.

A mobile Citizens Band antenna mirror mount could conceivably be clamped directly to the bicycle frame with an adjustable-angle antenna stud, but the geometry of my bike didn't allow the proper clearance and interfered with rear wheel motion.

The total weight of the mounting hardware for the transceiver and antenna is around 1.5 pounds and the transceiver, antenna and coax add about another 2.5 pounds for a total weight of 4 pounds. The finished product is shown in Figure 5.

## In Practice

Bicycle mobile ham radio is a blast! It's decidedly different from simply biking in the outdoors to experience the solitude and beauty of nature.

I normally bike on a nearby rails-to-trails conversion, a long abandoned spur of the old Grand Rapids-Indiana Railroad, now blacktopped for recreational use. I get quizzical looks from other cyclists who pass me wondering about the 10 foot high flagpole on the rear of the bicycle. Checking into nets always gets attention, particularly ARES® nets, and is a practical demonstration of the versatility of Amateur Radio. Announcing: "This is WA3LKN bicycle mobile, monitoring" almost universally garners a response. I had the unique experience of a chance eyeball encounter with an auto-mobile ham with whom I was chatting as we passed each other. We recognized each other from our antennas.

From the usual locations where I bicycle, I'm able to hit a number of repeaters. I generally have lower signal strength than the fixed stations as well as higher background noise, as expected. I sometimes drop out of the repeater as I ride through depressions or around obstacles, similar to mobile stations in general.

Time to dust off that bicycle in the garage and get some aerobic exercise in the outdoors while enjoying ham radio!

**Notes**

[1]ARRL order # 9450; **www.arrl.org/shop**.
[2]Bicycle Mobile Hams of America; **www.lafetra.com/bmha/default.htm**.
[3]MFJ Enterprises, PO Box 494, Mississippi State, MS 39762; **www.mfjenterprises.com/index.php**.
[4]Bike Nashbar: 1-800-NASHBAR; **www.nashbar.com**.
[5]Performance Bicycle: 1-800-553-8324; **www.performancebike.com**.

*All photos courtesy of the author.*

*David R. Pennes, MD, WA3LKN, was first licensed in 1968 at age 15 as WN3LKN. He enjoys operating 2 meter bicycle mobile and collects and restores telegraph equipment. He is a diagnostic radiologist in private practice in Grand Rapids, Michigan. You may contact him at: 2059 E Wyndham Hill Dr NE, Apt 303, Grand Rapids, MI 49505-6358 or at* **dpennes@hotmail.com**.

**Figure 5 — The completed setup ready for action. The bottom portion of the CG-144 antenna is shown. The pouch hanging from the top tube holds a battery pack for night time riding.**

# Something for Everyone at the 2009 ARRL National Convention

*Join the ARRL at the 2009 National Convention, hosted by the Dayton Hamvention®.*

**S. Khrystyne Keane, K1SFA**

In May, the ARRL National Convention will gather in Trotwood, Ohio — just minutes away from downtown Dayton. The convention is hosted by Hamvention and sponsored by the Dayton Amateur Radio Association. Hamvention, held annually since 1952, is the largest Amateur Radio gathering in the world.

It's no wonder Amateur Radio should feel so quite at home in Dayton. The region is well known to innovation and inventors such as NCR founder John Henry Patterson and Charles F. Kettering, inventor of the automobile self-starter. Dayton is most recognizably known in aviation heritage as the home of Wilbur and Orville Wright, the famed brothers who conducted the first successful powered flight in 1903. In this same vein, ARRL promises a national convention that will celebrate the very best of Amateur Radio technology and techniques. There will be something for every active ham to enjoy — the do-it-yourselfer, the experimenter, the educator and the public service volunteer.

## Experience the EXPO

At the heart of the national convention is ARRL EXPO, a large exhibit area in one of the six Hara Complex buildings. ARRL EXPO will be packed with ARRL officials and staff representatives, programs and activities.

A handful of new, interactive ARRL exhibits will provide engaging real-life experiences, encouraging visitors to explore ways to become more active. At the ARRL project-building booth, attendees can try their hand at assembling a kit — handling electronic components, circuit boards and even trying their hand at soldering.

"If you have never built a project before, we hope you will consider this a 'Soldering 101' basic course," said ARRL Laboratory Engineer Bob Allison, WB1GCM. Allison will lead a team of instructors who will mentor visitors through the activity. "We also want to encourage hams who have not built something in a long time to get back in the saddle. Project building is fun, and it's a great way to build low-cost gear and accessories. We want everyone to unlock their inner do-it-yourselfer."

You can also explore the many facets of ARRL Field Day at ARRL EXPO. "Field Day is the largest on-the-air operating event," said ARRL Field Day Manager Dan Henderson, N1ND. "We decided to showcase Field Day at the convention because it represents the very best of the Amateur Radio Service. The event draws tens of thousands of radio amateurs to the airwaves over a single weekend." Field Day is part emergency preparedness exercise, part public demonstration and part radio club social event. ARRL Field Day is June 27-28 — the climax of "Amateur Radio Week" sponsored by ARRL.

Richard Garriott, W5KWQ, will attend the 2009 ARRL National as a special guest of the ARRL and AMSAT. Garriott, who took off for the International Space Station this past October, became the sixth private citizen to fly with the Russian Federal Space Agency for a short-term mission on ISS. Not two hours after he arrived on the ISS, Garriott was making ham radio contacts, just as his father, Owen Garriott, W5LFL — the first ham to make QSOs from space — did in 1983 while aboard the space shuttle *Columbia* on STS-9. Garriott will spend some time in the ARRL EXPO exhibit area, meeting convention attendees and signing autographs.

If you enjoy waxing nostalgic over the gear of yesteryear, then drop by the exhibit area to meet vintage equipment photographer Joe Veras, K9OCO. He will be autographing his new book, *50 Years of Amateur Radio Innovation*, recently published by ARRL. There are some other "vintage" surprises planned, as well.

When you come to the ARRL EXPO, be sure to have a copy of your license on hand so you can get in the hot seat of W1AW/8 and get on the air! You can also meet W1AW Station Manager Joe Carcia, NJ1Q, part of the team that supports the Hiram Percy Maxim Memorial Station at ARRL Headquarters. Personnel from the ARRL DXCC Branch will be on hand to check DX cards and applications. All cards will be eligible for checking — including old cards, cards for deleted countries and cards for 160 meters. Applications will be limited to 120 cards (more cards will be checked as time and volunteer Card Checkers are available). Finally, ARRL EXPO is the site of the huge ARRL bookstore for popular publications and products, and purchase official ARRL merchandise. All who join the ARRL or renew their membership at the convention will receive a free gift.

The ARRL Youth Lounge in the ARRL EXPO is the place to meet and socialize with other young hams. Whether you're 1 or 21, the Youth Lounge is sure to offer something that young hams will enjoy. Come to chat with other hams, listen to music, grab a snack or participate in one of the many activities, such as fox-hunts, scavenger hunts, Morse code fun, a QSL card designing contest, crafts, prizes and more. An ARRL Youth Dinner is planned for Saturday night. Whether or not you're licensed, you're welcome to come by and join the fun!

## Dayton or Bust!

Experience all the fun and excitement that only an ARRL National Convention can bring. Make plans to join the ARRL at the Dayton Hamvention, May 15-17.

*S. Khrystyne Keane, K1SFA, is the ARRL News Editor. She can be reached at* **k1sfa@arrl.org**.

## Do It at Dayton

*When*: May 15-17, 2009
*Where*: Hara Complex in Trotwood, Ohio
*Information*: **www.arrl.org/expo**

*Program Highlights*

★ ARRL EXPO — This special exhibit area will feature project building, ARRL program representatives, presentations and the huge ARRL bookstore.
★ Field Day Exhibit — Learn more about the Number 1 on-the-air operating event.
★ Dayton Hamvention — Enjoy the world's largest hamfest and flea market.
★ DXCC Card Checking
★ ARRL Youth Activities and Youth Lounge. Youth calling frequencies: 145.540 MHz (107.2 Hz CTCSS) primary, 146.430 (233.6 Hz CTCSS) secondary and FRS Channel 1.
★ W1AW/8 Special Event Station — Bring a copy of your license to operate.
★ And much, much more!

See **www.hamvention.org** for lodging options and travel information.

# Repeaters and the Conversation Carousel

*How to get on and join in your local repeater's community.*

**Steve Sant Andrea, AG1YK**

"AG1YK listening" stops your scanner and grabs your attention. You want to join in, but you're not sure how it all works. Hams seem to come and go; sometimes four or five are tossing a conversation around punctuated by dead air and beeping noises.

You probably know the basics: From their locations on hilltops or on tall buildings, repeaters receive on one frequency, amplify the signal and retransmit it on a different frequency. Their advantageous locations provide reliable communications over wide areas.

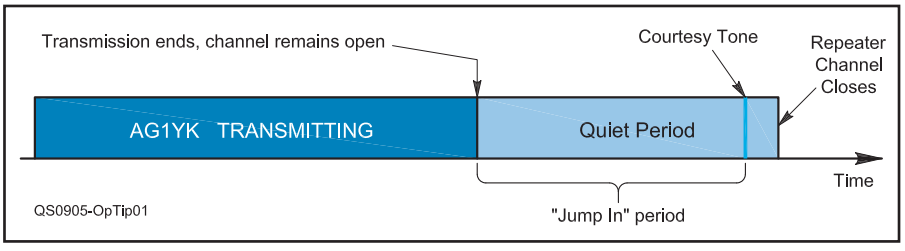
Aside from the practical uses of repeaters in outdoor activities and public service, many find the repeater *community* the most compelling reason to get on. Similar to the office fax machine or the school lunch room, repeaters can provide places for groups to meet and talk about what's happening in the world (or in the street right in front of them).

## Let's Get Started

So how do you get into this community? The best place to start is to identify the repeaters (aka "machines") you can hit. Aside from a local ham, someone who knows the ins and outs of the nearby machines, the best way to find a repeater is by consulting a directory. You can purchase a printed *ARRL Repeater Directory* (in either pocket or desktop size), or you might prefer a full-featured map-based CD reference, *TravelPlus for Repeaters*.[1] Either will do the trick.

The most basic things you need to know are the repeater's location by state and town, its output frequency, call sign, access tone and sponsor. Other information includes the frequency *offset* (the difference between the repeater's transmit and receive frequencies) and notes on its various capabilities.

Most, but not all, repeaters require an access signal consisting of either a low frequency tone (called CTCSS)[2] or digital coded squelch (DCS) tones. These are used to reduce interference between repeaters. If your transmission doesn't include the correct access signal, the repeater will ignore it. Although the *Directory* provides what you need to know about accessing a repeater, some repeaters are open only to members of a club or other group. It's the repeater owner's prerogative whether to operate an Open or a Closed repeater.




**A quiet period follows every transmission through a repeater and ends in a courtesy tone. This is the time to "jump-in" to an ongoing discussion.**

## Your Radio Will Remember

Once you have a local repeater identified, you'll need to set your transceiver to the repeater's output frequency and set the access tone and offset. Most modern transceivers have a memory feature designed for repeater operation. You'll have to (gasp!) read your radio's manual to find the exact procedure, but typically you'll need to start in your radio's direct frequency (VFO) mode and set up the output frequency, offset and tone. Once you have these set, activate the radio's memory mode and store the settings in an available memory location. Many transceivers also allow you to add a short text label to identify the repeater. Now you're ready to jump on that repeater whenever you wish without needing to reset any controls.

## Jumping In

Listen first to get a feel for how the conversation is going. Or, if there's no one on, feel free to jump right in. Press the PTT button and pause for a second before speaking. This delay allows the repeater to fully activate and will prevent the first syllable of your transmission from being chopped off. This delay is especially important with *linked* repeater systems, where several local repeaters are connected either by radio or the Internet to cover a wider area.

After the pause, just give your call sign. With any luck, someone monitoring the repeater will respond and away you go. If you're joining a conversation, perhaps during commuting hours, you may find there are several stations taking part in the "rotation." Who goes next? If they've been on for a bit, the order is probably already set. So how do you get into the action? Wait for the beep!

Most repeaters have what is called a *courtesy tone*. When a station stops transmitting, the repeater will remain open for a few seconds to allow anyone listening an opportunity to jump in (see Figure 1). At the end of this quiet period, the repeater will transmit a courtesy tone to signal that is closing the channel if no one transmits. The next person in the rotation should wait for this tone before hitting the PTT button. During this short break, just announce your call sign and stop transmitting. The next station will normally acknowledge you, add his comments and then turn it over to you. (If this doesn't happen right away, be patient.) He or she will usually tell you who you should turn it over to when you are done. When you have put in your two cents, simply pass it to the next party.

One last point to mention. Nets — groups with a specific purpose — often use repeaters to expand coverage. There are a lot of fun things in ham radio, but many nets are serious. When you hear about hams helping out in a hurricane or flood, they often do so through a net operation. Whether there's an actual emergency or it's just time for the weekly net, they often operate using a very specific format.

That's about all there is to getting on your local repeater. If you're looking for more details, the ARRL Web site has a lot of information on what repeaters are and how they work: **www.arrl.org/tis/info/repeater.html**.

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

[1] You can purchase the new 2009-2010 editions of *The ARRL Repeater Directory* or *TravelPlus for Repeaters* from your local ARRL dealer or from the ARRL Bookstore. Telephone toll-free in the US 888-277-5289, or 860-594-0355, fax 860-594-0303; **www.arrl.org/shop/**; **pubsales@arrl.org**.

[2] S. Ford, WB8IMY, "Low Tones in High Places," *QST*, Jul 2007, p 52

# FCC Special Counsel Laura Smith Visits ARRL

FCC Special Counsel Laura Smith visited ARRL Headquarters on March 5 and 6, her first official visit as Special Counsel. Smith was named to the position earlier this year, filling the vacancy created when Riley Hollingsworth, K4ZDH, retired in 2008; Hollingsworth served in that position for more than 10 years as the Commission's enforcement watchdog over the Amateur Radio Service.

While at Headquarters, Smith visited with HQ staff members in the Lab, the Volunteer Examiner Coordinator (VEC), the Regulatory Information Branch and Membership and Volunteer Programs (MVP).

Spending the afternoon of the 5th with ARRL Lab staff, Smith discussed power line noise and how it can affect Amateur Radio. "Since Riley had retired last year, very little had been done at the FCC with regard to the power line noise enforcement," said ARRL Laboratory Engineer and power line noise expert Mike Gruber, W1MG. "The Lab staff discussed the status of the ARRL-FCC Cooperative Agreement on power line noise with Laura and how best to proceed forward. While the ARRL is not in the enforcement business, the Cooperative Agreement was an attempt to help the FCC focus its limited resources in the area where they are most needed — enforcement. The ARRL's goal is to help resolve as many of these cases as possible with technical and other help *before* they ever get to the FCC."

Gruber also briefed Smith on some power line noise basics, including a demonstration of some professional grade locating equipment. Using a Model T spark coil as a noise source, Gruber was able to show Smith how a utility can locate power line noise — in many cases, without too much difficulty.

According to ARRL Regulatory Information Branch Manager Dan Henderson, N1ND, the FCC wanted Smith to visit the ARRL once she accepted the position. "I think this visit has been a very productive two days. We are getting to know Laura, and she is getting to know our organization and what we, as the ARRL, can do to help her make her job easier to help the amateur community as a whole," Henderson said.

**FCC Special Counsel Laura L. Smith.**

Smith, a lawyer, is no stranger to the FCC or Amateur Radio. She began her legal career with the Commission, working in the Mass Media Bureau and Wireless Telecommunications Bureau (WTB), working with Senior System Analyst Bill Cross, W3TN; she also served as Deputy Division Chief of the Public Safety and Private Wireless Division.

Calling Hollingsworth "irreplaceable," Smith said what he did for the Commission and for the amateur community was "amazing. He volunteered for that job. He stood up and said, 'I'm an amateur. I love this community and I want to give back to it.' This position needs to be filled by somebody who is interested in doing it long-term. This [job] is not a stepping stone; it's not a short term process. This wouldn't work if I were trying to be Riley. I'm not going to be Riley. We're very different people. But we both have the same goal: To make the amateur community better."

Smith emphasized that an Amateur Radio license is "a privilege, not a right. When you come to the FCC and you sign up for a license and you get that license, you have agreed to abide by [Part 97]. That is inherent in the application process. As an applicant and a licensee, you have said, 'I will hereby comply with the Rules that have been enacted by the FCC.' So you have said, 'I will adhere to that.' And if you choose not to, then you are subject to losing that privilege."

Smith is not yet a licensed amateur. She said that she will "ultimately become a ham," but that she did not want to get her license just because her job involves Amateur Radio: "I didn't want to come into this job and become a ham, saying, 'I'm getting this job so I'm going to be a ham — not because I'm interested in being a ham, but because it looks better on paper.'" Smith said that her father-in-law — who was stationed in the FCC's Field Office in Los Angeles — used to administer the Morse code test to prospective licensees: "He has challenged me that before I can become an amateur on any level, I must learn Morse code and I must pass the test with him administering the Morse code. So I have a challenge. I am going to begin learning Morse code this summer. He is going to start teaching me, so once I have sufficient proficiency, then he will let me take the [Technician] test."

## ARRL NATIONAL CONVENTION TO FEATURE RICHARD GARRIOTT, W5KWQ

Richard Garriott, W5KWQ, will be attending the 2009 ARRL National Convention — hosted by the Dayton Hamvention® — as a special guest of the ARRL and AMSAT. Garriott, who took off for the International Space Station on October 12, 2008, became the sixth private citizen to fly with the Russian Federal Space Agency (RKA) for a short-term mission on the ISS. Not two hours after he arrived on the ISS on October 14, Garriott was making ham radio contacts, just as his father, Owen Garriott, W5LFL — the first ham to make QSOs from space — did in 1983 while aboard the space shuttle *Columbia* on STS-9. Both Richard and Owen are ARRL members.

"We are so excited to have Richard be a part of our National Convention this year," said ARRL Sales and Marketing Manager Bob Inderbitzen, NQ1R. "He will spend some time in the ARRL EXPO exhibit area, meeting convention attendees and signing autographs. He's also been confirmed as a Hamvention forum speaker." The ARRL EXPO is a large exhibit area located in the Ballarena Hall (near the 400-numbered booths) at Hara Arena. For more information on the ARRL National Convention and the ARRL EXPO, please see page 71.

"This mission to the ISS fulfilled a lifelong dream to experience spaceflight, just as my father first did 26 years ago," Richard said. "It's an honor to be the first American

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

## FCC News

♦**Julius Genachowski Nominated as Next FCC Chairman**: On March 3, President Barack Obama nominated Julius Genachowski as FCC Chairman. Genachowski, 46, is a technology executive and a former classmate of Obama's from Harvard Law School. Upon Senate confirmation, Genachowski will replace Acting FCC Chairman Michael Copps; Copps took over the Commission on January 22, 2009, two days after then-Chairman Kevin Martin resigned. Genachowski has been widely praised by industry executives and consumer-activist groups — two groups often at odds — for his wide-ranging experience and intimate knowledge of technology issues.

"I can think of no one better than Julius Genachowski to serve as chairman of the Federal Communications Commission," said President Obama. "He will bring to the job diverse and unparalleled experience in communications and technology, with two decades of accomplishment in the private sector and public service. I know him as the son of immigrants who carries a deep appreciation for this country and the American dream; and as the proud father of three children working with his wife Rachel to be responsible parents in this digital age."

**FCC Chairman Nominee Julius Genachowski**

to follow a parent into space." While living on the ISS, Richard conducted scientific experiments and environmental research — but he also had a chance to do quite a bit of Amateur Radio operating, including sending slow-scan TV (SSTV) images.

Richard said that after his first QSOs with Earth, he understood how "well-networked" the global ham community really is: "I received specific reports back through Mission Control-Moscow about the technical aspects of my work and how the [amateur] community was enjoying the transmissions. This redoubled my enthusiasm to do quality work for the Amateur Radio legions around the world, as I realized how much it meant to those with whom I had the chance to talk. By late in my flight, I had contacted many hundreds of hams by voice and I have good records of these contacts."

For the past 26 years, ham radio operations from aboard the space shuttles and the International Space Station have helped to spotlight the innovation and experimentation that are benchmarks of the Amateur Radio Service. Richard Garriott's story as a private astronaut embodies that same "can-do" spirit. "We are absolutely delighted that Richard has agreed to take part in the 2009 ARRL National Convention. His biography reads like an adventure novel — one that spans global expeditioner, explorer and entrepreneur," Inderbitzen said. "Like many radio amateurs, Richard has an innate fascination with science and technology. He has written very enthusiastically about his experience using Amateur Radio from aboard the ISS. He found it particularly gratifying to find hams around the globe eager to make radio contact with him at any time of the day or night. Throughout the mission, he made hundreds of radio contacts with individuals and classrooms full of children. When we greet Richard in Dayton, we'll welcome him as one of our own!"

NASA

**Richard Garriott, W5KWQ, will join fellow amateurs in the ARRL EXPO at the 2009 ARRL National Convention.**

### WRC-11 AGENDA POSES OPPORTUNITIES AND CHALLENGES FOR HAMS

The next World Radiocommunication Conference (WRC-11) is scheduled for fall 2011. These periodic conferences of the Member States of the International Telecommunication Union (ITU) consider allocations to the various radio services — including the Amateur Radio Service — and evaluate what new technologies and applications should be addressed by future conferences.

The agenda for WRC-11, developed by the delegates at the last WRC in Geneva in 2007 (WRC-07), was formally adopted by the ITU Council in 2008. There are 25 agenda items addressing potential new or revised spectrum allocations to existing services. Of most interest to amateurs is agenda item 1.23, "to consider an allocation of about 15 kHz in parts of the band 415-526.5 kHz to the amateur service on a secondary basis, taking into account the need to protect existing services."

"This agenda item is the highest item on my long term priority list," said ARRL Technical Relations Manager Brennan Price, N4QX. "We are fortunate that WRC-11 presents an opportunity for a new secondary allocation in the medium waves. While the outcome in 2011 is far from certain, our experience in other bands — most notably 30 meters — indicates Amateur Radio's compatibility with certain other services as a secondary user."

Price said that some WRCs have posed great challenges for Amateur Radio, with blocks of spectrum potentially at risk. "This was the case at WRC-03 and WRC-07, which posed a very real potential reallocation of portions of the 40 meter band in Region 2 to HF broadcasting," he said. "The agenda for WRC-11 does not pose any threats to Amateur Radio as clear or as overt as those faced in prior years." Price and ARRL Technical Relations Specialist Jon Siverling, WB3ERA, are monitoring developments on a number of other agenda items that could affect Amateur Radio if they take unanticipated turns, including:

- Agenda item 1.14, considering requirements for and implementation of the radiolocation service (radar) between 30-300 MHz.
- Agenda item 1.15, considering possible allocations between 3-50 MHz for oceanographic radar applications.
- Agenda item 1.19, considering regulatory measures to enable software-defined and cognitive radio systems.
- Agenda item 1.22, examining the effect of emissions from short-range devices.

"Oceanographic radar is perhaps our biggest defensive issue," Price said. "Fortunately, its proponents, at least domestically and at least at this time, are acknowledging that sharing with Amateur Radio would be problematic."

WRC-11 is tentatively scheduled for October 24-November 18, 2011, in Geneva.

### TRAIN THE TRAINERS COURSE DEBUTS AT ORLANDO HAMCATION

The inaugural Train the Trainers course — supported by a grant from the ARRL Foundation — made its first appearance on February 13-14 at HamCation in Orlando, Florida. Led by ARRL Education and Technology Program Coordinator Mark Spencer, WA8SME, 12 participants — primarily from the ARRL Southeastern Division — completed the course. HamCation is the ARRL Southeastern Division's convention.

According to Spencer, the focus of the Train the Trainers course is on course development, instructional techniques and instructional resources — not on the technical

ED TYLER, KI4GKS

**Twelve participants attending the first-ever ARRL Train the Trainers course at the Orlando HamCation.**

content of the course. The course objective is to develop and validate a model program that could be used to provide instruction to volunteer licensing course instructors, helping to improve their teaching effectiveness.

ARRL Chief Development Officer Mary Hobart, K1MMH, attended the Train the Trainers course: "When I agreed to attend the Train the Trainer sessions at Orlando HamCation, I intended to be a fly on the wall. But as a volunteer instructor myself, I found that I was caught up in the enthusiasm of those who signed up for the course. Each of the participants came with a set of teaching experiences, and left with even more — and some made dramatic changes in their philosophy and approach to teaching licensing classes. I found the hours I spent under Mark's leadership rewarding and very, very useful. Kudos to Director Sarratt and the HamCation team for their support of this pilot project. I hope that this is just the beginning of something that can enhance our teaching of ham radio licensing."

Spencer commended the Orlando Amateur Radio Club (OARC) — HamCation's sponsor — for their "exceptional job of providing a venue for the class. ARRL Southeastern Division Director Greg Sarratt, W4OZK, and his primary point of contact, Ed Tyler, KI4GKS, did an excellent job of advertising the course, accepting applications from interested volunteer instructors and vetting and selecting the final pool of participants."

## In Brief

• **Field Day Station Locator Service Returning for 2009**: First introduced in 2008, the ARRL's Field Day Station Locator Service was a popular addition to the Field Day toolbox. This service — an interactive map that helps amateurs or those interested in Amateur Radio find a Field Day site near them — is free to clubs or individuals who will be operating public Field Day stations. Stations can also be listed by state or province. If your group would like to be a part of the Station Locator Service, it's easy to get started — just go to the Field Day Station Locator Web site (**www.arrl.org/fieldday**) and follow the instructions. ARRL Field Day is the most popular on-the-air operating event in Amateur Radio. On June 27-28, join tens of thousands of Amateur Radio operators as they gather for a public demonstration of our Service.


• **ARRL Sweepstakes and RTTY Roundup Set New Records**: The lack of good HF propagation didn't seem to affect participation in the 2008 Sweepstakes or the 2009 RTTY Roundup contests. According to ARRL Contest Manager Sean Kutzko, KX9X, both contests were record-breaking events. "We have received 3209 logs for the November SSB and CW Sweeps combined in 2008," Kutzko said. "That is — at bare minimum — a 5 year high. The 2009 RTTY Roundup in January saw 1564 entries, also a 5 year high." Kutzko said he attributes some of the increase to the hoopla surrounding the 75th running of Sweepstakes. "The excitement over the new Triple Play Award was likely a large factor in the RTTY Roundup increase," Kutzko said. "Interest in contesting in general is on the rise." In all, Kutzko said the ARRL Contest Branch received a total of 20,668 logs for 2008: "This is the highest number of logs we have ever received for Radiosport in a calendar year."

• **BSA Updates Radio Merit Badge Requirements**: The new requirements for the Boy Scout Radio Merit Badge became effective with the publication of *Boy Scout Requirements 2009*. While no new content has been added to the program, the new merit badge pamphlet features lots of new information — including color pictures and updated charts and text — that reflects the changes in the Amateur Radio Service since the last pamphlet update in 2002. Approximately 4000 Radio merit badges are earned each year. For a description of the new requirements, check out the BSA Web site (**www.scouting.org/boyscouts/advancementandawards/meritbadges/mb-RADO.aspx**).

## SECTION MANAGER NOMINATION NOTICE

To all ARRL members in the Colorado, Eastern Washington, Georgia, Los Angeles, Sacramento Valley, San Francisco, South Texas, West Virginia and Western Washington sections: You are hereby solicited for nominating petitions pursuant to an election for Section Manager (SM). Incumbents are listed on page 16 of this issue.

To be valid, a petition must contain the signatures of five or more full ARRL members residing in the section concerned. Photocopied signatures are not acceptable. No petition is valid without at least five signatures, and it is advisable to have a few more than five signatures on each petition. (Petition forms FSD-129) are available on request from ARRL Headquarters but are not required.

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

We suggest the following format:

(Place and Date)

Membership and Volunteer Programs Manager, ARRL
225 Main St
Newington, CT 06111

We, the undersigned full members of the _____ ARRL Section of the _____ Division, hereby nominate _____ as candidate for Section Manager of this section for the next two-year term of office.

(Signature____ Call Sign___ City__ ZIP__)

Any candidate for the office of Section Manager must be a resident of the Section, an Amateur Radio licensee of Technician class or higher and a full member of the League for a continuous term of at least two years immediately preceding receipt of a nominating petition. Petitions must be received at Headquarters by 4 PM Eastern Time on June 5, 2009. If more than one member is nominated in a single section, ballots will be mailed from Headquarters on or before July 1, 2009, to full members of record as of June 5, 2009, which is the closing date for nominations. Returns will be counted August 18, 2009. Section Managers elected as a result of the above procedure will take office October 1, 2009.

If only one valid petition is received from a section, that nominee shall be declared elected without opposition for a two-year term beginning October 1, 2009. If no petitions are received from a section by the specified closing date, such section will be resolicited in the October 2009 *QST*. A Section Manager elected through the resolicitation will serve a term of 18 months. Vacancies in any Section Manager's office between elections are filled by the Membership and Volunteer Programs Manager.

*— David Patton, NN1N, Membership and Volunteer Programs Manager*

# Adapting the ICS Message Form

*This article is but one example of how a local group is handling Amateur Radio communications requirements and the forms that drive the Incident Command System. We are aware of numerous other examples throughout the US. We encourage readers to submit their ideas and samples of how they have integrated ICS and Amateur Radio messages. Our ultimate goal is to use these ideas and offer a formal ARRL Message Form that meets all current needs. While the article mentions RACES, our focus is on ARES®. Please send examples of what you have developed to Steve, WV1X (***sewald@arrl.org***) and Dennis, K2DCD (***ddura@arrl.org***). — Ed.*

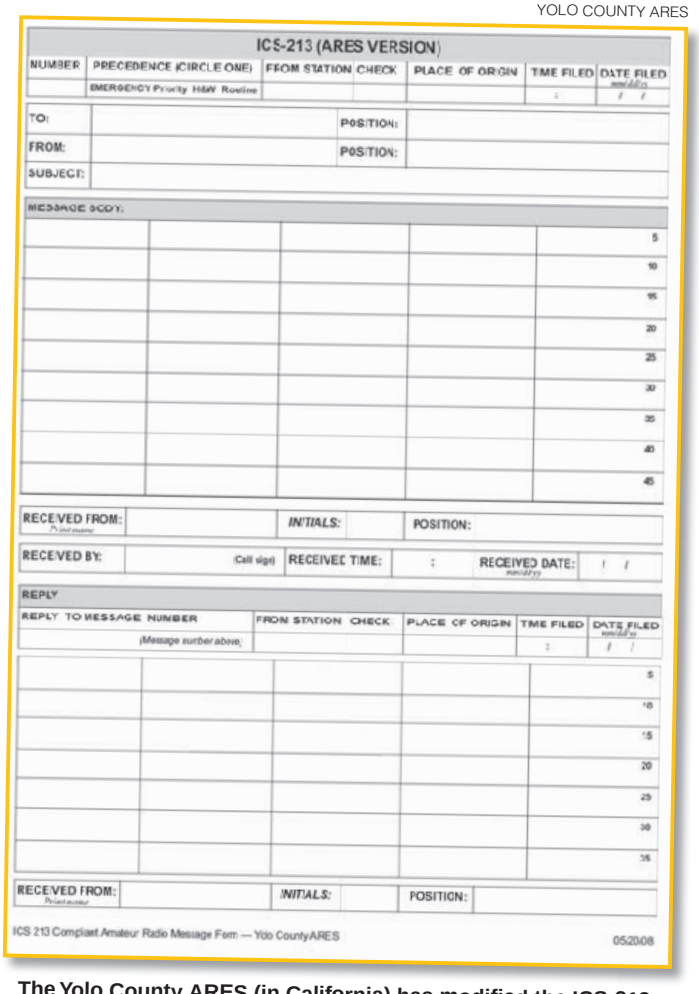
*Keith E. Miller Sr, N9DGK*
*EC, Heart of Tennessee ARES®*
*Rutherford County*
**n9dgk@arrl.net**

When Amateur Radio operators need to get a message through without tying up the airwaves or sending information to a non-ham, use of the ARRL Radiogram has been the accepted mode to provide accurate, documented information in a concise and precise format. The venerable Radiogram has been the standard for traffic handlers for years (**www.arrl.org/FandES/field/forms/#radiogram_form**).

Though there appears to be no precise form, the same radiogram format is used for moving traffic via packet radio and digital modes. All of these processes have been used for both normal and emergency communications.

Fast forward to the formal age of NIMS (National Incident Management System) protocols and the National Response Framework and the question now becomes, "How do we communicate using a standardized messaging form that is easy and understandable to use by emergency-responding Amateur Radio operators in an ICS environment?"

YOLO COUNTY ARES



ICS-213 (ARES VERSION)

| NUMBER | PRECEDENCE (CIRCLE ONE) | FROM STATION CHECK | PLACE OF ORIGIN | TIME FILED | DATE FILED |
|---|---|---|---|---|---|
| | EMERGENCY Priority Hdw Routine | | | : | / / |

TO: POSITION:
FROM: POSITION:
SUBJECT:

MESSAGE BODY:

RECEIVED FROM: INITIALS: POSITION:
RECEIVED BY: (Call sign) RECEIVED TIME: : RECEIVED DATE: / /

REPLY

| REPLY TO MESSAGE NUMBER (Message number above) | FROM STATION CHECK | PLACE OF ORIGIN | TIME FILED | DATE FILED |
|---|---|---|---|---|
| | | | : | / / |

RECEIVED FROM: INITIALS: POSITION:

ICS 213 Compliant Amateur Radio Message Form — Yolo County ARES 052008

**The Yolo County ARES (in California) has modified the ICS-213 message form to allow for better message documentation.**

By looking over the Internet, there are many articles and *PowerPoint* presentations about this subject. All generally agree that the ICS-213 General Message form is what emergency communicators should use. It is firmly placed in all Federal Emergency Management Agency (FEMA)/Department of Homeland Security (DHS) training and has been adopted at levels of government throughout the United States.

The dilemma for Amateur Radio operators who practice and provide emergency communications is that not all emergencies may require ICS message form use. If it does not, what form or forms should we use to move our information between the agencies that we are working with? Will we use a Radiogram? Will we use the ICS-213 General Message form modified for Amateur Radio message use? If we use the modified ICS-213 General Message form, how should it be modified to allow it to perform in place of or beside the venerable Radiogram?

Another means of contacting families, companies or other Amateur Radio groups is discussed and covered by the *ARRL NTS Methods and Practices Guidelines* (**www.arrl.org/FandES/field/nts-mpg**).

The importance of interoperability of communication between paid professional emergency organizations, as well as support from our Amateur Radio community through ARES®/RACES (in particular), highlights the questions raised above. It seems that much of the emergency traffic handled through Amateur Radio is generated on scene as "tactical traffic" that would not be formally passed as a document. Most is logged as matters of importance to the ongoing operation and it will be kept as part of the net control station's log of operation during the life of the event. The logging documentation is not kept on a formal document. It is kept on the group-generated log form. Formal traffic of any kind that is requested to be passed is sent and documented by the ARRL Radiogram.

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

As ARES®/RACES groups and many other Amateur Radio operators become more organized and offer their services to more and more organizations, it is understood that in an emergency those organizations will be required to operate under the ICS format. We, then, as backup emergency communicators, must be able to communicate through those same means. We must utilize the forms required under the ICS in addition to being familiar with the communication forms of the served agency. The ICS-205 Incident Radio Communications Plan, ICS-214 Unit Log and ICS-213 General Message forms are required during an ICS driven emergency.

These documents are specifically described as to size and format through the Government Printing Office standards division. As they are presented and described on the FEMA Web site **http://training.fema.gov/EMIWeb/IS/ICSResource/index.htm**, the ICS-213 form has no provisions in place to be tracked or logged when transmitted by radio. Internet searches show us that ARES®/RACES organizations attempting to integrate ICS-213 into their operations are developing many different versions. Some versions can be used for many served agencies. Other versions have been designed for specific agency use, but they still look more like the ARRL Radiogram than the ICS-213.

It seems that it would be in the best interest of our served agencies, and ARES/RACES, if a standard derived form that would serve our documentation requirements as well as preserve the original character of the document could be agreed on. For example, the ARRL Radiogram requires a "check" count for the body of the document. There is no such requirement for the ICS form. If someone, other than an Amateur Radio operator, filling out the document were asked to provide a "count," the person would have no idea what was being asked of him or her. There is no restriction of the size (word count) in the original message or the reply in the ICS-213. In the same manner, there is no understanding, outside of Amateur Radio, of what "precedence" is and how to apply precedence to a message. In this case, one or two simple questions by the receiving operator would help to determine the issue.

How could the ICS-213 document be modified to best meet our broad needs? We would think that it should be "clean" and understandable for the initiator of the document. It should also allow the operator tasked with sending the message to keep accurate records for that station's activity log.

It is my hope that this article sparks a positive and constructive dialogue that will result in an agreement on how amateur and served agency forms should be used together. Such agreement will allow all ARES®/RACES groups across the country to assist our served agencies even better and — if needed — to allow radio amateurs coming into a disaster scene from outside the affected area to start assisting with as little on-site training as possible.

## REMINDER ABOUT EMERGENCY PREPAREDNESS KITS

Currently the United States is in the midst of one of the largest food recalls in American history. As Americans dig through their cabinets and refrigerators to remove potentially contaminated food associated with the recent peanut recall, we would like to also remind citizens to open and check their Emergency Preparedness Kits to remove any potentially harmful items from these also.

Because peanut products are often recommended as staples in Emergency Preparedness Kits due to their long shell life and because they are a good source of protein, we encourage all kit owners to look at their kits to ensure food products are not on the peanut recall list. Please keep in mind that the peanut product recall extends beyond peanut-flavored products. The following are some examples of foods also included in the recall that may contain peanuts: granola, snack bars, crackers, cereal, trail mix, cookies, noodles, dog treats.

A full list of recalled peanut products and what individuals should do with recalled items can be found on the Food and Drug Administration's Web site, **www.accessdata.fda.gov/scripts/peanutbutterrecall/index.cfm**.

In addition to checking for peanut-related items, please be sure to check for other items in your kit that may have expired, including medications, food and pet food, water and other recalled items. The US government provides information on unsafe, hazardous or defective consumer products, food, medicine and cosmetics at **www.recalls.gov**.

Ensuring family and neighbors are prepared is an essential step in helping communities during and after an emergency. Families should have an Emergency Preparedness Kit in all locations that are frequented often, including homes, offices, schools, cars and day care facilities. These kits should hold a variety of essential items that are needed during a disaster, such as a flashlight, radio, cash, clothing, protective equipment, medicines and of course food and water. For a complete list of Emergency Preparedness Kit recommended items, please visit **www.fema.gov/plan/prepare/supplykit.shtm**.

*Citizen Corps Councils and Partners*: Councils and partners should remind their communities about the importance of maintaining and constructing an Emergency Preparedness Kit and consider hosting public preparedness training sessions to ensure that information about kits is reaching the community. In addition, Councils and partners should consider adding a link to the FDA Web sites along with information on the recall on peanut products to any Web pages or documents that refer to community preparedness or Emergency Preparedness Kit preparation.

This news story and other Community Preparedness news, including Citizen Corps Bulletins, can be found on our Web site at **http://citizencorps.gov/**. [Since 2003, ARRL has been an official affiliate program of Citizen Corps, an initiative within the DHS to enhance public preparedness and safety. — *Ed.*] — *The National Office of Citizen Corps, FEMA Community Preparedness Division*

# OP-ED

# Kindness in Amateur Radio

*William Baker, PhD, W1BKR*
**w1bkr@arrl.net**

February's "Op-Ed" called on all of us in the Amateur Radio community to treat one another with greater civility and respect. I could not agree more with that call and want to add a few words of my own.

I recently coauthored, with Michael O'Malley (Yale University), a book called *Leading With Kindness*, which was published by the American Management Association. In the book, Michael and I reject the old idea that people must be forced into productivity and we show that any organization is most productive when kindness guides the actions and decisions of its leaders. We show, with considerable data to back us up, that our current economic crisis was aided greatly by an epidemic of unkindness in American management.

By "kind" we don't mean a wimp. Gandhi was quoted as saying, "Don't mistake my kindness for weakness." The kind bosses we talk about are like good parents — people who make hard decisions and demand high performance with integrity. But they are also folks who display compassion, gratitude and humility.

Kind management not only improves the daily experience of those who work in an organization, but in difficult times it can ensure an organization's very survival. Research shows — not unexpectedly — that people working under "bully" bosses are reluctant to pass vital information up the chain of command. In a word, if employees repeatedly get slapped down for speaking up, they simply stop telling their bosses what's going on. Managers and leaders who don't show respect to those under them pay for it by being stranded without information and support when they most need it, as recent events so painfully show.

I'm inclined to believe some Wall Street leaders who testified that they really didn't know how dire the state of their companies had become. If, like so many American managers, they had long since bullied their employees into a resentful silence, it is almost guaranteed that the collapse of the organizations they presided over came to them as an unpleasant surprise.

Leadership styles are perhaps even more important in the Amateur Radio world, made up as it is of a patchwork of independent clubs and suborganizations. Amateur Radio volunteer organizations can thrive and function efficiently under leadership that values respect and kindness or they can deteriorate under imperious, "tough-minded" leaders. Many such leaders are not bad people. They are good people who just learned some bad habits by example (oftentimes angry parents) and who imitate and propagate that bad example in any group they join.

While the free flow of information up the chain of command could have insured a greater measure of corporate survival, the free flow of information from place to place in time of disaster, facilitated by the network of Amateur Radio operators, has at times aided actual, human survival. Imagine the situation if, after Hurricane Ike, the ham network that temporarily replaced failing cellular networks had been weakened or made less cooperative because of unkind leadership within the Amateur Radio community. Human safety may have been at risk and a remarkable opportunity to provide a true service to the larger community would have gone unrealized.

We've all seen clubs with strong leaders who presume that their group needs toughness to keep folks moving. A bullying leadership style can sometimes get results but only in the short term. Time and time again I've seen that clubs with leaders who respect their members, and organizations who respect and value other organizations, are the only ones whose good influence has a chance to last.

A key tenet of kind leadership and management is to treat all employees as volunteers. There are few things a person can give more valuable than their time — the only truly finite commodity any person has. A kind manager acknowledges the gift of another person's time by establishing an organizational culture of mutual respect. In the Amateur Radio community, where nearly everybody really *is* an unpaid volunteer, the advantages to valuing the gift of any person's time by treating them with respect should be self-evident.

Kind leadership could do more than help the current Amateur Radio community thrive. If we want to pass on Amateur Radio, that particular body of knowledge and set of traditions that inspire such fascination and fun, we have to maintain not only durable organizations, but ones that will continue to attract new people — and that means having leaders and members who, both in meetings and on the air, lead with kindness.

*William Baker, W1BKR, is President Emeritus of Thirteen/WNET, New York, America's flagship PBS station, and a University Professor at Fordham University, New York. You can contact the author at 2 Highgate Rd, Riverside, CT 06878-2611;* **w1bkr@arrl.net**.

### Op-Ed Policy

The purpose of Op-Ed is to air member viewpoints that may or may not be consistent with current ARRL policy.

1) Contributions may be up to 900 words in length.

2) No payment will be made to contributors.

3) Any factual assertions must be supported by references, which do not necessarily have to be included in the body of the article to be published.

4) Articles containing statements that could be construed as libel or slander will not be accepted.

5) The subject matter chosen must be of general interest to radio amateurs, and must be discussed in a way that will be understandable to a significant portion of the membership.

6) With the exception that the article need not be consistent with League policy, the article will be subject to the usual editorial review prior to acceptance.

7) No guarantee can be made that an accepted article will be published by a certain date, or indeed, that it will be published at all; however, only articles that we intend to publish will be accepted, and any article we have decided against publishing will be returned promptly.

8) Send your contributions to ARRL Op-Ed, 225 Main St, Newington, CT 06111 or via e-mail to **qst@arrl.org** (subject line Op-Ed).

# Strays

## SPECIAL VP9 CALL SIGNS

♢ 2009 is the 400th year anniversary of the settling of Bermuda by Sir George Somers. There are many island wide events planned by most organizations. The Radio Society of Bermuda has been granted a special call sign for use this year — VP94ØØ/xx. The xx suffix is the operator's call sign, VP94ØØ/LP, for example. There are a few Novice licensees who have a three letter suffix, such as NMT. — *Rose Spershott, VP9LP, Secretary, Radio Society of Bermuda*

# This Month in Contesting

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

## ANOTHER RADIOSPORT: ARDF

Your heart pounds as you rotate the antenna, searching for the next signal. Up and down you look, unable to find the correct heading. Then, suddenly, there it is — it's getting stronger — stronger still. Yes, there it is, you've got it. Another one in the bag, four more to go.

That sounds like the procedure used by many a contester finding the next multiplier in a big DX contest; yet it is also the same procedure used by a completely different set of people who are also doing Radiosport.

When you use the term Radiosport, most folks in the United States think of on-air contesting. Yet there is another definition of the word, one in which the competition is just as intense and the results are taken just as seriously. In this other world of Radiosport, men and women of all ages put on their running shoes, a set of headphones attached to a receiver, a map or compass and a small, handheld directional antenna. They then run through a course in a forest or trail, trying to find several hidden transmitters as fast as possible. This is the world of competitive ARDF, or Amateur Radio Direction Finding.

### How Does an ARDF Competition Work?

ARDF (sometimes called "foxhunting") is done throughout the world on a recreational basis. Many local clubs offer the following scenario: a ham gets to be the "fox" by finding a hidden location somewhere in the club's vicinity, then making short transmissions every 10 minutes or so, usually on a VHF simplex frequency. Other members of the club then use portable directional antennas to try and find the hidden club member. The first person or team to do so has "found the fox." Competitive ARDF combines casual foxhunting with more athletic pursuits such as running and orienteering. Participants have to run a course, usually through a forest or hilly terrain, and find hidden transmitters as quickly as possible. The sport got its start in Eastern Europe in the 1950s and quickly blossomed throughout Europe and Asia.

Over the years, a set of rules was defined and national competitions were held. ARDF competitions use 2 meters and 80 meters, as these bands are universally available throughout the world. Further codification of the rules and endorsement by the International Amateur Radio Union (IARU) eventually led to the first World Championships, held in Poland in 1980. Eleven countries were represented. US teams first started competing in the 1990s. In 2008, the World ARDF Championships were held in South Korea; 28 countries participated, including relative latecomers to the sport, such as the United States and Australia.

### Get to the Points

ARDF events are scored based on the number of transmitters found and the amount of time it takes the entrant to complete the course. There are currently nine entry classes in organized ARDF events, based on the age and gender of the entrant. While a control operator is needed for the transmitters on the course, it is generally not required to have an amateur license to compete, as the competition is based on receiving.

Think you'd like to give competitive ARDF a try? Maybe you'd just like to see an ARDF competition in action? You can visit the IARU Region 2 ARDF page on the Web at **www.ardf-r2.org/en**. There, you will find the standardized rules, a list of events, ARDF clubs and other information. Another great resource is **www.homingin.com**, which has lots of information for the beginning ARDF participant.

If you will be near Boston on June 5-7, you can see world-class ARDF competition in person! The Ninth USA ARDF Championships will be taking place about 10 miles south of Beantown. This is the top-level competition in the US; there will be many competitors from all across the country and even some DX locations as well. This event is also serving as the IARU Region 2 ARDF Championships. For more information, you can visit **www.bostonardf.org**. Stop by and see what the other world of Radiosport is made of!

## Sean's Picks

- **State QSO Parties This Month**: Seventh Call Area, Indiana, New England, Nevada.
- 2009 is the Year of the State QSO Party! Visit **www.arrl.org/ysqso** for details!
- **MARAC CW and SSB Contests (May 2-3)**: County Hunters, take note! This is *the* event for you. All sorts of rare counties will be on for this one. If you live near some rare counties, this is an easy event to pack up a mobile rig and operate the other side of the pileup!
- **Alessandro Volta RTTY DX Contest (May 9-10)**: Work the world on RTTY in this 24 hour Italian event, in honor of the Italian discoverer of electricity, Alessandro Volta. Grazie, Alessandro!
- **FISTS Spring Sprint (May 9)**: 4 hours of CW fun, sponsored by the International Morse Preservation Society. See how many "Fists" you can work.
- **50 MHz Spring Sprint (May 9-10)**: Get pumped up for the 6 Meter season by working this short event. Stations send their grid square. If you have an HF rig that also includes 6 meters, this is a fun event to try 6 meters for the first time.
- **EU PSK DX Contest (May 16-17)**: PSK is entering its second decade and there are lots of on-air events using this mode. Everybody works everybody in this 24 hour DX contest. Getting on PSK is easy, and because you can work the world with 25 W and a dipole, it's great fun for stations with antenna restrictions. Try it!
- **CQ WPX CW Contest (May 23-24)**: The last major HF contest before the summer "off-season." Prefixes are multipliers, making a KZ5 just as valuable as a XU7. Everybody works everybody.
- **QRP ARCI Hootowl Sprint (May 31)**: From 8 PM to midnight local time, see what 5 W or less can do for you on CW. You'll be surprised at what you can work. Send a signal report, State or Province, and your QRP ARCI member number. If you're not a member, send your power instead of your member number. This one is *fun*!

## Operating Tip of the Month

*"Get Focused: For the next major contest, concentrate on developing your operating skills. See what you and your station are capable of without extra technology. What band openings can you predict? What multipliers will you find? Development of these core skills will let you adopt and use new technologies more effectively in the long run."*

# CONTEST CORRAL

in association with the *National Contest Journal*

# May 2009

| Start and Finish | HF | VHF+ | Contest Title | SSB | CW | Dig | Exchange | Sponsor's Web Site |
|---|---|---|---|---|---|---|---|---|
| May 2, 0000Z - May 3, 2400Z | | 2.3, 3.4G | EU EME Contest | ✘ | ✘ | | TMO/RS(T) and "R" | www.dubus.org |
| May 2, 0000Z - May 3, 2400Z | 3.5-28 | 50-432 | MARAC CW and SSB Contests | ✘ | ✘ | | RS(T), state, county abbreviation | www.countyhunter.com |
| May 2, 0001Z - May 3, 2359Z | 28 | | 10-10 Spring CW & Digital Contests | | ✘ | ✘ | Call sign, name, 10-10 number, state | www.ten-ten.org |
| May 2, 6 AM - May 2, 1 PM | | 902+ | Microwave Spring Sprint | ✘ | ✘ | ✘ | Grid square (6-character preferred) | www.sysadnet.com/vhfsprintrules.htm |
| May 2, 1300Z - May 3, 0700Z | 1.8-28 | 50,144 | 7th Area QSO Party | ✘ | ✘ | ✘ | State and county code | www.7qp.org |
| May 2, 1500Z - May 3, 1500Z | 3.5-28 | | Portuguese Navy Day | ✘ | ✘ | ✘ | RS(T), serial | www.nra.pt |
| May 2, 1600Z - May 3, 0400Z | 1.8-28 | | Indiana QSO Party | ✘ | ✘ | | RS(T) + S/P or IN county, DX RS(T) only | www.hdxcc.org/inqp |
| May 2, 1700Z - May 3, 0459Z | 3.5-15 | | Radio Club of America QSO Party | ✘ | | | RS, QTH, name, equipment | www.radio-club-of-america |
| May 2, 2000Z - May 3, 1959Z | 1.8-28 | | ARI International DX Contest | ✘ | ✘ | ✘ | RS(T), serial or Italian province | www.qsl.net/contest_ari |
| May 2, 2000Z - May 3 2400Z | 3.5-28 | | New England QSO Party | ✘ | ✘ | ✘ | RS(T) and S/P or New England county | www.neqp.org |
| May 2, 6 AM - May 3, 8 PM | | 2.4G+ | 2 GHz and Up World Wide Contest | ✘ | ✘ | ✘ | 6-char grid locator | www.ham-radio.com/sbms |
| May 9, 1200Z - May 10, 2400Z | 1.8-28 | | Armed Forces Comm'ns Test | ✘ | | ✘ | RS(T) | www.netcom.army.mil/mars |
| May 9, 1200Z - May 10, 1200Z | 1.8-28 | | CQ-M International DX Contest | ✘ | ✘ | | RS(T) and serial | www.cq-m.andys.ru |
| May 9, 1200Z - May 10, 1200Z | 3.5-28 | | Alessandro Volta RTTY DX Contest | | | ✘ | RST, serial, CQ zone | www.contestvolta.com |
| May 9, 1700Z - May 9, 2100Z | 3.5-28 | | FISTS Spring Sprint | | ✘ | | RS(T), S/P/C, name, FISTS nr or power | www.fists.org/sprints.html |
| May 9, 1700Z - May 10, 1700Z | 1.8-28 | 50 | Nevada Mustang Roundup QSO Party | ✘ | ✘ | ✘ | RS(T) and S/P/C or NV county | nv.arrl.org/NQP |
| May 9, 2300Z - May 10, 0300Z | | 50 | 50 MHz Spring Sprint | ✘ | ✘ | ✘ | Grid square (6-character preferred) | www.sysadnet.com/vhfsprintrules.htm |
| May 16, 1200Z - May 17, 1200Z | 3.5-28 | | EU PSK DX Contest | | | ✘ | RST and EU area code or serial | www.eu.srars.org |
| May 16, 1500Z - May 17, 2359Z | 3.5-28 | | All America Contest | | ✘ | | RST, continent, and category | www.powerline.com.br/cwjf/eng4.htm |
| May 16, 1200Z - May 17, 1200Z | 1.8-28 | | His Majesty King of Spain Contest | | ✘ | | RST and serial or EA province | www.ure.es |
| May 16, 2100Z - May 17, 0200Z | 3.5 | | Baltic Contest | ✘ | ✘ | | RS(T) and serial | www.lrsf.lt/bcontest |
| May 17, 1000Z - May 17, 1400Z | 1.8-7 | | Worked All Britain - LF Phone | ✘ | | | RS, serial, and WAB nr or DXCC entity | www.worked-all-britain.co.uk |
| May 23, 0000Z - May 23, 2359Z | 1.8-28 | 50,144 | Bill Windle QSO Party | | ✘ | | RST, name, FOC number | kz5d@aol.com |
| May 25, 2300Z - May 26, 0300Z | 1.8-28 | | MI QRP Memorial Day CW Sprint | | ✘ | | RST, S/P/C, MI QRP number or power | www.miqrp.org |
| May 30, 0000Z - May 31, 2400Z | 3.5-28 | | CQ WPX Contest | | ✘ | | RST and serial | www.cqwpx.com |
| May 30, 0000Z - May 31, 2400Z | | 1.2G | EU EME Contest | ✘ | ✘ | | TMO/RS(T) and "R" | www.dubus.org |
| May 30, 1400Z - May 31, 2200Z | 3.5-28 | 50,144,440 | Kids Roundup | ✘ | | | Call sign, QTH, category, first name | kidsroundupcontest.w3vpr.org |
| May 31, 8 PM - May 31, Midnight | 3.5-28 | | QRP ARCI Hootowl Sprint | | ✘ | | RST, S/P/C QRP number or power | www.qrparci.org |

**All dates refer to UTC and may be different from calendar date in North America. Times given as AM or PM are local times and dates.**
**Refer to the contest Web sites for full rules, scoring information, operating periods or time limits, and log submission information.**
**No contest activity occurs on 30, 17, 12 meters. Serial — Sequential number of the contact. S/P/C — State, Province, DXCC Entity.**
**Publication deadline for Contest Corral listings is the first day of the second month prior to publication.**

**Check for updates, additional contests and a downloadable PDF version online at www.arrl.org/contests**

## MAY 2009 QUALIFYING RUNS

♦ W1AW Qualifying Runs are 7 PM EDT (2300Z) Monday, May 4 (10-40 WPM) and 9 AM EDT (1300Z) Friday, May 22. The West Coast Qualifying Run will be transmitted on 3590 and 7047.5 kHz by station K9JM at 9 PM PDT Wednesday, May 13 (0400Z May 14). Unless otherwise indicated, code speeds are from 10-35 WPM.

## ARRL Field Day is June 27-28!

Hams will be heading to the hills (and anyplace else you can imagine) once again next month. The Announcement is elsewhere in this issue. There will be more about FD2009 in the June issue — stay tuned!

## In the May/June "Contesting 101"

***SO2R: Single-Operator, Two Radios***. Kirk Pickering, K4RO, talks about how to get started in this style of operating, and why you would want to. Contesting 101 can be found in the *National Contest Journal*, published six times per year. For subscription information, visit **www.arrl.org/ncj**.

# 2008 ARRL CW Sweepstakes

## Record submissions and record scores made 2008 the best SS ever!

**Kelly Taylor, VE4XT**
ve4xt@mts.net

If there's one thing about Sweepstakes that keeps people coming back and continues to attract new entrants, it's that anyone, anywhere — with the right spirit, technique and old-fashioned perseverance — can be competitive and have fun. That's no more apparent than in the geographic distribution of winners for the 2008 running of CW Sweepstakes: two from California and one each from New Mexico, Colorado, Kansas and Tennessee; or, in that the 2008 running, at the depths of the sunspot doldrums, attracted record participation.

"SS is one of the contests that I can actually win from Tennessee and therefore it gets my full attention each year," writes three-time QRP (<5 W) champion Kirk, K4RO, who has returned to the top of the podium once again. "It's a lot more level playing field compared to a DX contest," writes Ken, N6RO, who surprised even himself with the Unlimited crown.

With sunspots rarer than Yukon QSOs, scores must have been dismal, right?

Wrong — an amazing 57 new Section records and 19 Division records were swept away. Even more amazing, two all-time records were set: Steve, N2IC, pumped the high-water mark in Single-Op, High-Power to 244,640 points, and Bob, KØHC, hoisted the School category flag into the rafters at 190,720. N2IC's score is the highest ever made in CW Sweepstakes in any category! Not bad for a "dying" mode on dead bands, eh? (The Web version of the write-up contains a complete list of all new records, and the complete list of records is available at **www.arrl.org/contests/**.)

### Category Champs

Steve, N2IC, has taken the Single-Op High-Power crown again from New Mexico, edging out Puerto Rican powerhouse WP3R. In 2008, WP3R was piloted by Alex, LZ4AX. Randy, KØEU, has ridden his Colorado station to the top of Single-Op Low-Power for the third time running.

From California, Ken, N6RO, is on top of the Unlimited category while the crew at W6YI walked away with the Multioperator title. Rounding out the North American odyssey is Bob, WØBH, who again won the School Club category from KØHC in Kansas.




### Single Operator, High Power

If there was any doubt that WP3R would return to the Top 10, consider that WP3R operator Alex, LZ4AX, lost to N2IC by only six QSOs — so close that log checking could have easily reversed the title. Not far behind was Gator, N5RZ, operating at K5TR, who took third place by the narrowest of margins — one QSO — over NØNI, operated by Mark, AG9A. Talk about a photo finish!

Steve, N2IC, isn't ready to declare the Puerto Rico advantage dead despite having won two in a row. "Puerto Rico and the Virgin Islands will always have an advantage. It's hard to compete with a rare multiplier that has simultaneous propagation to the entire mainland all day Sunday," Steve writes in an e-mail. Even so, he warns that his New Mexico location may only get better as the sunspots return and 15 and 10 meters become productive again.

For his part, Alex isn`t making any excuses, but admits that taking time off from defending a university dissertation to walk in the shoes of an operator with eight consecutive SS CW wins wasn`t easy. Especially considering he couldn't get into one of those shoes given his foot was in a cast after suffering a serious ankle injury playing volleyball the Tuesday before the contest.

He has little to excuse. As Alex notes in his posting on the 3830 Contest Claimed Score e-mail reflector, he found he was almost 200 QSOs behind Steve on Sunday morning." Here I realized that if I don't do something I'm going to get beaten *really* badly," he writes.

This is where an oft-repeated tidbit of contesting advice returns. Just as Steve noted last year, perseverance pays off. "There was nothing else to do except concentrate on the radios and forget everything else," Alex wrote. Ending with a six QSO difference shows the strategy almost worked. Here's hoping your ankle feels better, Alex.

### Single Operator, Low Power

Randy, KØEU, has the change in dates for daylight saving time to thank, in part, for his victory. For years, SS in Colorado started at 2 PM local time. So when 2 PM rolled around and he couldn't get his logging software to work right, he thought he was off to a really bad start.

"I tried everything I could think of to fix it and was in major panic mode. In desperation, I installed an earlier version of the software and the problem went away," Randy writes in an e-mail, eventually tracing the issue to his computer, not the software.

"Everyone knows that the first few hours are critical in SS and I figured I was toast when I finally got things ready at about 2:20 PM local time." The quiet bands were, well, disquieting, but when someone answered his CQ SS with a "40 min early," it finally dawned on him. Murphy wasn't done with Randy yet, but he did hold off until after the contest to break the boom on his combined 6 element 20 meter and 3 element 40 meter Yagi.

He hit his sweep in good time. VY1EI popped up on the second radio about 3.5 hours in and when he took his first break at 13.5 hours, he needed just North Dakota and Newfoundland-Labrador, both of which he nailed in his first hour back, snagging VO1HP and KEØA. "What a relief. That meant that I didn't have to worry about multipliers and could concentrate totally on rate for the remainder of the contest. I'm not sure how much longer my streak will hold. I truly believe there's an element of luck in winning SS and I've been blessed to win 3 years in a row."

Randy's sweep certainly paid off. It held off Tor, N4OGW's strong showing. Tor


## 2008 ARRL Sweepstakes, CW

| | Score | QSOs | Mults | Hrs |
|---|---|---|---|---|
| ***Single Operator, QRP*** | | | | |
| K4RO | 124,960 | 781 | 80 | 24 |
| W7YAQ | 106,176 | 672 | 79 | 23 |
| K8MM | 106,018 | 671 | 79 | 22 |
| W2RU | 104,754 | 663 | 79 | 22 |
| NØUR | 104,320 | 652 | 80 | 23 |
| KØAV | 99,792 | 648 | 77 | 24 |
| N7IR | 94,010 | 595 | 79 | 24 |
| KR2Q | 93,478 | 607 | 77 | 22 |
| W6JTI | 89,744 | 568 | 79 | 24 |
| K9ZO | 87,164 | 592 | 77 | 25 |
| ***Single Operator, Low Power*** | | | | |
| KØEU | 188,160 | 1,176 | 80 | 24 |
| N4OGW | 186,440 | 1,180 | 79 | 24 |
| K7BG | 183,768 | 1,179 | 78 | 24 |
| N5AW | 179,200 | 1,127 | 80 | 24 |
| VA7RR | 173,760 | 1,086 | 80 | 24 |
| N7OU | 173,326 | 1,097 | 79 | 24 |
| K6LA | 171,746 | 1,087 | 79 | 24 |
| NØAT (NØKK, op) | 164,640 | 1,030 | 80 | 24 |
| N5DO | 164,320 | 1,040 | 79 | 23 |
| N9CK | 163,840 | 1,024 | 80 | 24 |
| ***Single Operator, High Power*** | | | | |
| N2IC | 244,640 | 1,529 | 80 | 24 |
| WP3R (LZ4AX, op) | 243,680 | 1,523 | 80 | 24 |
| K5TR (N5RZ, op) | 241,600 | 1,510 | 80 | 24 |
| NØNI (AG9A, op) | 241,440 | 1,509 | 80 | 24 |
| K5GO | 231,680 | 1,448 | 80 | 24 |
| WXØB (K5GA, op) | 230,880 | 1,447 | 80 | 24 |
| W7RM (N6TR, op) | 227,040 | 1,419 | 80 | 24 |
| K5NA | 222,080 | 1,388 | 80 | 24 |
| W9RE | 218,240 | 1,372 | 80 | 24 |
| VY2ZM (K1ZM, op) | 217,760 | 1,361 | 80 | 24 |
| ***Single Operator, Unlimited*** | | | | |
| N6RO | 207,200 | 1,295 | 80 | 24 |
| W6YX (N7MH, op) | 203,520 | 1,272 | 80 | 24 |
| N4BP | 201,760 | 1,261 | 80 | 24 |
| K3MM | 197,342 | 1,249 | 79 | 24 |
| K6LL | 196,868 | 1,246 | 79 | 24 |
| KH6LC (SMØDRD) | 194,400 | 1,215 | 80 | 24 |
| N4ZZ | 193,920 | 1,212 | 80 | 24 |
| W8MJ | 193,760 | 1,214 | 80 | 24 |
| K6YT (WØYK, op) | 192,960 | 1,208 | 80 | 24 |
| K6TA (N6BV, op) | 190,720 | 1,192 | 80 | 24 |
| ***Multioperator*** | | | | |
| W6YI | 235,840 | 1,474 | 80 | 24 |
| NR5M | 234,720 | 1,467 | 80 | 24 |
| N6VR | 228,480 | 1,428 | 80 | 24 |
| K1RX | 220,960 | 1,381 | 80 | 24 |
| K4TD | 214,560 | 1,341 | 80 | 24 |
| W7RN | 214,080 | 1,338 | 80 | 22 |
| KP2M | 208,960 | 1,306 | 80 | 24 |
| KT1D | 199,040 | 1,244 | 80 | 24 |
| K2NNY | 198,880 | 1,243 | 80 | 24 |
| W4RM | 196,800 | 1,230 | 80 | 24 |
| ***School Club*** | | | | |
| KØHC (WØBH, op) | 190,720 | 1,192 | 80 | 24 |
| W1MX (KBØVVT, op) | 106,080 | 663 | 80 | 19 |
| N9UC | 50,880 | 318 | 80 | 8 |
| K5LSU | 45,600 | 304 | 75 | 19 |
| N5XU (AA5BT, op) | 19,200 | 160 | 60 | 4 |
| W8SH | 14,616 | 126 | 58 | 7 |
| N9GTC | 6,600 | 75 | 44 | 3 |

scored more QSOs than Randy but missed a sweep by one section, costing him the title. Third place Matt, K7BG, also scored more QSOs than Randy and only one fewer than Tor, but missed the sweep by two sections.

### Single Operator, QRP

A common misconception among those who have never tried it or those who have never won is that you can't CQ when QRP. How can you generate any traffic with power that wouldn't even warm up a light bulb? Antennas help, but in the main, finding clear frequencies to CQ and being persistent pays off. And if anyone knows that, it's Kirk, K4RO, who won QRP in 2008.

"I basically never stop CQing somewhere on one radio and I never stop tuning the second radio looking for QSOs. I keep both radios fully active for the entire contest, even when it's exhausting," Kirk writes in an e-mail. "Having effective antennas (two for each of the "important" bands, 40 meters and 80 meters) also helps a lot. The real secret to my success is to keep plugging away year after year. Eventually my number comes up."

Kirk was pleased to learn his sweep stood up through the log-checking process. He's lost a sweep in the past when the only QSO with a section was busted. But a sweep with 5 W is far from easy. "The truth is that a QRP sweep takes a lot of work and also a little bit of luck," he writes. "Breaking a pileup on VY1 during SS with 5 W takes every trick in the book, plus a very good operator on the other end as well. The QRP operator also has to know when something is hopeless. If the needed station is very weak and only answering the biggest guns, it's time to move on and come back later for another try."

### Single Operator, Unlimited

No one is perhaps more surprised by his victory than Ken, N6RO, himself. "It's a first for me in 55 years of SS CW in any category, though I had a couple of second and third place finishes in the 1970s," Ken writes in an e-mail. "In the past few years I've been edged out by K6LL in the Unlimited category, so I'm pleased to get by Dave for once."

Ken says he's surprised largely because conditions were so poor and that California lost the advantage it normally has on the productive high bands. "Fortunately, 40 and 80 had good activity during most of the wee hours." But that had its drawbacks, too. "I operated in short spurts nearly all night. That made it tough to concentrate on Sunday and get the 24 hours in."

A note to all contesters: The category name "Unlimited" will replace "Assisted" in all ARRL contests. It is felt that "Single-Operator, Unlimited" was a more accurate and meaningful description of the category. — *Ed.*

### Multioperator

Here is another category won on very small margins. W6YI beat out the crew at NR5M by a mere seven QSOs. It shows once again that to win, BIC time is what counts. BIC is, of course, an acronym for Butt In Chair. Considering W6YI's total amounted to an average of just more than one Q per minute, screw this up by more than 6 minutes over the contest and it could cost you the title.

JASON HISSONG, N8XE

**Jason Hissong, N8XE, of Hilliard, Ohio was so happy to get his first-ever Clean Sweep, he gave thanks to the propagation gods by tying a broom to his tower after working Nevada for his last one.**

The 3830 e-mail reflector posting for W6YI, entered by John, K6AM, offers some clue to both W6YI's and N6RO's victories. "Bands were in pretty good shape all weekend here on the Left Coast. The station played real well thanks to the fine maintenance from Jim, W6YI."

### School Club

Kansas may be best known for launching Dorothy into Oz, but it seems there's no place like home for Bob, WØBH, who again took KØHC at Hesston College in Hesston, Kansas to the top of the School Club category.

Rebecca, KBØVVT, returns to Top 10, this time from W1MX, the Massachusetts Institute of Technology, in the no. 2 spot in School Club. Despite the equalizer effect of SS, it is still very hard to win from the East Coast.

### Tight Races

Often overlooked but often more interesting than the overall winners, are those tight races in SS for awards of less prominence but just as important to the winners. If there was an award for the closest victory for a section, it would go to Joe, WØDB, who chaired Ed's, WØSD, South Dakota station to a three-QSO victory over Todd, WDØT, in high-power. Both earned sweeps.

Not far behind was Arnie, N6HotelCalifornia, beating Kurt, W6PH, by five QSOs, also in high-power, for the Orange section title. Again, both earned sweeps.

## Table 2
## 2008 November CW Sweepstakes Plaque Winners

Thanks to the generous sponsorship of numerous clubs, individuals and ICOM America — the principal awards sponsor for the 2008 ARRL November Sweepstakes — we are pleased to announce that the Overall and Division leaders in each category receives a Sweepstakes plaque. The ARRL wishes to thank the plaque sponsors for their continued commitment to the ARRL Plaque Program. Without their support and dedication, the Plaque Program would not be possible.

| *Division/Plaque Category* | *Winner* | *Plaque Sponsor* |
|---|---|---|
| **Overall** | | |
| Single Operator High Power CW | N2IC | Trey Garlough, N5KO |
| Single Operator Low Power CW | KØEU | Sean Kutzko, KX9X |
| Single Operator QRP CW | K4RO | QRP Amateur Radio Club International |
| Single Operator Unlimited CW | N6RO | Hal Kennedy, N4GG |
| Multioperator CW | W6YI | ICOM America |
| School Club College Division | KØHC (WØBH, op) | ICOM America |
| **Atlantic** | | |
| Single Operator High Power CW | AA3B | North Coast Contesters |
| Single Operator Low Power CW | WY3A | Potomac Valley Radio Club |
| Single Operator QRP CW | W2RU | ICOM America |
| Single Operator Unlimited CW | K3MM | ICOM America |
| Multioperator CW | K2NNY | North Coast Contesters |
| **Central** | | |
| Single Operator High Power CW | W9RE | Society Of Midwest Contesters |
| Single Operator Low Power CW | N9CK | Society Of Midwest Contesters |
| Single Operator QRP CW | K9ZO | Sean Kutzko, KX9X |
| Single Operator Unlimited CW | K9NW | ICOM America |
| Multioperator CW | K9MOT | ICOM America |
| School Club CW | N9UC | ICOM America |
| **Dakota** | | |
| Single Operator High Power CW | WØSD (WØDB, op) | Minnesota Wireless Association |
| Single Operator Low Power CW | NØAT (NØKK, op) | Minnesota Wireless Association |
| Single Operator QRP CW | NØUR | Tod Olson, KØTO |
| Single Operator Unlimited CW | KTØR (KØOB, op) | Minnesota Wireless Association |
| Multioperator CW | KØHB | Minnesota Wireless Association |
| **Delta** | | |
| Single Operator High Power CW | K5GO | ICOM America |
| Single Operator Low Power CW | N4OGW | ICOM America |
| Single Operator QRP CW | K4RO | ICOM America |
| Single Operator Unlimited CW | N4ZZ | ICOM America |
| Multioperator CW | W5RU | ICOM America |
| School Club CW | K5LSU | ICOM America |
| **Great Lakes** | | |
| Single Operator High Power CW | W5MX | North Coast Contesters |
| Single Operator Low Power CW | N8SS | Mad River Radio Club |
| Single Operator QRP CW | K8MM | Mad River Radio Club |
| Single Operator Unlimited CW | W8MJ | ICOM America |
| Multioperator CW | K8CC | ICOM America |
| School Club CW | W8SH | ICOM America |
| **Hudson** | | |
| Single Operator High Power CW | N2NT (N2NC, op) | ICOM America |
| Single Operator Low Power CW | K2UF | ICOM America |
| Single Operator QRP CW | KR2Q | ICOM America |
| Single Operator Unlimited CW | N2ED | ICOM America |
| Multioperator CW | WW2DX | Stuart Silverstein, K3UEI, Memorial |
| **Midwest** | | |
| Single Operator High Power CW | NØNI (AG9A, op) | ICOM America |
| Single Operator Low Power CW | KX9X (@ KEØRC) | Society Of Midwest Contesters |
| Single Operator QRP CW | NØSS | ICOM America |
| Single Operator Unlimited CW | KØOU | ICOM America |
| Multioperator CW | ABØS | ICOM America |
| School Club CW | KØHC (WØBH, op) | ICOM America |
| **New England** | | |
| Single Operator High Power CW | N1LI (K1DG, op) | ICOM America |
| Single Operator Low Power CW | K1BX | ICOM America |
| Single Operator QRP CW | AA1CA | QRP Club of New England |
| Single Operator Unlimited CW | W1SJ | ICOM America |
| Multioperator CW | K1RX | ICOM America |
| School Club CW | W1MX (KBØVVT, op) | ICOM America |
| **Northwestern** | | |
| Single Operator High Power CW | W7RM (N6TR, op) | ICOM America |
| Single Operator Low Power CW | K7BG | ICOM America |
| Single Operator QRP CW | W7YAQ | ICOM America |
| Single Operator Unlimited CW | KB7Q | ICOM America |
| Multioperator CW | NN7SS | ICOM America |
| **Pacific** | | |
| Single Operator High Power CW | KH7X (KH6ND, op) | ICOM America |
| Single Operator Low Power CW | N6NF | Robert A. Wilson, N6TV |
| Single Operator QRP CW | W6JTI | ICOM America |
| Single Operator Unlimited CW | N6RO | ICOM America |
| Multioperator CW | W7RN | ICOM America |
| **Roanoke** | | |
| Single Operator High Power CW | N4AF | Potomac Valley Radio Club |
| Single Operator Low Power CW | K8AC | Raleigh Amateur Radio Society - W4DW |
| Single Operator QRP CW | K3AN | Bill Harding, K4AHK |
| Single Operator Unlimited CW | W4MR (AA4NC, op) | ICOM America |
| Multioperator CW | W4RM | ICOM America |
| **Rocky Mountain** | | |
| Single Operator High Power CW | N2IC | ICOM America |
| Single Operator Low Power CW | KØEU | Grand Mesa Contesters of Colorado |
| Single Operator QRP CW | KØAV | Colorado QRP Club |
| Single Operator Unlimited CW | WØZP | ICOM America |
| Multioperator CW | K5TA | ICOM America |
| **Southeastern** | | |
| Single Operator High Power CW | WP3R (LZ4AX, op) | ICOM America |
| Single Operator Low Power CW | N4PN | ICOM America |
| Single Operator QRP CW | W5JBI | ICOM America |
| Single Operator Unlimited CW | N4BP | ICOM America |
| Multioperator CW | K4TD | ICOM America |
| **Southwestern** | | |
| Single Operator High Power CW | K6NA | ICOM America |
| Single Operator Low Power CW | K6LA | Larry Serra, N6NC |
| Single Operator QRP CW | N7IR | N6HE and W6DLD |
| Single Operator Unlimited CW | K6LL | ICOM America |
| Multioperator CW | W6YI | ICOM America |
| **West Gulf** | | |
| Single Operator High Power CW | K5TR (N5RZ, op) | Ken Adams, K5KA |
| Single Operator Low Power CW | N5AW | ICOM America |
| Single Operator QRP CW | N5WLA | ICOM America |
| Single Operator Unlimited CW | N5NA | ICOM America |
| Multioperator CW | NR5M | ICOM America |
| School Club CW | N5XU (AA5BT, op) | ICOM America |
| **Canada** | | |
| Single Operator High Power CW | VY2ZM (K1ZM, op) | ICOM America |
| Single Operator Low Power CW | VA7RR | ICOM America |
| Single Operator QRP CW | VA3NR | QRP Amateur Radio Club International |
| Single Operator Unlimited CW | VE7XF | ICOM America |
| Multioperator CW | VE6EX | |

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

And for all those Minnesota Wireless Association (MWA) members who are passionate about contesting but rarely earn ink in SS write-ups, here are two MWA members who fought tooth-and-nail and earned the no. 3 spot on the tight race chart: Kirk, NØKK, operating at NØAT, edged Al, KØAD, by a mere 10 QSOs in low-power.

Good job to all for providing dramatic finishes to the fight for their sections. The Web version of this article at **www.arrl.org/contests/results** includes a table detailing all of the section-leading races that were decided by fewer than 5000 points. There were quite a few!

Also of note is the continued tribute to Dave, KTØR, who passed away in September of 2007. With the support of his wife Adrienne, members of the MWA have kept his call sign on the air. Dave was a tireless supporter of multioperator contests, hosting many fine events at his station on a relatively small city lot. Greg, KØOB, did the call sign proud, operating KTØR to a 39 QSO Minnesota victory over WØPI in the Unlimited category.

### Want More Stuff To Sweep?

Complete SS CW score listings and extra data can be found on the Web! Visit **www.arrl.org/contests** for more!

### Wrap-up

In next month's *QST*, you'll find the write-up for the Phone weekend of Sweepstakes and discover which hardworking clubs will be taking home the gavels. The 2008 contest featured Clean Sweep brooms and we understand quite a few were ordered! The tradition of Sweepstakes — the oldest domestic contest in Radiosport — is as strong as it has ever been with the 1419 submitted logs representing participation at historic levels. The competition is strong, the finishes close and the victories sweet! We'll look for you once again on the first weekend in November. QST

# 2009 ARRL Field Day — Are You Ready?

## 1800 UTC June 27, 2009 – 2100 UTC June 28, 2009

✘ ***How to obtain full information*:** The full Field Day rules and information packet may be downloaded at **www.arrl.org/contests/forms**. You may also request the full packet by sending a large self-addressed stamped envelope with 4 units of postage to Field Day Packet Request, ARRL, 225 Main St, Newington, CT 06111.

✘ ***What is Field Day?*** Field Day is the largest on-the-air operating event in the world. It is part emergency exercise, part public awareness, part education, and 100% *fun*! Field Day gives both experienced operators and neophytes a chance to share ideas and new experiences in the Amateur Radio.

✘ ***How to participate:*** There are six operating categories for Field Day. Class A is made up of any group (or club) with at least three persons which participates "in the field" away from a normal station location. Class B is for one or two person operations also operating away from a traditional station location. Class C is for Mobile stations. Class D is for home stations operating on commercial power. Class E is for home stations operating on emergency power. Class F is for stations operating from an established Emergency Operations Center.

✘ ***What to say:*** All stations will exchange the number of transmitters they have in simultaneous operation, their entry category, and their ARRL / RAC Section. For example, a station in West Texas operating as Class A with 3 transmitters would send the exchange 3A WEST TEXAS. DX stations will use the term DX in lieu of an ARRL/RAC section designator. The complete list of sections is found at **www.arrl.org/contests**.

✘ ***Where to operate:*** Participants may make Field Day HF contacts on 160, 80, 40, 20, 15 and 10 meters as well as all VHF/UHF bands. Field Day operation is not permitted on the 60, 30, 17 or 12 meter bands.

W8ERV

✘ ***Quirks:*** Stations that begin setting up their Field Day operation before 1800 UTC Saturday may operate only 24 consecutive hours. Stations that do not begin set up until 1800 UTC Saturday may operate the full Field Day time period.

✘ ***Best reason to participate:*** Field Day is fun! Whether you are a hard-core contester, someone who likes to build antennas, a casual operator or someone just curious about the hobby, there are enough things happening at most Field Day sites to capture your interest and get you involved. If you have never operated, make sure you visit your group's GOTA (Get On The Air) station if it operates one and participate!

✘ ***Field Day Extras:*** Don't forget to purchase your official 2009 ARRL Field Day memorabilia. Visit **www.arrl.org/fieldday** for information on all of the Field Day products. Show your support for the most popular Amateur Radio on-the-air operating event of the year!

✘ ***Relative challenge:*** 99% of a successful Field Day takes place before the first QSO is completed. The challenge of Field Day rests in the planning, preparing and setting up the event. By the time you actually start operating, you will find stations on every HF band and mode to keep you busy. VHF/UHF activity and satellite operation also present unique challenges that will keep your group testing its limits of creativity. And don't forget that the W1AW Field Day bulletin will again be transmitted several times by K6KPH in California (see the schedule included with the full rules on the ARRLWeb).

✘ ***Scoring:*** Each CW and Digital QSO counts two points each, Phone QSOs count one point. You may work each station once per band and mode, CW, Phone and Digital. Your multiplier is determined by the maximum amount of power used by any transmitter at your site. Make all QSOs running 5 W or less, with a power source other than commercial mains or a motor driven generator and your multiplier is 5. Make all of your QSOs using 150 W or less and your multiplier will be 2. If you use more than 150 W your multiplier is 1. Voice modes (SSB, AM, FM, etc) are considered Phone. Repeater or Internet relayed contacts do not count for QSO credit.

W8ERV

WA2AXZ

✘ ***Bonus points:*** Because Field Day is really about amateur radio demonstrating its emergency communications capability and community awareness, a wide range of bonus points is available. See rule 7.3 for the complete list of bonus points and which category stations are eligible to claim each.

✘ ***Make sure to look for:*** Though we are at the bottom of the sunspot cycle, there will be activity on 10 meters, though only briefly for many participants. So keep an eye on propagation. Propagation enhancements also may well occur on VHF bands, so keeping an eye on 6 and 2 meters SSB/CW may yield some interesting QSOs.

✘ ***How to report your score:*** Your entry must be postmarked by July 28, 2009. The best way to submit (and earn 50 additional bonus points) is to use the Web applet at **www.b4h.net/cabforms**. Input your summary information at that site and then e-mail or regular mail the supporting documentation. A complete entry must include an official Field Day summary sheet (completely and accurately filled out), documentation or proof of any bonus points your group claims, and a list of stations worked broken down by band and mode (known as a Dupe Sheet). Full logs are not required for reporting Field Day. Regardless of your logging method, paper or electronic, you must still submit a summary sheet in the official format. Non-Web applet e-mail submissions should go to **fieldday@arrl.org**. Paper submissions should go to Field Day Entries, ARRL, 225 Main St, Newington CT 06111. A Cabrillo log file does not include all the necessary summary information, so you must still submit a summary sheet. Cabrillo format logs will be accepted in lieu of dupe sheets, however.

✘ ***For more information:*** Contact the ARRL Contest Branch at **contests@arrl.org** or by phone at 860-594-0236. QST

# 2009 ARRL June VHF QSO Party

## 1800Z Saturday June 13 – 0300Z Monday, June 15

*What makes a VHFer shine*
*Under the last-quarter moon?*
*When the propagation gods align*
*To allow a phenomenon so divine:*
*Sporadic-E in the month of June.*


KØIP

Get ready for the biggest VHF operating event of the year! Thousands of amateurs at home or on the hilltops and roads will see how far they can push signals on the VHF bands. With SSB and CW you can work stations hundreds or thousands of miles away on the VHF, UHF and microwave frequencies. It's too much fun to miss!

**Complete rules can be found at:**

**www.arrl.org/contests**

Submit Cabrillo-formatted electronic logs to **junevhf@arrl.org** or mail paper logs to: ARRL June VHF QSO Party, 225 Main St, Newington, CT 06111. Log deadline is 0300Z Wednesday, July 15, 2009.

# SPECIAL EVENTS

***Contact these stations and help commemorate history. Many provide a special QSL card or certificate!***

**Apr 18-Apr 19, 1400Z-0100Z**, Orange, VA. Albemarle Amateur Radio Club, W4DO. Stonewall Jackson BSA Council Camporee — Montpelier. 14.230 7.215 3.815 3.530. QSL. AARC, PO Box 6833, Charlottesville, VA 22906. **www.albemarleradio.org**

**Apr 25-Apr 26, 1900Z-1900Z**, Hoquiam, WA. Grays Harbor Amateur Radio Club, W7ZA. Annual Birthday Event (53 years). 52.890 28.485 3.630 147.160. QSL. Annual Event, W7ZA, PO Box 2250, Aberdeen, WA 98520. **gharc.org**

**Apr 29-May 2, 1800Z-2359Z**, Barry, IL. Hannibal Amateur Radio Club, K9P. USPSA — Single Stack Nationals 2009 Event. 14.250 7.250. QSL. Hannibal Amateur Radio Club, PO Box 1522, Hannibal, MO 63401. **www.w0kem.com**

**Apr 30-May 14, 1909Z-2009Z,** Cambridge, MA. MIT Radio Society, W1MX/100. 100th Anniversary of MIT Radio Society. 14.275 7.275 7.045 3.530. QSL. MIT Radio Society, 77 Massachusetts Ave, Room 50-358, Cambridge, MA 02139. **web.mit.edu/w1mx/www**

**May 1-May 2, 1500Z-2100Z**, Liberty, MS. Amateur Radio Club of Amite County, W5CCW. Amite County & Liberty Mississippi Bicentennial Celebration. 21.280 14.225 7.225 3.725. Certificate. Paul J. McGehee, 4044 Hwy 567 N, Liberty, MS 39645. **amitecounty200.com**

**May 2, 1400Z-2000Z**, Reno, NV. EMCOMM WEST, N7V. EMCOMMWEST 2009, including Pacificon 2009. 446.050 146.580 14.335 7.295. QSL. EMCOMMWEST, PO Box 51048, Sparks, NV 89435. **www.emcommwest.org**

**May 2, 1200Z-1830Z and May 3, 1300Z-1600Z**, Northfield, MA. 72 Rag Chew Group, K1R. Celebrating the 5th Anniversary of the 72 Rag Chew Group. 7.272. Certificate. Russell Newton, K1LRB, 363 S Mountain Rd, Northfield, MA 01360. **www.ragchewers.net**

**May 2-May 3, 1300Z-0000Z**, Millville, NJ. W2A. Astronomy Day 2009; share the joy of astronomy. 14.240 14.070 7.240 7.070. Certificate. Holly Dome Observatory, 356 Briar Dr, Millville, NJ 08332. **www.HollyDome.com**

**May 2-May 3, 1300Z-0700Z**, Bryce Canyon National Park, UT. Gary Keck, KE7DX. Bryce Canyon National Park Operation. 14.255 14.040 7.235 7.040. QSL. Gary Keck, KE7DX, PO Box 18135, Tucson, AZ 85731. **www.marketemporium.com/joomla/ke7dx_menu**

**May 2-May 3, 1400Z-0559Z daily**, Conway, AR. Faulkner County Amateur Radio Club, W5AUU. Toad Suck Daze Festival. 14.260 7.260. Certificate. Faulkner County Amateur Radio Club, PO Box 324, Conway, AR 72033. **www.w5auu.org**

**May 2-May 3, 1500Z-0100Z**, Murfreesboro, TN. Short Mountain Repeater Club, W4YXA. Celebrating the 30th Anniversary of SMRC. 21.300 14.285 7.220 3.820. QSL. Lyle Townsend, 1037 Chris Dr, Portland, TN 37148. **www.shortmountain.org**

**May 2-May 3, 2000Z-2100Z**, Aquinnah, MA. Fall River Amateur Radio Club and Team HAMCOW, W1ACT/P. IOTA NA046, Dukes City, US Islands MA-005S, NEQP. 14.280 14.040 7.040 3.540. QSL. Roland Daignault, N1JOY, 19 Davis Rd, Westport, MA 02790-3433. **hamcow.net** *or* **qsl.net/bcra**

**May 8-May 25, 1500Z-0300Z**, Indianapolis, IN. Indianapolis Motor Speedway Amateur Radio Club, W9I MS. 93rd running of the India-

Maty Weinberg, KB1EIB ♦ Special Events ♦ events@arrl.org

napolis 500. 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**

**May 9, 1300Z-1800Z**, Helen, GA. Gateway Amateur Radio Club, K4Z. JAKES Day. 7.223. QSL. Jim Balaun, K4PZ, PO Box, Cleveland, GA 30528. *Juveniles Acquiring Knowledge Ethics Sportsmanship; from Smithgall Woods State Park Conservation Area.* **ng4ar@yahoo.com**

**May 9, 1400Z-1900Z**, Caldwell, NJ. West Essex Amateur Radio Club, W2EF. Operating from President Grover Cleveland's Birthplace. 146.52 21.330 14.250 7.250. Certificate. West Essex ARC, PO Box 54, Essex Fells, NJ 07021-0054. **www.wearc.org**

**May 9, 1600Z-2359Z**, San Diego, CA. USS *Midway* (CV 41) Museum Radio Room, NI6IW. Commemorating Armed Forces Day and participation in the annual MARS Amateur Radio Cross Band Communications Tests. SSB 14.320 7.250 CW 14.060 7.055 PSK-31 7.070-7.080 RTTY 14.080 7.080 2m/70cm SOCAL rep WIN. QSL. USS *Midway* (CV 41) Museum Radio Room, 910 N Harbor Dr, San Diego, CA 92101. **af6ha@yahoo.com**

**May 9-May 10, 1300Z-0100Z**, Franklin, IN. Mid-State Amateur Radio Club, W9M. 25-Year Anniversary of the Mid-State Amateur Radio Club. 21.340 14.240 7.240 146.520. QSL. MARC, PO Box 836, Franklin, IN 46131. **www.midstatehams.org**

**May 14-May 17, 1600Z-0100Z**, Angels Camp, CA. Calaveras Amateur Radio Society, N6FRG. Calaveras County Fair and Frog Jump Jubilee. SSB 14.320 7.290 PSK 14.070 IRLP 3428. Certificate. Calaveras Amateur Radio Society, PO Box 391, Angels Camp, CA 95222. **www.frogtown.org** *or* **www.calaverasars.org**

**May 15-May 17, 1300Z-1700Z**, Dayton, OH. Dayton Amateur Radio Association, W1AW/8. Dayton Hamvention and ARRL National Convention. 147.55 28.470 25.050 14.270 14.050 7.227 7.050. QSL. ARRL-W1AW, Joe Carcia, NJ1Q, 225 Main St, Newington, CT 06111-1494. **www.hamvention.org**

**May 15-May 18, 1000Z-0000Z**, Dayton, OH. Feld Hell Club, W8H. Promoting digital mode — Feld Hellschreiber at Dayton Hamvention. 21.074 14.074 10.136 7.074. QSL. Scott Pettigrew, 6015 Driftwood Ct, Maineville, OH 45039. **www.feldhellclub.org**

**May 16, 1200Z-2100Z**, Farmingdale, NY. Great South Bay Amateur Radio Club, W2GSB/APM. Arm Forces Day at Historic Republic Airport. 14.260 7.260 3.895 14.070 PSK. QSL. W2GSB/APM, PO Box 1356, West Babylon, NY 11704. *Home of the P47, F105 Thunder Chief, A10 Famous War Planes.* **www.gsbarc.org**

**May 16, 1400Z-2000Z**, Westmont, IL. DuPage Amateur Radio Club, W9DUP. Commemorating Armed Forces Day. 145.430 28.400 14.290 7.250. Certificate. Brian Eder, WB9UGX, PO Box 71, Clarendon Hills, IL 60514. **www.w9dup.org**

**May 16-May 17, 1500Z-0300Z**, Navarre Beach, FL. Navarre CERT Amateur Radio Club, N4F. Celebrating the 25th Annual Navarre Beach FunFest. 14.250 7.250. Certificate. Navarre CERT, Communications Coordinator, 8668 Navarre Pkwy, Navarre, FL 32566. **funfest@w4sjv.com** *or* **www.navarrecert.org**

**May 17, 1600Z-2000Z**, Sandy Hook, NJ. Roseland Amateur Radio Club, K2A. Coastal Defense Day from Sandy Hook Lighthouse, USA-731. 14.270 7.270. QSL. Roseland ARC, 300 Eagle Rock Ave, Roseland, NJ 07068. **k2gq@hotmail.com**

**May 20, 0000Z-2359Z**, Topsham, ME. Mid Coast Red Cross Radio Club, N1R. 100th Anniversary of Mid Coast Chapter of Red Cross. 7.262 7.020 3.940 3.520. QSL. Steve Kercel, 2 Brian Dr, Brunswick, ME 04011. **kercel1@suscom-maine.net**

**May 23, 1500Z-2000Z**, Fort Wayne, IN. Amateur Radio Military Appreciation Day, KC9HAJ. In support and appreciation of our troops and veterans. 28.450 21.290 14.260. Certificate. ARMAD, 6116 Graymoor Ln, Ft Wayne, IN 46835. *Join us on frequency, or set up on your own, and salute our heroes; main purpose is to get activity on the air to show support to our troops and veterans*. **www.armad.net**

**May 25, 1200Z-2359Z**, Belleville, MI. Yankee Air Museum, W8YAF. Observing Memorial Day at YAM Air Park, Willow Run Airport. 7.270. Certificate. Frank A. Nagy, 24315 Waltz Rd, New Boston, MI 48164-9167. **oldcrowtwo@hotmail.com**

**May 25, 1200Z-2359Z**, Nutley, NJ. Robert D. Grant United Labor Amateur Radio Association, N2UL. CQ Memorial Day. Labor remembers our heroes. 449.975 28.460 14.260 7.250. Certificate. RDGULARA, 112 Prospect St, Nutley, NJ 07110-0716.

**May 25, 1400Z-2145Z**, Baton Rouge, LA. Baton Rouge and USS *Kidd* Amateur Radio Clubs, W5KID. Memorial Day. SSB: 15 20 40 m Gen and above RTTY sub band CW: QRP sub bands. QSL. W5KID, 305 S River Rd, Baton Rouge, LA 70802. *Primary frequency is 20 meters.* **www.lsu.edu/brarc/uss_kidd.htm**

**May 25, 1600Z-2359Z**, San Diego, CA. USS *Midway* (CV 41) Museum Radio Room, NI6IW. Commemorating Memorial Day. SSB 14.320 7.250 CW 14.060 7.055 PSK-31 7.070-7.080 RTTY 14.080 7.080 FM/dig 2 m/70 cm SOCAL rep. QSL. USS *Midway* (CV 41) Museum Radio Room, 910 N Harbor Dr, San Diego, CA 92101. **af6ha@yahoo.com**

**May 25-May 26, 1500Z-0300Z**, Santa Cruz, CA. Instigators Radio Consortium Of SLV, K6V. Memorial Day 2009, from the Veterans Memorial Building. 14.280 7.250. QSL. Radio Room, 846 Front St, Santa Cruz, CA 95060.

**May 30-May 31, 0000Z-2000Z**, Estes Park, CO. HamCon Colorado 2009, W1AW/Ø. ARRL 2009 Rocky Mountain Division Convention. 50.125 21.300 14.257 7.257. QSL. W1AW/Ø, 225 Main St, Newington, CT 06111. **www.hamconcolorado.org**

**May 30-May 31, 1400Z-0200Z**, Libby, MT. Lincoln County Amateur Radio Group, KK7XT. Opening Day Heritage Museum. 21.300 14.250 7.200. QSL. Bill Cunnane, 622 Michigan Ave, Libby, MT 59923. **www.libbyheritagemuseum.org/aboutus.htm**

**May 31, 1300Z-2100Z**, Bethpage, NY. Long Island Mobile Amateur Radio Club, WV2LI. LIMARC Picnic Special Event Station. 14.327 14.037 7.237 7.037. QSL. Diane Ortiz, K2DO, PO Box 657, Copiague, NY 11726. **www.limarc.org**

**Certificates and QSL cards**: To obtain a certificate from any of the special-event stations offering them, send your QSO information along with a 9 ×12 inch self-addressed, stamped envelope to the address listed in the announcement. To receive a special event QSL card (when offered), be sure to include a self-addressed, stamped business envelope along with your QSL card and QSO information. *Note: Some clubs may ask for a nominal fee to cover the cost of the certificate or QSL. Request will be made on air during the event or on the club's Web site.

**Special Events Announcements**: For items to be listed in this column, use the ARRL Special Events Listing Form, at **www.arrl.org/contests/spevform.html**. A plain text version of the form is also available at that site. You can also request a copy by e-mail or send a self-addressed stamped envelope (SASE) (Special Requests, ARRL, 225 Main St, Newington, CT 06111; write "Special Events Form" in the lower left-hand corner). Off-line completed forms can be mailed, faxed (Attn: Special Events) or e-mailed.

Submissions must be received by ARRL HQ no later than the 1st of the second month preceding the publication date; a special event listing for **July** *QST* would have to be received by **May 1**. In addition to being listed in *QST*, your event will be listed on the *ARRLWeb* Special Event page. Note: All received events are acknowledged. If you do not receive an acknowledgment within a few days, please contact us.

Special Events listed in this issue include current events received through March 13. You can view all received Special Events at **www.arrl.org/contests/spev.html**. QST

## Strays

COURTESY EA8CAC


***EA to VE:*** **During a recent month-long trip to British Columbia and Alberta, ARRL member Juan J. Hidalgo, EA8CAC, happened across this intriguing sign. It turns out that Telegraph Cove was the northern terminus of an overland telegraph line that began in Campbell River, BC and ran along the east coast of Vancouver Island. Juan was active on EchoLink and CW during his vacation in Canada.**

W3UR

# HOW'S DX?

# DX Cluster Use

*This month's lead item was written by Paul Granger, F6EXV, a leading DXer and DXpeditioner from France. Thank you Paul for your comments, which are right on the mark. — W3UR*

DXing is no longer what it used to be — thanks to new technologies. When I started DXing over 30 years ago, rare country hunters would organize on VHF networks or would even telephone each other as soon as an extraordinary DX or a needed one would appear on the air. In Bordeaux, we would monitor 145.450 MHz in those days and would sometimes hear brief announcements like "VK9YA is presently on 21.295, split up 5; here is F6BKI."

Today, all Internet-connected DXers share the results of their hunts live, but also the hunt of the whole world, thanks to the worldwide cluster network. A ZL8 appears on 17 meters and the whole world knows in a matter of 1 minute. Nevertheless, erroneous or useless information occasionally appears and I thought it would be nice to remind users of the basic rules, which, in my humble opinion, should rule the use of the cluster.

## The Cluster is Not Meant to Make QSOs

It is more and more common to see two connected hams exchange reports on the cluster, sometimes after having completed a schedule on 160 meters, for example. Reports should not be passed on the cluster, but only on the air; otherwise, why not telephone each other to make the QSO? Giving reports over the cluster may invalidate the QSO for DXCC.

## The Cluster is Not Meant to Spot Stations You Cannot Hear

How many times have we seen information such as "DX de F6XYZ 21260.0 FK8ZZ No copy in Paris?" Most of the time, the information was given a few minutes before by someone else who copies the DX. Imagine all the connected stations informing the world they are not copying that DX. The clusters would be full of useless information.

## The Cluster is Not a Chat Box

Limit the use of *announce* and *announce/full* to what is really necessary. Before asking for a QSL manager, search the Internet or check the cluster by typing "SH/QSL DXØAA." It is likely the information will be displayed without you bothering the rest of the world. Avoid chatting with your local friends. Use the *talk* command rather than *announce*. If you wish to inform everyone that you have received a card for a recent DXpedition and you have been lucky enough to be one of the first to receive it, use *announce* rather than a DX spot such as "DX 14000.0 KH8SI QSL received today." Remember that the spot will be treated like a real one and computer bells will ring all over the world for those with logging programs indicating that entity is still needed on that band. These guys will hate you forever. Comments should be information useful to others, not to your ego. Give the split rather than say 599 or "yesssssssssss first call!"

## The Cluster is Not a Parrot

Once you have read the information on the cluster and have been lucky enough to make the contact yourself there is no need to spot it again. The whole world already knows that the DX is there, so avoid repeats. How many times do we see the same spot repeated 20 times in 5 minutes? Much of the information is wrong in terms of call sign. 6W1XX is spotted as BW1XX. The cluster is not a bible and you should listen for the call on the air rather than fully trust the cluster information.

## A DXpedition is Not Necessarily Connected to the Cluster Network

You hear that rare IOTA expedition to P29 on 15 meters. You need P29 on 17 meters. Asking them through the cluster to QSY (change frequency) to that band is unlikely to reach them. On a desert island, the expedition is not connected to the Web and they will not see your request. These expeditions do not go there just for you. Surely you don't want to be seen as selfish by the whole worldwide community. The cluster is not meant for complaints, at least in terms of spots. Don't criticize a DXpedition for not being on a band you need it on — just listen and they will be there sooner or later. You are not there with the DXpedition team and you cannot imagine what circumstances the guys are facing on their side.

## The Cluster is Not Meant for You to Spot Yourself

Don't spot yourself as calling on a certain frequency, even if you have a sked (scheduled contact). If you are on an IOTA, someone will spot you quickly after you show up on the air; your ego will have to bear with waiting for the spot. Imagine every active station spotting themselves. The cluster would be full of useless information. Don't spot your next door neighbor, even to say he is calling DX. You hear him CQing DX, but this does not mean he is heard on the other side. Let some DX spot him instead.

## Not Everybody is Connected to His Local Cluster

It is useless to thank the guy you just worked when you spot him. Hopefully you will have thanked him over the air and he is not necessarily connected to read your thanks. Better yet send him a QSL! The common "Tnx new one" may be nice, but who cares? Imagine everyone spotting all their new ones.

## The Cluster is Not a Copy of Your Log

It is not worth informing the whole world you just worked a common DL on 20 meters or an SP on PSK on 17 meters. Even a beginner can find this kind of station by just switching on his rig. It is a poor excuse to say a beginner needs such help. A beginner must also learn to turn his VFO knob. If there is no DX today, there is no need to feed the cluster with useless local information.

## What to Spot, What Not to Spot

Common sense should dictate your choices. The desire to help a beginner is a poor excuse to spot *everything*. There is no general rule or a list of what to spot. What is rare and of interest is not limited to what you need. Nevertheless to work a Ukrainian on 15 meters PSK is not a fabulous achievement of which the whole world must be informed. To work Florida on 17 meter CW may be nice, but should the world know? Any station

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

has at least one reference for a local award (DOK for DL, postal code for Spain, department for F, county for USA, etc). This does not mean you must spot everything you hear. What are these awards worth if you just need to watch your screen to get them? A special prefix can be spotted, without exaggerating in terms of repeats. A semi rare US state can be spotted (like Wyoming or the Dakotas) but who needs a spot from New York?

As a conclusion, I would like to say this is only a point of view. The cluster system is a fabulous technical achievement, but do not forget that everything that goes through it travels the entire world in a matter of seconds. And it is better to find the DX before it is spotted: fewer competitors, easier to get though — so get to your VFOs!

## DX NEWS FROM AROUND THE GLOBE

### *5N — NIGERIA*

Bodo, DL3OCH, also known as HB9EHJ and KT3Q, will be working in Nigeria for several months starting in March. Bodo is really into EME and has put together an EME group in Nigeria to put in a big effort. 5NØOBA, 5N9AYM, 5N4BRJ and 5NØATI will help him put Nigeria on the air. He is getting his gear together to take to Africa. Some will be left there after the operation as a donation to the radio club. He is donating a new IC-706 transceiver himself but still needs a 2 meter preamplifier. Bodo prefers an SP-2000 or other reliable preamplifier with relays. HB9CRQ is sending a kilowatt amplifier. Bodo expects to put out 700 W on 2 meters. He would like to receive donated gear in time to test it all out before taking it. The heaviest gear is being shipped ahead of time on February 13. Besides HB9CRQ, DJ9YW, DL8YHR and DL8EBW have also provided gear.

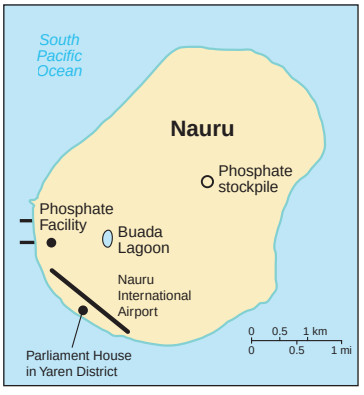
Inclusive dates for Bodo's Nigeria operation are March 21-July 24. He will also do a lot of HF operation, including 160 meters, even though it's not the best season for Topband. Nigeria is very rare on 160 meters in North America. Bodo will use the call sign 5NØEME. QSL via DL3OCH. He doesn't plan to do any QSLing until he gets back home to Germany, at the end of the trip. He will be very busy in Nigeria and wants to spend as much of his free time as possible operating. For IOTA fans, Bodo hopes to make it to AF-076.

### *8Q — MALDIVES*

8Q7CQ, Maldives, is planned by GØVJG for June 1-15, 2010. It will be mostly HF, possibly some 6 meters, SSB. This will be Kuredo Island, AS-013 and it'll be GØVJG's honeymoon.

### *C2 — NAURU*

Dani, EA4ATI (9M2TI, XT2ATI, XT2TI, HP2PL, Z39A, 6W1EA, 6W1/EA4ATI, HP1/EA4ATI, HI5/EA4ATI, HI3CCP, HI3C, 3XY9B, etc), is planning a DXpedition to Nauru Island between May 3-17. He is looking for other operators, additional Yagis and financial support. Check out the C21TI Web site, **http://c21ti.madrono.net**, for details of the planned upcoming DXpedition.




**Nauru Island is located in the South Pacific near the Marshall Islands.**

### *FJ — SAINT BARTHELEMY*

Jeff, FJ/N1SNB, will be on from St Barthelemy May 27-June 1 for the WPX CW contest. Jeff says he has a perfect place to stay, having been there before. He will be all bands with an R7 vertical and wires for low bands.

### *JD1/O — OGASAWARA ISLANDS*

Four operators, each with his own call sign, will be on from Chichijima, Ogasawara, April 29-May 12. JD1BLK, JD1BMH, JD1BMT and JD1BLY plan to operate CW, SSB and digital, 160-6 meters and satellite. QSL via JM1LJS, JG7PSJ, JE4SMQ and JI5RPT, respectively. Also, each, except JE4SMQ, has a Web site that you might find interesting: **radio-dream.com/jd1blk/e**; **sapphire.ganko.tohoku.ac.jp/jd1bmh** and **www.ji5rpt.com/jd1**.

### *PACIFIC ISLES*

Hrane, YT1AD, is putting together his next operations, from Tokelau, Central Kiribati and Conway Reef in the Pacific. With the help of coleader David, K3LP, ZK3 and T31 are planned for April 2010 or the end of September 2010 and 3D2/C is being planned for the end of September 2011. YT1AD and Miki, YU1DW, will be out there April 20-May 7 this year to try to get things lined up. They will also do some operating: 5W8A and 5WØDW April 22, KH8/N9YU April 22-24, 3D2AD and 3D2DW April 25 and May 4, and T3ØM and T3ØDW April 27-29. See their Web site, **www.yt1ad.info/t31**, for information.

### *POSTAL INCREASE*

The United States Postal Service has announced that effective May 11 the price of a first class 1 ounce envelope will increase from 42 cents to 44 cents. Post cards will go to 28 cents. Airmail to all countries (except Canada and Mexico) will be raised to 98 cents. Mail to VE will be 75 cents, while to XE it will be 79 cents. No word in the official announcement (**www.usps.com/prices/pricechanges.htm**) whether there will be an increase to International Reply Coupons (IRCs), although they too will probably be going up.

### *TT8 — CHAD*

Frank, F4BQO, will be back in Chad and QRV as TT8CF now through July 1. He'll be on SSB and CW on HF. QSL via F4BQO.

### *ZK2 — NIUE*

Chris, ZL1CT (ZL1V/GM3WOJ), tells us he will be operating as ZK2V from Niue Island (OC-040) for 5 weeks! The DXpedition, no "holiday DXpedition" will be QRV from May 16-June 20, with hopes of working as many as possible to give them their first ZK2 QSO. Chris does expect to have Internet while on the island and will be updating his Web page (**www.gm7v.com/zk2v.htm**), which will include a log search. He is looking at using either the 5B4WN or G4ZFE log search applet. Chris is also trying to locate a small (lightweight) amplifier. He'll be there during the island's "cyclone season" so there may be a few electrical storm interruptions. "Resources are limited, so activity will be mainly on 80/40/20/15 CW/SSB, with some 12/17/30 meter band activity and some RTTY," says Chris. QSL via N3SL.


**Niue Island is located in the South Pacific northeast of New Zealand.**

## WRAP UP

That's it for this month. A big thanks to F6EXV and *The Daily DX* for helping to make this column possible. Until next month, see you in the pileups! — *Bernie, W3UR* QST

W3ZZ

# THE WORLD ABOVE 50 MHz

# Distance Scoring

As I write this in late February, there has been a spirited discussion of a variety of VHF contesting topics during the previous month. Among these is an almost perennial issue, distance scoring. In the past when the issue of distance scoring has arisen, it has engendered very little enthusiasm from the VHF contesting fraternity. I know that I discussed the possibility of going to distance scoring in one or more ARRL contests during the tenure of the ad hoc VHF Committee that preceded the current VHF/UHF Advisory Committee (VUAC) and the idea was roundly shouted down. It has garnered no more enthusiasm during a number of discussions on the VHF Reflectors. Until now. The current discussion indicates a much greater interest in the concept and a willingness to consider using it as a metric in the ARRL VHF contests, dependent in part on the details of its implementation.

I first raised the idea of distance scoring in print in an article for *CQ Contest* magazine (March 1999).This month I want to talk a little about the concept, the reasons for considering it and some of the details. In so doing I will repeat some of the points I touched on 10 years ago, but the intervening time has modified my thinking and that of others so now is a good time to revisit this approach.

## Why Distance Scoring Now?

Much has been written about activity in ARRL VHF contests. While one can argue about the level of activity based on the number of stations that actually make even one contact in a VHF contest, one cannot argue that for almost a decade beginning in the mid 1990s the number of logs submitted to the VHF contests had been diminishing and, while that trend appears to have stabilized somewhat in the past few years, the trend-line has not shown any particular upward movement, being dependent as one would expect, especially in June, on band conditions. Given that the majority of new HF transceivers now have 6 meter capability and given the high popularity of the small HF+V/UHF transceivers like the ICOM IC-706/FT-100 and their successors, the IC-7000/FT-857, one would incorrectly have expected a significant increase in activity but such has not been the case.

There is no sense of stagnation in the HF contests. In spite of truly dreadful conditions occasioned by the lack of sunspots, QSO rates are rising, sunspot cycle adjusted multiplier totals are up and even the Sunday doldrums in the HF Sweepstakes are disappearing. The CQWW DX Contest sets new records yearly. VHF contesting in Europe appears to be robust and this year for the first time the July CQ VHF Contest had 532 logs vs 485 for the ARRL September VHF Contest. Ten years ago the July CQ VHF Contest did not exist.

So why is it that we have reached an asymptote in the numbers of VHF+ stations we can contact under normal conditions? Even in 2006 with the best conditions in anyone's memory from the central US, little more than 1500 Qs can be made on 6 meters and the East Coast has been limited to ~1000 Qs under optimal conditions. These are the same numbers that have existed for more than a decade and parallel the most that can be made on 2 meters — 700. The latter has been exceeded only once in the last decade during an enormous East Coast tropo opening. A good part of the reason may be the rules structure of the ARRL VHF contests and the fact that with very minor exceptions the rules are identical for all three major VHF contests.

## Contest Rules

In 1999 I said, "Rules for any ham radio competition are designed to maximize the number of contestants and the amount of enjoyment they get out of participating. The most successful contests are those that do this the best." That has not changed. The best contests start with a popular set of rules and modify them only to entice new participants and increase the satisfaction of the current participants. For instance, in the ARRL DX Contest the world works US States (Hawaii and Alaska remain DX) and Canadian Provinces. The highly disliked CW quotas, where only 5 DX stations per country per band could be worked, was eliminated in the 1970s; the very popular multioperator, two transmitter category was instituted in the 1980s.

The CQWW DX contest allows DX to work DX, which increases the variety of DX participation and adds a new multiplier — 40 zones — covering the entire world. This highlights the need to look in every direction for contacts instead of concentrating just on Europe and Japan. Over the years to this have been added the two point rule for the Caribbean, the inclusion of DXpeditions in club scores and the use of computer databases and algorithms to aid the human log checkers in determining the accuracy of the logs. The CQ VHF Contest is a two band competition occurring during the end of the Sporadic E ($E_s$) season. It emphasizes 6 meters while providing an outlet on 2 meters if $E_s$ is poor. It also incorporates the original rover rules [both Qs and grids can be worked again in each activated grid].

The latter highly popular rule was changed some 15 years ago to deal with club scoring issues and to this day has been a bone of contention throughout the community. Still more changes have been proposed by the VUAC and will be discussed in a subsequent column if adopted by the ARRL Programs and Services Committee.

A second function of contest rules is to inform the contestants what is legal and not legal to do. Statements of intent are fine but are basically unenforceable unless the rules specifically allow the adjudicators explicitly to find violations directly in the log. The nature of contesting is such that many of the competitors push the rules to give them a unique advantage. Sometimes this leads to an advance in the contesting art (like Single Operator Two Radio — SO2R); oftentimes

### This Month

| | |
|---|---|
| May 1 | Summer $E_s$ Contest begins |
| May 2 | 6 meter Marathon begins |
| May 2 | Microwave Spring Sprint |
| *May 3 | Very good EME conditions |
| May 9-10 | 50 MHz Spring Sprint |
| May 9-10 | 2 GHz and Up Contest (SBMS) |
| May 15 | VHF Weak Signal Banquet (Dayton) |
| *May 31 | Good EME conditions |

*Moon data from W5LUU

Gene Zimmerman, W3ZZ ♦ 33 Brighton Dr, Gaithersburg, MD 20877 ♦ w3zz@arrl.org; (301-948-2594)

**Table 1**

**Examples of Pure Distance Scoring Metrics**

Distance is calculated from the center of the 4 or 6 digit grid by contest software or by the sponsor from the Cabrillo file.

| *Contest* | *Exchange* | *Scoring* | *Bonus* |
|---|---|---|---|
| 10 GHz and Up | 6 digit grid | ∑1 km = 1 pt + 100 pts/QSO | |
| 2 GHz and Up | 6 digit grid | ∑1 km = 1 pt | 2 × pts for ≥24 GHz |
| Stew Perry | 4 digit grid | ∑1 pt per 500 km + 1 pt/QSO | |

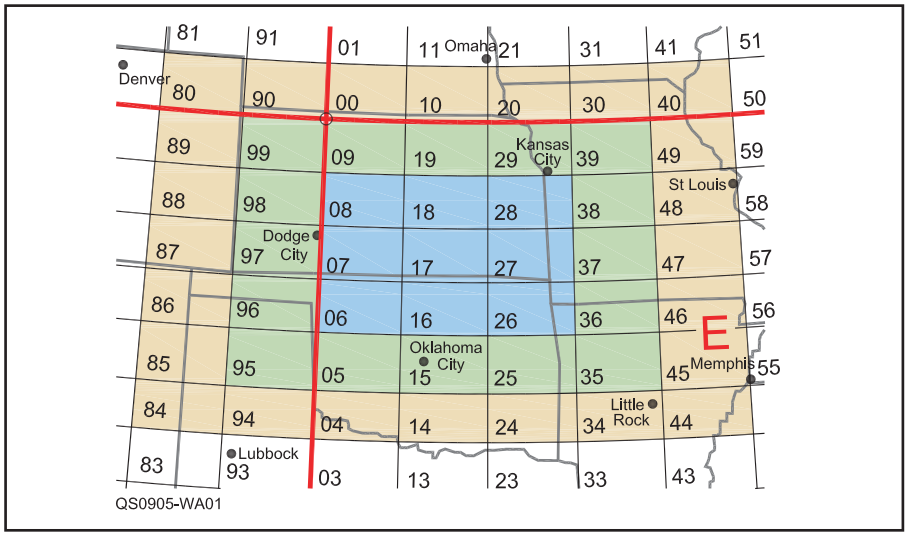



**Figure 1 — Concentric rectangle model for distance scoring with the contest station in EM17. Contacts with stations within the inner ring (blue) count 1 point. Contacts with stations in the next ring outward (green) are 2 points. Contacts with stations in the outer ring (brown) and beyond are 3 points.**

it is either illegal under the rules or unethical and violates the spirit of the rules. In the latter case the legality should last only one year; explicit rules changes need to be implemented to eliminate the abuse.

## What is Distance Scoring?

The current ARRL "big three" VHF contests all have basically the same format: Score is QSO points dependent on what band the contact is made multiplied by the sum of the Maidenhead grid squares worked per band. The point values are such that microwave contacts are valued at 3 to 6 times that of contacts made on the two most popular VHF bands, 6 and 2 meters. In fact without strong propagation enhancement on 6 and/or 2 meters and with no enhancement on the microwaves, all three of these contests are basically microwave contests.

These rules fail to address what at least I feel is the most fascinating aspect of VHF+ operation — the ability to work long distances on bands that are normally believed to be only for line-of-sight. VHF contests even more than HF contests ought to emphasize this kind of DX. The current rules do encourage operators to acquire new bands but not to improve their stations so they can work longer distances. Moreover while there is never a level playing field in any contest — there is always an advantage to particular geographic locations, particular sites within those locations and the physical constraints of a specific location (no — you cannot erect a Beverage receiving antenna or a full-sized 80 meter beam on a quarter acre suburban lot), a scoring metric that emphasizes the distance of the contact would be especially useful for stations located in less populated areas where many of their contacts are more than 500 km away.

## Distance Scoring Metrics

There are basically two forms of distance scoring. The classic form is where the score is the sum of the points-per-contact where the points-per-contact are set equal to some percentage of the contact distance in km (1 km = 1 point is common). Many European VHF contests, especially those for the RSGB in England, follow these rules. Six digit grid squares are exchanged and contest software calculates the distances or the sponsor calculates the distances from the Cabrillo file. Often there are no other multipliers; in some cases grid squares, countries (European countries are often no larger than US states) and/or postal zones are multipliers.

We already have such scoring. The 10 GHz and Up Contest uses this metric as do the San Bernardino Microwave Society (SBMS) 2 GHz and Up Contest and the Stew Perry Topband Distance Challenge (160 meters). The exact distance metrics are outlined in Table 1.

The alternative approach is some form of concentric rectangles using 4 digit grids and a fixed point value for each ring. Look at Figure 1 for a model station in EM17. Contacts with stations in EM17 and the 8 grids that touch EM17 (blue) are one point. Contacts in the next ring out (green) are worth 2 points. Contacts in the next ring out (brown) and all subsequent rings are 3 points. The final score would be the sum of the QSO points times the sum of the grid squares worked on all bands.

## Alternatives and Consequences

The purpose of distance scoring is to reward longer distance contacts that are difficult to make. The first problem is how to deal with $E_s$ contacts, which are long but very easy to make. Next, we must consider FSK441 digital contacts that, while somewhat more difficult to set up, technically utilize the skill of Joe Taylor, K1JT, as a software author to complete. Given even a very modest station — 100 W to a small beam — most of your WSJT contacts are guaranteed if the other station shows up.

The Stew Perry Challenge deals most effectively with this by assigning points for multiples of km. Five hundred km might even be the right number but that needs further discussion. Multiple hop $E_s$ — more difficult to achieve — would be rewarded but the farthest single hop contact would barely be worth 5 points. DX would be worth chasing. The Challenge also retains grid square multipliers and 4 digit grid squares at that. My gut feeling is that in a regular VHF contest, any distance scoring system that does not use grid squares as a multiplier might not be very popular. The concentric rectangle model also needs only 4 digit grid squares and limits the values of easy to work $E_s$ to 3 points. It does not reward long distance tropo or multiple hop $E_s$.

What about microwave contacts? Though a few amateurs have the technical talent and test equipment to build from scratch, getting on the microwaves is now a matter of integration and reaching for one's checkbook rather than design and build. Easy? Not particularly. But not much more difficult than building a high performance station on the lower V/UHF bands. Therefore, short range contacts within the first ring or its kilometer equivalent should not be rewarded by additional points. The Challenge version could deal with this by reducing the distance needed to earn bonus points. There could be a single

value for 902 MHz and above or different values for 902/1296 MHz and 2304 MHz and above similar to what is now done in all "big three" ARRL VHF contests. The concentric rectangle model could assign larger point values to rings 2 and 3 — perhaps 3 and 5 points for 902 and 1296 and 4 and 8 points for 2304 and up. The key is that short distance contacts in ring 1 would remain 1 point. The 10 GHz and Up already has an effective distance scoring metric. I have said previously that the UHF contest ought to adopt a set of rules based on the SBMS 2 GHz and Up contest metrics or modify the 10 GHz and Up rules to fit. I truly believe that might indeed rejuvenate the UHF Contest.

Certain issues would arise with either approach. Having huge numbers of stations geographically near you would be less of an advantage than it now is. If 6 digit grid squares were used, rovers would need a GPS that reads out in Maidenhead grids. But many rovers have this already and it is not a high cost item. The emphasis of the "big three" would be changed from microwaves to a more balanced performance on both microwaves and non-microwaves. You would need both a good VHF station and a good microwave station and the ability to operate both effectively if you want a competitive score. Grid circling problems would be minimized. Finally, the software or the sponsor would score the contest.

## In Conclusion

This column is meant to show what could be done with distance scoring. Within the two metrics described there are other ways to implement this idea. What is important is to consider whether we want all the major ARRL VHF contests to remain essentially identical. If we want distance scoring I would suggest we do it in September. That would minimize the impact of $E_s$ and would be the best chance we might get extended tropo somewhere in the country. There is a Yahoo! group being formed as I write to consider various distance scoring issues. Eventually we may see if this type of scoring is viable in this country.

## ON THE BANDS

A very slim report this month. But things are warming up and soon summer will be here!

**6 meters**. After an average-at-best minor $E_s$ season, February greeted us with 11 straight days of single hop $E_s$ (a little like February of 2006) then spotty until two good days on the 26th and 28th. Most of the traffic was along the southern tier of states from Florida through Texas and southern California and into the Caribbean and Central America as well as into Mexico. But a few openings were noted north/south and from the Northeast to both the Midwest and VE1. For instance on the 7th, Chip, K7JA, worked YN and heard the TI beacon loudly. Al, XE1NK (EK09) worked into FL, TX, NM and AZ. Jon, NØJK (EL17) worked TX and Mexico on the 19th. On February 26 Al, K7ICW (DM62) worked throughout the Southeast and West to AR, MS and LA. On the 28th, K7JA worked TX, AR, OK, KS and double hop into FL.

DICK HANSON, K5AND

**Figure 2 — The 6 meter station at K5D. K5AND and WØRUN tried hard but the propagation was very spotty.**

The big excitement was the Desecheo DXpedition (K5D) with K5AND and WØRUN at the 6 meter position (see Figure 2). Unfortunately there were no openings to speak of for K5D. They made 96 contacts mostly on scatter to Florida and KP4 including two JT65a digital EME Qs with W7GJ and K6MYC.

**Microwaves**. Al, K7ICW (DM62oh) reports the first signals heard over a mountainous occluded 400 km path to K5RHR (DM65uv) on 23 cm. No QSO yet but these mountain paths are often very difficult to traverse.

**Meteor Scatter.** Good results on FSK441 digital meteor scatter are available regardless of conditions. After several unsuccessful tries John, W5UWB (EL17ax) reports a 1397 km contact with NØPB (EM39wo) on 222 MHz. NØPB was running only 15 W!

## HERE AND THERE

**2008 2 GHz and Up World Wide Club Contest**. The San Bernardino Microwave Society (SBMS) sponsors this microwave contest, which runs from 0600 local May 9 to 2000 local May 11. Exchange 6 digit grid squares. Stations are encouraged to operate from more than a single location; such stations may be worked again on each band for additional credit after a change of location (a move of at least 16 km). Scoring is by distance points from the center of the 6 digit squares between stations in km; 1 km = 1 pt. Band multipliers and bonus points are applied. Further information is at **www.ham-radio.com/sbms/club_test/2ghz_up_test.html**. As noted previously, the rules for this contest ought to be the rules for the ARRL August UHF contest.

**Spring Sprints**. The Microwave Sprint runs from 0600-1300 local time on May 2 and the 50 MHz Sprint from 2300Z May 9 to 0300Z May 10. More information in last month's column and at **www.sysadnet.com/vhfsprintrules.htm**.

**Fifth 6 Meter Marathon**. The Marathon begins on 0000Z May 2, 2009 and ends August 2, 2009 at 2400Z. Top score in each US call area will receive an award. In 2008, EA6SX was the overall winner with 94 countries. TB7MPB (49) and PJ2BVU (42) were continental winners, W1JJ (84) the US winner and OH3JR (57) the top OH. Details are at **http://6m.dy.fi**. [Tnx Seppo, OH1VR]

**Summer $E_s$ Contest**. The Super 7's sponsor this long-term digital (JT6M mode) meteor scatter contest, which runs from 0000Z May 1 to 0000Z September 1. Three classes: QRP, low and high power; spotting networks and schedules are permitted. Score is QSO points × total grid points + bonus points as defined on their Web site at **www.ykc.com/wa5ufh/WSJTGROUP/JT6MTest.htm**.

**VHF Weak Signal Group Banquet at Dayton Hamvention®**. The 15th annual VHF Weak Signal Group Dinner at the Dayton Hamvention will be held on Friday, May 15 at the Holiday Inn Dayton North, Waggoner Ford Rd exit off I-75. This annual event is an excellent opportunity to meet your VHF buddies at the Hamvention. More information is available from Tony Emanuelle at **wa8rjf@arrl.net**.

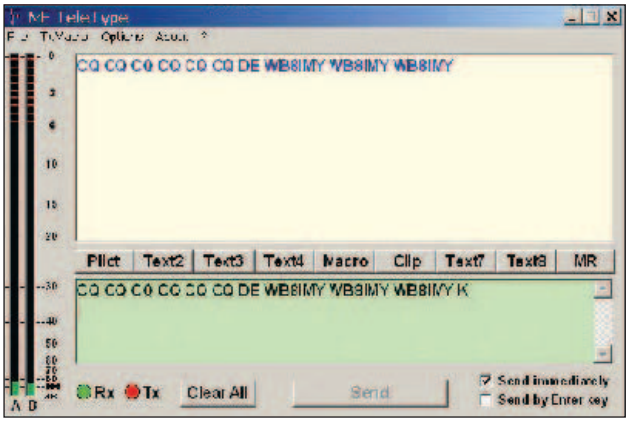
WB8IMY

# ECLECTIC TECHNOLOGY

# The Marketplace of Digital Modes

Just before the close of 2008, Norbert Peiper (of *MRP40 Morse Decoder* fame) announced the debut of a new sound-card digital mode he called Multi Frequency Teletype, or MFTT. The software is written for *Windows* (*XP* or *Vista*) and is free for downloading at **www.polar-electric.com/MFTT/**.

MFTT uses DTMF (dual-tone multifrequency) tones to carry the data. This creates some unusual sounds, to say the least. You can adjust the transmission "speed" according to signal conditions (slower speeds for poorer conditions; faster speeds for better conditions). As you do so, the transmit audio varies from creepy carnival calliope to whispering, ghostly warble. Norbert claims excellent performance under weak signal conditions, but I haven't had a chance to test this myself.




**MFTT is the latest HF digital mode to stroll upon the stage. It is free for downloading at www.polar-electric.com/MFTT/.**

While reading online discussions about MFTT, it occurred to me that I had lost track of how many digital modes are available to amateurs today. My rough guess is that the number easily exceeds two dozen (depending on how you are counting), most of which sprang into existence within the last decade.

But despite this embarrassment of digital riches, only six modes are used by significant numbers of hams on a regular basis: PSK31, RTTY, packet, D-STAR, PACTOR and the WSJT suite. Why so few?

In some instances a mode is *de rigueur* for the application in question. If you want to do digital meteor scatter or moonbounce, WSJT is the way to go. If you want to access the Winlink network on HF, you need PACTOR. If you want to use the Automatic Position Reporting System (APRS), you'd better become acquainted with packet. And if you want to explore the cutting edge of voice/data networking on VHF+, it is time to read up on D-STAR.

When it comes to sound-card-based digital hamming on the HF bands, you have a virtual smorgasbord of modes at your disposal — RTTY, PSK, Hellschreiber, Throb, MT63, Olivia, DominoEX, Chip64, Pax, Contestia, MFSK16, MFTT, ALE400, WinDRM and FDMDV. You can bet that I've omitted several others, not to mention all the various "flavors" of each mode. But despite this lengthy list, only RTTY and PSK31 are truly dominant.

Perhaps Adam Smith's "invisible hand" is at work. Although Mr Smith was talking about economics when he invoked that memorable analogy, the same rule applies to the Amateur Radio marketplace of ideas and technologies. Put simply, the amateur community decides, through the choices made by individuals, which modes win the popularity contests. Cost and performance factors have their roles to play, but sometimes it just boils down to comfort and habit.

Consider PSK31, the most popular mode among HF digital ragchewers and DX chasers. Other HF digital modes may have more to offer (take the excellent performance of Olivia as an example), but for many, PSK31 is *adequate* for their needs — and adequate is often good enough. The same is true for RTTY, the mode of choice among HF digital contesters and DXpedition operators. Again, are there better digital modes for contesting and pileups? Probably, but RTTY fulfills the need very well so the incentive to switch is weak.

Like everything else in the marketplace, it takes more than an enthusiastic sales pitch to sell a product (or a new digital mode). Some customers will buy out of pure curiosity, but they are the minority. (In consumer electronics, these are the "early adopters.") The rest will hang back and wait to see if sufficient numbers of their friends reach for their wallets — or their keyboards. Technological change requires patience and can't be rushed. As the saying goes, "The mill of the gods grinds slowly, but it grinds exceedingly fine."

## Meteor Scatter Update

In the January "Eclectic" I discussed the idea of an Amateur Radio digital network based on continuously operating meteor-scatter stations, a technique well known in commercial and military circles. One of the challenges is creating a system that could capitalize on the very short transmit/receive turnarounds (about 150 ms).

Charles Brain, G4GUO, sent the following:

"There may be two ways around the quick turnaround problem:

(1) Use full duplex 10 meter/6 meter operation (or here in the UK 6 meter/4 meter).

(2) Use a selective ARQ scheme. Break the message up into a large number of small packets. Transmit them repeatedly in sequence for 1 minute. The receiving end would then transmit an ack map (1 bit per sequence number) repeatedly for a minute. The transmitter would then remove the acked frames from its transmit queue and only repeatedly resend the unacked frames. Data and acks could be intermixed of course.

What waveform to use? Well, you could use BPSK or QPSK, but how about using GMSK using 9600 baud ready radios? You don't need linear amplification. You can send a lot of bits in 100 ms, MSK is fairly frequency error intolerant, it is easy to sync to and it can be implemented on a soundcard. High power 9600 baud ready radios are relatively cheap and easy to obtain."

If the name and call sign seem familiar, Charles is a pioneer in digital voice technology and the creator of the *PCALE* software for *Windows* that's used by amateur ALE (Automatic Link Establishment) enthusiasts worldwide. QST

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

K2TQN

# VINTAGE RADIO

# Everett Sutton, 7DJ, Port Angeles, Washington

Both of his parents were experienced telegraph operators; his father, Leon, worked at the local weather bureau office as a meteorologist. In those days they communicated to other offices by telegraph so he was fluent with Morse and International codes.

His mother was born on her father's sailing vessel in the China Sea and spent her early years in the Orient, being educated there. At the age of 12 she made her home at the family residence in Searsport, Maine, finishing her high school course there. She then moved to Port Angeles, Washington, and was employed by Western Union as a telegraph operator. His parents were married in May 1907 and they moved to Port Crescent, Washington. His mother was employed in the local telegraph office there and at Port Angeles again on her return in 1915.

Everett Sutton was born on July 6, 1908 and moved to Port Angeles, Washington when his father was transferred there in 1915. I suppose it was only natural that he would learn Morse code after he became interested in ham radio at age 15. His father gave him a key and he learned the Morse and International codes on his own and became expert in both.

A 1923 magazine article about Sutton said, "His aunt was the first woman in the United States to obtain a radio license." I have not been able to confirm this. But it is obvious that someone had influenced him to get into ham radio.

Everett assembled the sending and receiving sets himself. All the parts were purchased for $60, except for the variocoupler. That he made by wrapping wire on pancake flour cartons from his mother's kitchen. The receiving set consisted of two tubes, a detector and a one step amplifier. His transmitter was a "5-watter" built from a 1DH circuit. His antenna is a 2 wire aerial 50 feet high. For a counterpoise he used his mother's clothes line, except on Mondays, when he disconnected it. [I'm thinking Monday was washday? — *Ed.*]

Don Mix first comments about Everett Sutton, 7DJ, in his diary:

1924-02-15 Friday — Signals were almost like old times this a.m. with the 6's & 7's rolling in, in great shape. Hooked up with 6AKW for minute but he didn't copy us. A bit later raised 7DJ a 5-watter with unrectified AC who was knocking my ears off and gave him 7 msgs and 275 words of press in 2 sections. Copied PQZ press but lead to tickler broke as I was tuning in GBL so could not copy him.

Later Mix would add this in his *QST* story[1] about the conditions during this time:

During the month of January we were in communication 35 times. Canadian 9BP was back on the job again and he and 9DKB shared most of the traffic. Canadian 4HH also handled a bunch. Conditions were very poor, QRN [static] storms occurring almost nightly, and signals on an average were weak and fading badly, although there were one or two nights when the signals came bumping in fine. Signals were exchanged with 7OM and 7OB, both using 2 five-watters, and with 7DJ, who was using but one 5-watter. The signals from these stations were much stronger than many quarter-kilowatt sets.

The return of the sun in February was accompanied by an abrupt decrease in signal strength, so we were able to work but 8 times. Although 9BP and 9DKB were on and tried to get thru to us, we were not able to work Barnsley at all and 9DKB but twice. 7DJ, Everett Sutton, of Port Angeles, Washington, with his little five-watter handled most of the small amount of traffic dispatched during this month.

[1]D. H. Mix, 1TS/WNP, "My Radio Experience in the Far North," *QST*, Nov 1924, pp 17-23; available online to members through the *QST* Archive Search on the ARRL Web page.

RADIO WORLD MAGAZINE

**Everett Sutton, 7DJ, in front of his home.**

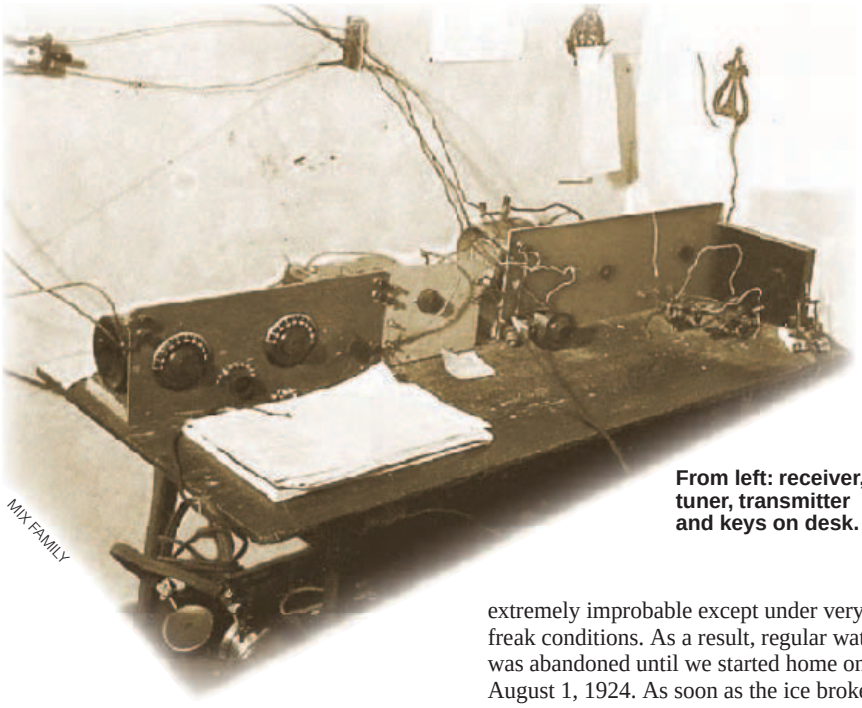
And in April Mix's diary commented:

1924-04-14 Monday — Raised 7DJ this a.m. on a QST-CQ at 12:30 – 9:30 PST an hour before end of silent hours. Gave him 6 without much trouble when the battery went down. Gave him 2 for ARRL one for [the North American Newspaper Alliance] NANA, one for home and one to McDonald. Felt rather punk this a.m. but managed to get after a can of water before dinner.

Mix continues in his *QST* story:

The next date on which we were able to break thru was April 14th, when, after over a month of vain attempts to raise someone, 7DJ answered a CQ and reported "QSA" [your signals are strong]. We worked for an hour without trouble, his signals being heard a couple of feet from the phones and 7DJ copying our signals with only an occasional repeat. He answered our CQ at 12:34 EST, which was 9:34 his time. It must have been still twilight there, while the sun was above the horizon at Refuge Harbor. 7DJ was the last station we were able to raise, although nightly watch was kept for about a month after this date. Signals grew steadily weaker and weaker until within less than

John Dilks, K2TQN ♦ 125 Wharf Rd, Egg Harbor Township, NJ 08234-8501 ♦ k2tqn@arrl.org



MIX FAMILY

From left: receiver, tuner, transmitter and keys on desk.

Larger version of photo Sutton had on his station wall.

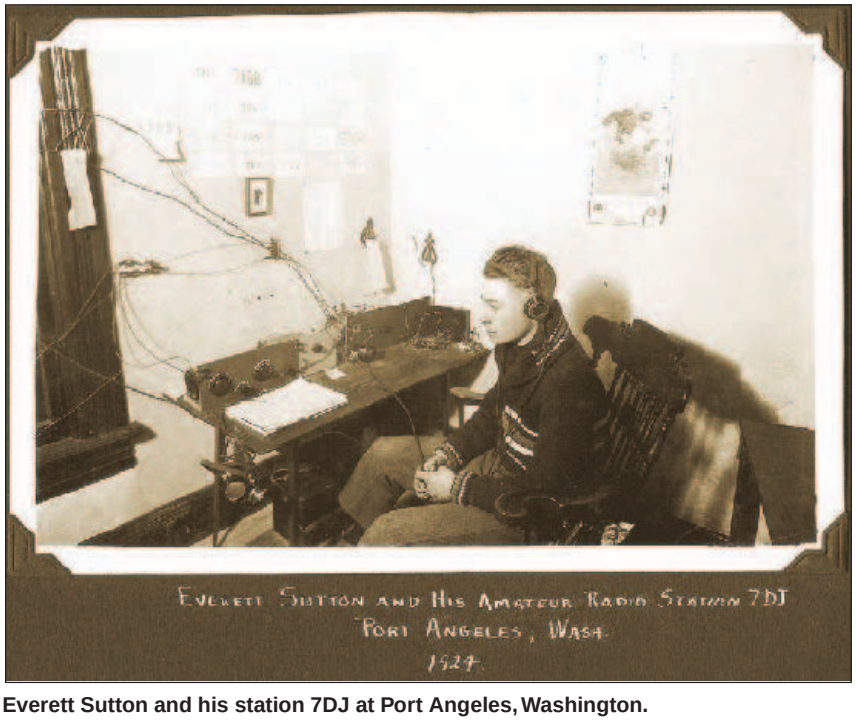
two weeks after working 7DJ no signals could be heard on short waves at all, and those of long wave high-powered commercial stations were weakened until it was impossible to copy press from POZ.

## The End of Radio Communications

Mix says:

In the middle of May I reported radio conditions to Capt. MacMillan and told him that as the supply of oil was rapidly diminishing, I thought it inadvisable to run the transmitter regularly, as the possibility of raising anyone was extremely improbable except under very freak conditions. As a result, regular watch was abandoned until we started home on August 1, 1924. As soon as the ice broke up around the ship about the first of June and she was free to shift with the wind and tide, it was necessary to abandon the aerial support on land and return to the original ship's antenna which we had used until the "Bowdoin" froze in.

I couldn't find any record of Everett Sutton having a ham license in later years. I do know he went to work for the weather bureau service and was stationed at the Cape Flattery Lighthouse on Tatoosh Island just over a half mile off Cape Flattery, the northwestern tip of the Olympic Peninsula. He raised his family there.




Everett Sutton and his station 7DJ at Port Angeles, Washington.

On September 18, 1934 the newspapers reported Sutton helped recover the body of a drowned assistant lighthouse keeper. The assistant had taken two Navy men who were working at the light to the Neah Bay mail boat and was returning to the island when his boat flipped over hitting him in the head and he lost his life.

After retiring to Port Angeles, Everett Sutton became a Silent Key in July 1980.

***Correction:*** In the March 2009 Vintage Radio, I attributed 7DC to Everett Sutton, Port Angeles, Washington. I should have said: 7DC, James Rutledge, Bremerton, Washington.

## Conclusion

I will be making a few presentations about the 1923 *Bowdoin* expedition, the "Wireless North Pole and the Adventures of Don Mix" with lots of the original photos. I regret not being able to go everywhere I have been invited. But I will list the first two here and update the list on my Web page, **www.k2tqn.com**. I hope, if you are in the area, you will attend.

May 5, 2009, at 6 PM — Old Barney Amateur Radio Club (New Jersey), free open house meeting. For information see their Web site: **www.obarc.org**.

June 12, 2009, at Noon — Mid-Atlantic Antique Radio Club (Maryland), yearly swap meet. For information see their Web site: **www.maarc.org** (admission charged for swap meet). QST

W1GHZ

# MICROWAVELENGTHS

# Microwave Transverters — System Design

A transverter is a frequency converter for both transmitting and receiving. It is the usual way to get on a microwave band, since only a few commercial transceivers cover the 1296 MHz band and there are none at all for other microwave bands.

In previous "Microwavelengths" columns, we have described most of the common microwave components. Now it is time to put them together into a transverter and make an operational system. We can buy a basic transverter module and other building blocks from Down East Microwave (**www.downeastmicrowave.com**) or from Kuhne Electronic (**www.kuhne-electronic.de/en**). Another option is to acquire surplus components and modules. Or we can build modules from scratch, using basic components like transistors, MMICs (monolithic microwave ICs), capacitors and transmission lines. What we can't do is buy a complete system, ready to plug in and operate. Microwave operation still requires some level of homebrewing, even if it is just connecting modules together with coax cables.

Most amateur microwave systems are a combination of all the above sources: some purchased components, some surplus, some homebrew and maybe a borrowed part or two to get things working in time for a contest.

## System Design

How can we figure out if all these random pieces will work together? Rather than connecting them up and seeing if smoke comes out, we can do a little paper design and a few simple calculations. The block diagram of a basic transverter is sketched out in Figure 1; the transmit section is in the top row and the receive section in the bottom row. Common to both are the local oscillator (center box) and the IF transceiver interface (left box). For now, we can leave them as black boxes.

## Transmitter Design

Let's start with the transmit section. Each component has an estimated gain, which we can use to estimate signal levels; some have loss, which is a negative gain. Starting at the left side, the maximum signal input to a typical mixer is one mW, or 0 dBm. A good mixer might have a gain of −7 dB (a conversion loss of 7 dB) so the signal level out of the mixer is −7 dBm. This is followed by a filter, with typical loss of −3 dB, reducing the signal level to −10 dBm. Next is an amplifier, with gain — let's say we have one with +20 dB of gain, which increases the signal level to +10 dBm. Then another filter reduces the level to +7 dBm. Finally, we have a modest power amplifier, with +16 dB of gain, raising the signal level to +23 dBm, 200 mW — enough power for many microwave contacts or to drive a future power amplifier.

At this point, we must also start to consider the amplifier capability. If we have an amplifier rated for 0.25 W output, all is well — operating just below the maximum power will keep it linear. Alternately, if the amplifier is only rated for 100 mW that's all we can expect to get. With 5 mW of drive we would be overdriving it and creating distortion and possibly damage. On the other hand, if it were a 1 W amplifier, we would be running it far below its capability — not getting our money's worth and probably generating more heat and draining our batteries faster than necessary for the output power obtained.

Power levels are important for the driver amplifiers as well, so that all stages are run within their capability and linear range, resulting in signals that are as loud and clean as possible. We would like to have a few dB of headroom in driver stages, so the driver amplifier in our example should be capable of perhaps +13 dBm output; then it will be more linear at +10 dBm and not add significant distortion to the signal. By doing this simple analysis, just making calculations by adding dB, and making adjustments as needed, we may have confidence that the system will perform as expected.

## Receiver Design

Calculations for the receive section are a little more complicated, since we are concerned with noise figure (NF) as well as gain. Gains still add directly in dB, but each

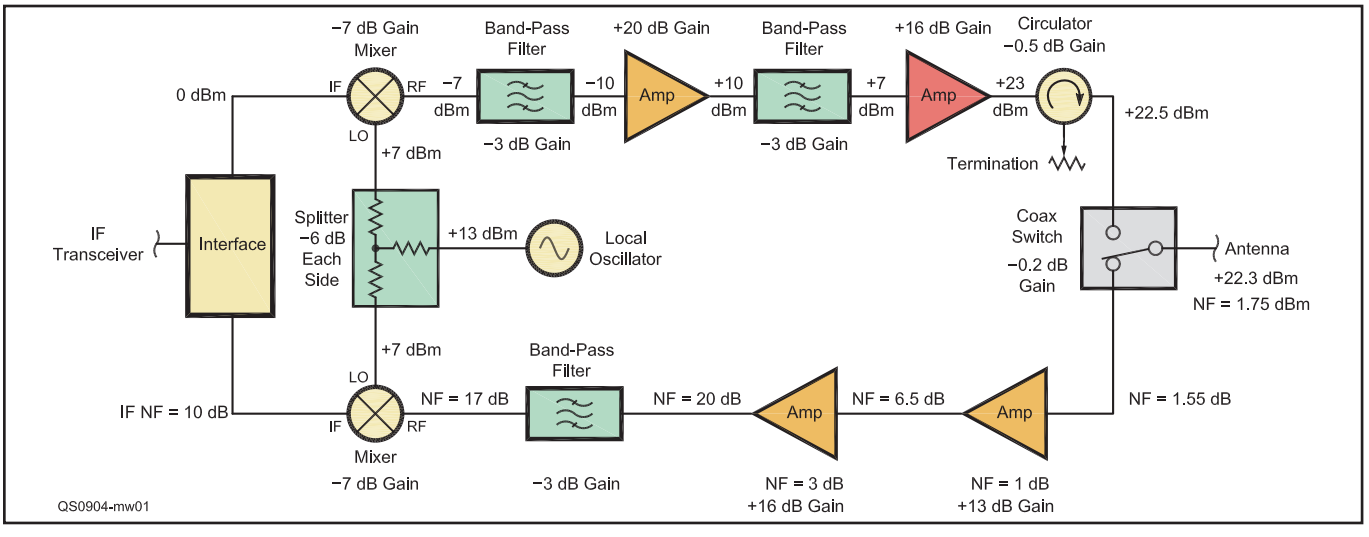



**Figure 1 — A block diagram of a basic transverter showing direct signal flow. The values for the gain and noise figure of each stage are indicated.**

Paul Wade, W1GHZ ♦ 161 Center Rd, Shirley, MA 01464 ♦ w1ghz@arrl.org

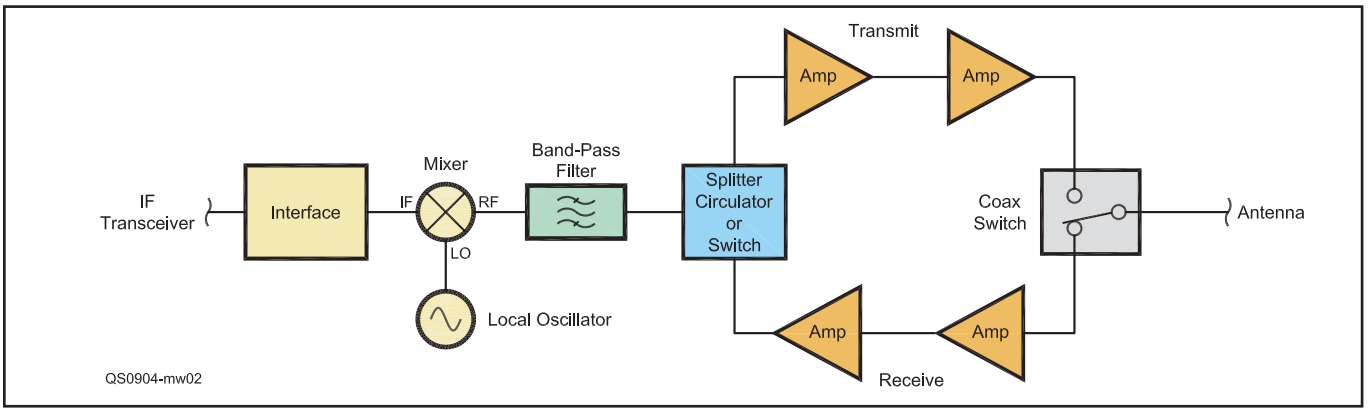



**Figure 2 –– A block diagram of a basic switched transverter.**

stage adds a little more noise, decreasing the signal-to-noise ratio so the effective noise figure of the system increases. An amplifier increases the signal level so that the noise added by following stages becomes less significant; the noise contribution of the following stages is divided by the gain of the amplifier. We can calculate the effective noise figure of an amplifier with noise figure NF1 and gain G1 followed by a stage with noise figure NF2:

$$NF\ (dB) = 10\ Log\ \{NF1 + (NF2 - 1)/G1\} \quad [Eq\ 1]$$

where

NF = Noise figure of stage

G = Gain of stage

To further complicate the calculations, NF1, NF2 and G1 in equation 1 are ratios, rather than dB:

$$ratio = 10^{(dB/10)} \quad [Eq\ 2]$$

where dB = the noise or gain value for the stage or stages being analyzed.

Equation 1 converts the NF back to dB. If this seems too complicated, there is a "Cascade Calculator" online at **www.microwaves101.com**.

Referring to Figure 1, we calculate NF from left to right, starting with the noise figure of the IF transceiver. Most small transceivers have noise figures in the 6 to 10 dB range at 144 or 432 MHz, so we will use a 10 dB NF. Then we use the above equations to calculate the noise figure at the mixer — actually, for devices without gain, like the mixer and filter, we can simply add the loss of the stage to the noise figure of the following stage. The mixer and filter bring the noise figure following the second amplifier up to 20 dB, which seems high. We must rely on the low-noise amplifiers to compensate and make the system noise figure more reasonable.

Repeating the calculation for our second-stage amplifier, we find that the noise figure at this point is 6.5 dB, even though the amplifier alone has a NF of 3 dB — the rest is attributable to the high noise figure that follows.

Finally, we make the calculation for the low-noise amplifier at the front end and find that our system noise figure here is 1.55 dB. This noise figure is pretty good but not as good as the amplifier alone.

Now we can try some what-if calculations to see if we can improve things. What if we use the same device in the second stage as in the front end (NF = 1 dB, Gain = 13 dB). Does this help? *No!* The resulting NF is higher, about 1.8 dB — the higher gain of the original second stage helps to overcome the high noise figure of the following stages.

Another choice might be to add a third stage before or after the filter, to overcome the high noise figure of the mixer and IF. This can lower the system noise figure, but makes the mixer and IF transceiver more susceptible to overload from strong signals. You might think that there wouldn't be a lot of strong microwave signals, but most of the amateur microwave allocations are shared and strong signals in other parts of the band can raise havoc. A good filter can help — many of our transverters use printed filters, which offer limited out-of-band rejection. Terminating the mixer properly can also improve strong-signal performance.

A simpler system is shown in Figure 2, where the mixer and filter are shared between transmit and receive. The simplicity usually requires some compromises — the splitter adds additional loss and switching may be more complex. The more elaborate system of Figure 1 allows the transmit and receive paths to be optimized independently for best performance. Designing the system on paper makes trade-offs easy.

In Figure 2, it is pretty obvious that the transmit and receive amplifiers form a loop, broken only by the TR relay. If the total gain is greater than the relay isolation, the loop can easily oscillate. A simple solution is to power only one side at a time — the transmit side is usually powered down except while transmitting to save on power consumption but the receive side doesn't draw much power so it might be left on to simplify switching.

## Putting it Together

A good system design on paper is a start, but doesn't make any contacts. The next step is to build a transverter. Most of us use a modular approach, so we can connect up the modules just like the system diagram and check it out. I like the breadboard approach — lay everything out on a hunk of plywood, connect up one piece at a time and test as I go.

It's much easier laid out flat and open. Figure 3 shows the start of a 10 GHz transverter using surplus and homebrew modules, interconnected with surplus semi-rigid coax cables. Power and control connections are made with clip leads for initial tests, then permanent dc and control wiring is added later.

When everything seems to work, fasten things to the plywood with screws and tie-wraps, wrap the works in clear kitchen plastic wrap and take it out for some field tests to make some contacts.

Usually, getting out and making contacts reveals some opportunities for improvement. When everything works to satisfaction, then it is time to package the system up properly — the subject of our next column. QST

PAUL WADE, W1GHZ

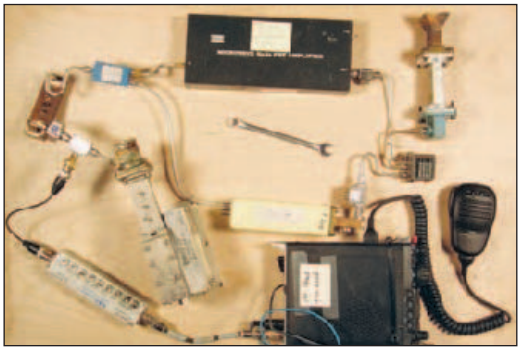


**Figure 3 –– A breadboard layout of an experimental transverter.**

# CONVENTION AND HAMFEST CALENDAR

**Abbreviations**
*Spr* = Sponsor
*TI* = Talk-in frequency
*Adm* = Admission

**Arizona (Prescott) — May 30 F H R S V**
Set up 7 AM; public 8 AM-1 PM. *Sprs:* Yavapai ARC and Verde Valley ARA. Granite Mountain Middle School, 1800 Williamson Valley Rd. 3rd Annual Prescott Hamfest. *TI:* 146.88 (100 Hz). *Adm:* Free. Tables: $10 per space. Terry Pemberton, KB7TRE, 7295 N Bridle Path, Prescott, AZ 86305; 928-445-8126; **kb7tre@cableone.net**; **www.w7yrc.org/**.

**California (Sacramento) — May 17 F R**
7 AM-noon. *Spr:* North Hills RC. Natomas High School, 3301 Fong Ranch Rd. *TI:* 145.19 (162.2 Hz), 224.4. *Adm:* Free. Tables: $10 per space. Les Cobb, W6TEE, 4114 Horgan Way, Sacramento, CA 95821; 916-481-6040; **w6tee@qsl.net**; **www.k6is.org**.

## Rocky Mountain Division Convention

**May 29-31, Estes Park, CO**
**D Q R S V**

The Rocky Mountain Division Convention, sponsored by HamCon Colorado, will be held at the Holiday Inn Estes Park Conference Center, 101 S Saint Vrain Ave. Doors are open Friday 1 PM to Sunday 2 PM. This year's theme is *Amateur Radio: Resilient, Relevant, Ready*. Features include a Friday eve keynote speaker and address; major exhibitors; superb technical program featuring both new and time-tested technologies; numerous discussion forums; meetings; VE sessions (Saturday, 9-11 AM; walk-ins welcomed); acclaimed speakers; special guests from ARRL HQ Harold Kramer, WJ1B (ARRL Chief Operating Officer and *QST* Publisher) and Mike Gruber, W1MG (ARRL EMC Engineer and contributor to "The Doctor is IN" *QST* column); QLF contest; Wouff Hong ceremony; W1AW/Ø Special Event Station; QSL card checking; convention logo pins ($3 while supplies last); Saturday eve banquet; Sunday buffet breakfast; transmitter hunt; RV camping (800-562-1887). Talk-in on 146.685 (123 Hz). Admission is $15 (adults), $8 (under 18) in advance; $20 (adults), $10 (under 18) at the door. Tables are $50. Contact Steve Williams, KØSRW, 8310 Ashford Ct, Colorado Springs, CO 80920; 719-337-8103; **k0srw@earthlink.net**; **www.hamconcolorado.org**.

**Connecticut (Goshen) — May 30 F R T V**
8 AM-1 PM. *Spr:* Southern Berkshire ARC. Goshen Fairgrounds, Rte 63. 18th Annual Hamfest. *TI:* 147.285 (77 Hz). *Adm:* $3. Tables: $10. Lee Collins, K1LEE, 5 White Hollow Rd, Lakeville, CT 06039; 860-435-0051 (phone and fax); **k1lee@arrl.net**; **www.w1baa.org**.

**Connecticut (Vernon) — May 23 F R T**
8 AM-1 PM. *Spr:* Natchaug ARC. Tolland County Agricultural Center, 24 Hyde Ave (Rte 30). Hartford Hamfest. *TI:* 145.11. *Adm:* $5. Tables: $20. Wayne Rychling, N1GUS, 59 Clint Eldredge Rd, Willington, CT 06279; 860-487-1921; **n1gus@arrl.net**; **www.na1rc.org**.

**Florida (Gainesville) — Apr 25-26 F Q V**
Saturday 8 AM-4 PM, Sunday 8 AM-2 PM. *Spr:* Gainesville ARS. Alachua County Fairgrounds, 3400 NE 39th Ave (SR-222). Gainesville Poorman's Hamfest and Computer Show, on-site camping with hookups ($10 per night). *TI:* 146.82 (123 Hz), 146.985. *Adm:* advance $5, door $7. Tables: $8. Pete Winters, KF4QEV, c/o GARS, Box 140383, Gainesville, FL 32614-0383; 352-224-2075; fax 386-454-1411; **hamfest@gars.net**; **www.gars.net**.

**Florida (Pinellas Park) — May 23 F R T**
8 AM-1 PM. *Spr:* The Glorious Society of the Wormhole. Freedom Lake Park, 1000 46th St N. Wormfest 2009. *TI:* 146.85 (146.2 Hz). *Adm:* Free. Tables: Free. Bill Williams, AG4QX, 3215 W Tambay Ave, Tampa, FL 33611; 813-837-3833; **ag4qx@arrl.net**; **www.thewormholesociety.org**.

**Florida (St Petersburg) — May 3 F T V**
8 AM-1 PM. *Spr:* St Petersburg ARC. Lake Maggorie Park, Martin Luther King St S and 38th Ave S. *TI:* 147.06. *Adm:* Free. Leslie Johnson, WA4EEZ, 6601 Bougainvilla Ave S, St Petersburg, FL 33707; **wa4eez@verizon.net**; **www.sparc-club.org/**.

**Florida (Titusville) — May 2 F T V**
7 AM. *Spr:* North Brevard ARC. Jess Parish Medical Center, 951 N Washington Ave. *TI:* 145.25 (107.2 Hz). *Adm:* Free. 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 (Byron) — May 9 F T V**
8 AM-3 PM. *Sprs:* Middle Georgia Radio Assn, Central Georgia RC, and Byron Middle School ARC. Byron Middle School, 201 Linda Dr. *TI:* 146.85. *Adm:* $4. Tables: $5. Larry Keith, KQ4B, 231 Shenandoah Tr, Warner Robins, GA 31088; 478-957-3734; **kq4b@arrl.net**; **www.heartofgeorgiahamfest.com**.

### Coming ARRL Conventions

**April 17-18**
Midwest Division, South Sioux City, NE*

**April 17-19**
International DX, Visalia, CA*

**April 18**
Tennessee Section, Bartlett*

**April 24-25**
Southeastern VHF, Charlotte, NC*

**April 24-26**
Idaho State, Boise*

**April 25**
Arkansas State, Rogers*
Louisiana State, Monroe*
Utah State, South Ogden*

**May 1-3**
EMCOMMWEST, Reno, NV*

**May 2**
South Carolina Section, Spartanburg*

**June 12-13**
West Gulf Division, Plano, TX

**June 13**
Tennessee State, Knoxville

**July 4**
Eastern Pennsylvania Section, Bressler
*See April *QST* for details.

## Georgia State Convention

**June 6, Marietta**
**D F H R S T V**

The Georgia State Convention (81st Annual Hamfest), sponsored by the Atlanta Radio Club, will be held at Jim Miller Park, 2245 Callaway Rd. Doors are open for setup at 6:30 AM; public 8 AM-3 PM. Features include indoor air-conditioned flea market, exhibitors, dealers, vendors, tailgating, forums, club displays, VE sessions, handicapped accessible, refreshments, Friday RV camping. Talk-in on 146.82 (146.2 Hz). Admission is $5 (under 18 free). Tables are $20. Contact John Talipsky, N3ACK, 385 Madison Chase Dr, Lawrenceville, GA 30045; 678-618-2190 or 770-995-6446; fax 678-985-2906; **johnn3ack@comcast.net**; **www.atlantahamfest.com**.

**Illinois (Princeton) — Jun 7 V**
8 AM-3 PM. *Spr:* Starved Rock RC. Bureau County Fairgrounds, W Peru St (US Rtes 6 and 34). *TI:* 146.955 (103.5 Hz). *Adm:* $7. Tables: $12. James Clapp, KC9FGU, 921 N 24th Rd, Oglesby, IL 61348; 815-481-6117; fax 815-646-4362; **starvedrockhamfest@hotmail.com**; **www.qsl.net/w9mks/hamfest.htm**.

**Kentucky (Grayson/Olive Hill) — Jun 6 F V**
9 AM-2 PM. *Spr:* Little Sandy ARC. TJ's Music Hall, junction of US Rte 60 and State Rte 182. *TI:* 146.7 (107.2 Hz). *Adm:* $4. Tables: $5. David Crisp, KV4EK, 925 Taylor Branch, Grayson, KY 41143; 606-474-8485; **dave41143@peoplepc.com**.

**Louisiana (Florien) — Jun 6 F H R V**
7 AM-3 PM. *Sprs:* ARC of Sabine and Gulf Coast Hurricane Net. Civic Center, 107 High School Dr. *TI:* 147.28, 146.52. *Adm:* $5. Tables: $5. Cecil Harper, WD5CQG, 294 Balleycastle Dr, Milam, TX 75959; 409-625-1565; **wd5cqg@arrl.net**; **www.arcsonline.org**.

**Maine (Hermon) — Jun 6 D F S T V**
Set up 6:30 AM; public 8 AM-1 PM. *Spr:* Pine State ARC. Hermon High School, Rte 2. 22nd Bangor Hamfest. *TI:* 146.94 (100 Hz). *Adm:* $5. Roger Dole, KA1TKS, 852 Bog Rd, Hermon, ME 04401; 207-848-3846; **rdole@hermon.net**; **www.n1me.com**.

**Maryland (Boonsboro) — May 3 D F H R V**
6 AM-1 PM. *Spr:* Antietam Radio Assn. Washington County Agricultural Center, 7313 Sharpsburg Pike (Rte 65). Equipment auction. *TI:* 147.09, 146.94. *Adm:* $5. Tables: $10. Karin Christensen, KB3GFV, Box 52, Hagerstown, MD 21741; 301-432-2358; fax 304-876-7260; **dilbert@wildblue.net**; **www.w3cwc.org**.

**Maryland (West Friendship) — May 24 F R T**
8 AM-2 PM. *Spr:* Maryland FM Assn. Howard County Fairgrounds, 2040 Fairgrounds Rd (Rte 144). *TI:* 146.76, 224.76, 444.0 (107.2 Hz).

**D = DEALERS / VENDORS**
**F = FLEA MARKET**
**H = HANDICAP ACCESS**
**Q = FIELD CHECKING OF QSL CARDS**
**R = REFRESHMENTS**
**S = SEMINARS / PRESENTATIONS**
**T = TAILGATING**
**V = VE SESSIONS**

Gail Iannone ♦ Convention and Hamfest Program Manager ♦ giannone@arrl.org

*Adm:* $6. Tables: $20. John Elgin, WA3MNN, 518 Copley Ln, Silver Spring, MD 20904; 301-641-5313; fax 301-384-6513; **wa3mnn@verizon.net**; **www.marylandfm.org**.

**Massachusetts (Cambridge) — May 17**. Nick Altenbernd, KA1MQX, 617-253-3776 (9 AM-5 PM); **w1gsl@mit.edu**; **www.swapfest.us**.

**Michigan (Chelsea) — Jun 7 F**
8 AM. *Spr:* Chelsea ARC. Chelsea Fairgrounds, 20501 Old US Hwy 12. Overnight camping (no hookups). *Tl:* 145.45 (100 Hz). *Adm:* advance $4, door $5. Tables: $10. Frank Pohs, KD8ABW, 636 W Main St, Manchester, MI 48158; 734-945-1915; **frank.pohs@gmail.com**; **www.wd8iel.net**.

**Michigan (Grand Rapids/Hudsonville) — Jun 6 F T V**
Set up Friday eve or Saturday 6 AM; public 8 AM-2 PM. *Spr:* Independent Repeater Assn. Hudsonville Fairgrounds, 5235 Park Ave. "Good Old Days" Hamfest; famous "Roadkill-Chili" potluck supper (Friday, Jun 5, 6:45 PM), foxhunt. *Tl:* 147.16 (94.8 Hz). *Adm:* advance $5, door $6. Tables: Free. Don Andrews, K8YES, 5168 Olsen Springs Ct SW, Wyoming, MI 49509; 616-532-7769; **andrews_don@juno.com**; **www.w8hvg.org**.

**Nebraska (Falls City) — Jun 6-7 D F R S V**
Saturday 8 AM-5 PM, Sunday 8 AM-noon. *Spr:* Tri-State ARC. Prichard Auditorium, W 17th and Barada Sts. *Tl:* 147.075 (146.2 Hz), 146.54. *Adm:* $4. Tables available. Todd Weaklend, WØTAW, 71275 648th Ave, Verdon, NE 68457; 801-892-2323; **info@southeastnebraskahamfest.com**; **www.southeastnebraskahamfest.com**.

## Atlantic Division Convention

**May 30, Rochester, NY**

**D F Q R S T V**

The Atlantic Division Convention (75th Annual Rochester Hamfest and Technology Expo), sponsored by the Rochester ARA, will be held at the Barnard Carnival Grounds, 380 Maiden Ln (Greece). Doors are open for setup at 6 AM; public 8 AM. Features include unlimited outdoor flea market spaces (free); commercial vendors; buy and sell new and used radio and electronic equipment; inside exhibit areas for clubs, dealers, and tech hobby groups (R/C, Model Trains, Rockets, etc); programs, forums, and meetings; QSL card certification; VE sessions (9-11 AM; no pre-registration necessary, no fee); overnight camping ($5, no hookups); 1st Annual Rochester Hamfest Fish Fry and ARRL Awards dinner (6 PM); refreshments. Talk-in on 146.88 (110.9 Hz). Admission is $5 (under 16 free with paying adult). Contact Len Crellin, KC2PCD, c/o RARA, Box 93333, Rochester, NY 14692; 585-671-2424; **kc2pcd@rochester.rr.com**; **www.rochesterham.org**.

**North Carolina (Durham) — May 23**
**D F R T V**
8 AM-2 PM. *Spr:* Durham FM Assn. Little River Community Complex, 8307 N Roxboro Rd. 36th Annual DurHamFest, Robotics Demo. *Tl:* 147.225, 145.45. *Adm:* $5. Tables: $12. Linda Jackson, KF4LJZ, 919-477-8368; **kf4ljz@aol.com**; **www.dfma.org**.

## ARRL National Convention

**May 15-17, Dayton, OH**

**D F Q R S V**

The ARRL National Convention, sponsored by the Dayton ARA, will be held at the Hara Arena, 1001 Shiloh Springs Rd (Trotwood). Doors are open Friday 8 AM-6 PM, Saturday 8 AM-5 PM, Sunday 8 AM-1 PM. Hamvention's 2009 theme is Dream: *Digital Radio Enabling Amateurs to do More*. Features include exhibitors and vendors showing their latest products and equipment; huge outside flea market/vending area; forums and presentations on all facets of Amateur Radio; VE sessions (Friday 2:30 PM, Saturday 9:30 AM and 1:30 PM; first-come, first-served basis; no pre-registration is available; no fee for exams); visit the "ARRL Expo" area (located in the Hara Ballarena, near the 400-numbered booths) for exhibits and activities to enhance your ham radio experience, ARRL bookstore, meet the ARRL staff and volunteers, DXCC card checking, ARRL Youth activities, and many other ARRL services and programs representing a wide variety of Amateur Radio interests (**www.arrl.org/expo**); Wouff Hong ceremony. Talk-in on 146.94, 146.64, 223.94, 442.1. Admission is $20 in advance, $25 at the door (good all 3 days). Contact Mike Kalter, W8CI, c/o Dayton Hamvention®, Box 964, Dayton, OH 45401-0964; 937-276-6930, fax 937-276-6934; **info@hamvention.org**; **www.hamvention.org**.

**Ohio (Tedrow) — Jun 6 F T V**
8 AM-noon. *Spr:* Fulton County ARC. Roth Family Park, 101 Hill Ave. *Tl:* 147.195. *Adm:* $3. Lindsay Infante, K8LI, c/o FCARC, Box 521, Wauseon, OH 43567; 419-822-4382; **lindsayinf@yahoo.com**; **www.k8bxq.org**.

## Northwestern Division Convention

**June 5-7, Seaside, OR**

**D F H S V**

The Northwestern Division Convention (SeaPac), sponsored by the Oregon Tualatin Valley ARC, will be held at the Seaside Convention Center, 415 1st Ave. Doors are open for setup on Friday 11 AM-8 PM and Saturday 7:30-9 AM; public Saturday 9 AM-4:30 PM, Sunday 9 AM-1 PM. Features include flea market; commercial exhibitors; new equipment dealers; 3 free 90-minute seminars on Friday (12:30-5 PM); Spaghetti Feed (Friday, 4-8:30 PM, Seaside Fire Hall); other seminars and forums on Saturday; special guest from ARRL HQ Dave Sumner, K1ZZ, Chief Executive Officer, Executive Vice President and Secretary of the ARRL; meetings; hidden transmitter hunt; VE sessions (Saturday 9 AM-noon, Our Saviour's Lutheran Church-East Parish Hall; pre-register with Carl Clawson, WS7L, 503-629-5796; **ws7l@arrl.net**); RAGS Country Store; SeaPac Collector's Pins ($5); DX and YLRL luncheons; Saturday eve happy hour and banquet featuring guest speaker Paul Linnman, KEX radio personality; refreshments. Talk in on 146.66. Admission is $8 in advance, $10 at the door. Tables are $15 each for 1 day and $25 each for 2 days. Contact C. Wayne Schuler, AI9Q, 16414 NE 21st St, Vancouver, WA 98684; 360-892-5580 (phone and fax); **ai9q@arrl.net**; **www.seapac.org**.

**Pennsylvania (Butler/Pittsburgh) — Jun 7**
**D F S V**
Set up Saturday after 6 PM; public Sunday 8 AM-3 PM. *Spr:* Breezeshooters ARC. Butler Farm Showgrounds, Rte 68. 55th Annual Hamfest and Computer Show. *Tl:* 147.3. *Adm:* $5. Tables: $20. Robert Benna, N3LWP, 1010 Willow Dr, Pittsburgh, PA 15237; 412-366-0488; fax 412-366-0486; **n3lwp@verizon.net**; **www.breezeshooters.net**.

**Quebec (Sorel-Tracy) — May 24**. Luc Leblanc, VE2DWE, 450-743-8676; **ve2cbs@raqi.ca**; **www.hamfest.qc.ca**.

**Washington (Stanwood) — May 9 D F S V**
9 AM-5 PM. *Spr:* Stanwood-Camano ARC. Stanwood Middle School, 9405 271st St NW. 18th Annual Electronics Flea Market and Hamfest. *Tl:* 145.19. *Adm:* $5. Tables: $15. Vic Henry, N7KRE, 830 Granite Ln, Camano Island, WA 98282; 360-387-7705; **nwecop@tgi.net**; **www.scarcwa.org**.

**West Virginia (Ripley) — May 3 F V**
8 AM-2 PM. *Spr:* Jackson County ARC. Ripley Middle School, 1 School St. *Tl:* 146.67 (107.2 Hz). *Adm:* $5. Tables: $5. Roy Moore, KB8ZSG, 25 Daniels Run Rd, Spencer, WV 25276; 304-927-4412; **afa2ax@yahoo.com**.

## Wyoming State Convention

**May 22-24, Casper**

**H V**

The Wyoming State Convention, sponsored by the Sweetwater ARC, will be held at the Best Western Ramkota Hotel, 800 N Poplar St. Doors are open Friday 5-8 PM, Saturday 7 AM-8 PM, Sunday 8:30 AM-2 PM. Features include foxhunt, home brew, VE sessions, handicapped accessible. Talk-in on 146.94 (123 Hz). Admission is $15 in advance, $20 at the door. Tables are $5. Contact Dave Gregory, N7COA, 1000 S Dakota St, Green River, WY 82935; 307-875-5324 (phone and fax); **n7coa@arrl.net**; **www.wy7u.org**.

### To All Event Sponsors

Before making a final decision on a date for your event, you are encouraged to check the Hamfest and Convention Database (**www.arrl.org/hamfests.html**) for events that may already be scheduled in your area on that date. You are also encouraged to register your event with HQ as far in advance as your planning permits. See **www.arrl.org/FandES/field/hamfests/regform.html** for an online registration form. Dates may be recorded up to two years in advance.

Events that are sanctioned by the ARRL receive special benefits, including an announcement in these listings and online, donated ARRL publications and handouts.

*For hamfests:* Once the form has been submitted, your ARRL director will decide whether to approve the date and provide ARRL sanction. *For conventions:* Approval must come from your director and the ARRL executive committee.

The deadline for receipt of items for this column is the **1st of the second month preceding publication date**. For example, your information must arrive at HQ by **April 1** to be listed in the **June** issue. Information in this column is accurate as of our deadline; contact the sponsor or check the sponsor's Web site for possible late changes, for driving directions and for other event details. Please note that postal regulations prohibit mention in *QST* of prizes or any kind of games of chance such as raffles or bingo.

Promoting your event is guaranteed to increase attendance. As an approved event sponsor, you are entitled to special discounted rates on *QST* display advertising and *ARRLWeb* banner advertising. Call the ARRL Advertising Desk at 860-594-0207, or e-mail **ads@arrl.org**. QST

# SILENT KEYS

*It is with deep regret that we record the passing of these amateurs:*

ex-AK1C **Passburg**, Olaf, E Longmeadow, MA
KB1CFR **Carastro**, Joseph L., Fort Myers, FL
W1HHY **Matthews**, John C., Milford, CT
ex-W1IQ **Rule**, William H., Augusta, ME
WA1LES **Chistolini**, Joseph P., Springfield, MA
W1LFK **Parmelee**, Charles Dan, Middletown, CT
W1ME **Caswell**, George E. Sr, Scarborough, ME
W1NPL **White**, Edward J., Chicopee, MA
K1OEQ **Schoonmaker**, Lester L., Milford, CT
W1WG **Fairbanks**, Earl T., Shelton, CT
KB1ZC **Parker**, Dr Johnson, Bethany, CT
WB2ABF **Hultman**, Ivar N. Jr, Rochester, NY
W2CEN **Zielinski**, Paul M., Fairport, NY
W2GDZ **Keitel**, John C., Iselin, NJ
KB2LB **Cohen**, Harvey H., Caledonia, NY
KA2MBP **Gallo**, Nicholas J. Jr, Ridgefield, CT
♦WB2MPC **Houser**, Kenneth D., Palm Bay, FL
♦WB2NQV **Kosman**, Charles R., Wichita Falls, TX
W2NYV **Steneck**, Walter G. Jr, Ossining, NY
N2OLZ **Mill**, Andrew L., Lockport, NY
K2VYG **Kanen**, Robert M., Long Valley, NJ
K3DM **Frost**, Robert T., Narberth, PA
♦AF3E **Wilder**, William E., Fairhope, AL
KE3HI **Hoffman**, Sidney C., Silver Spring, MD
KD3IH **Radding**, Earl C., Greenwood, DE
K3NTR **Baum**, Herbert E., Lock Haven, PA
KB3PLT **Henry**, Jared A., Erie, PA
W3QQ **Justis**, Cedrick D., Newark, DE
♦WA3TQJ **Michaud**, Thomas E., Warrington, PA
♦K3TUP **Kanzius**, John, Erie, PA
N3YPC **Dias**, George B., Newville, PA
K4ABW **Edwards**, Harold D., Gadsden, AL
KK4AC **Mashburn**, Vernon A., Lawrenceburg, TN
W4AL **Zetekoff**, Alfred, Boca Raton, FL
W4AX **Owsley**, Woodrow W., Dallas, GA
KM4CV **Taylor**, Perry E., Statesville, NC
WD4DAK **Stuart**, Louis P., Stanton, TN
W4DDV **Michaels**, Joseph III, Phoenix, AZ
KI4DIT **Coons**, Norman M., Richmond, VA
K4FAZ **Swan**, Richard T., Huntsville, AL
WD4JB **Beard**, Jimmy M., Gadsden, AL
KA4JHE **South**, Linden, Center, KY
WA4JSM **Wachter**, George F., Huntsville, AL
W4KPC **Discher**, Edgar H. Jr, Milledgeville, GA
WD4MFN **Lones**, William F., Knoxville, TN
W4OJI **Riddle**, C. G., Atlanta, GA
N4OZN **Phillips**, Robert C., Huntsburg, OH
N4PU **Burns**, James N., Cumberland City, TN
KB4QKW **Durham**, Margaret D., Fort Worth, TX
KM4QP **Michael**, Harlan G., Madison, AL
N4SPL **Finley**, John G., Lutz, FL
♦K4TPO **Songer**, George L. Sr, Suwanee, GA
K4USE **Vavrina**, James M., Sun City Center, FL
W4VKR **Grow**, Frank C., Nicholasville, KY
W4YDH **O'Rear**, Dr Harry B., Waynesville, NC
♦KX4Y **Schliemann**, Dieter K., Scottsboro, AL
KK4ZH **Lee**, Thomas M., Lewistown, MO
WB4ZRN **Dillon**, Harry E., Nashville, TN
K5AZ **Atkinson**, Dr Gene, Houston, TX
K5BPA **Stroud**, Wallace J. Jr, Lake Charles, LA
W5CFK **Phares**, Charles C., Kerrville, TX
W5CIV **Boles**, Jerry H. Jr, Dumas, TX
W5DHG **Guffey**, David H., Menlo, GA
K5DJV **Vordenbaum**, Eldera J., Kerrville, TX
♦W5FDF **Robinson**, Ralph O., Kerrville, TX
N5KLM **Tasetano**, John R. Jr, Moore, OK
W5PRV **Morgan**, Joseph F., Kerrville, TX
KC5STB **Crawford**, Thomas F., Ingram, TX
W5VAB **Krueger**, Norman T., Dardanelle, AR
W5WMA **Talkington**, Leslie O. Jr, Irving, TX
KB5XM **Stokes**, Henry H., Yukon, OK
AD6AM **Greenwood**, James A., Antioch, CA
W6APR **Morris**, Albert L., Grass Valley, CA
W6BGN **Ingram**, Emmett Jr, Rancho Palos Verdes, CA
KE6CYU **Myers**, Richard L., Lake Forest, CA
W6EAG **Artz**, George W., Sacramento, CA
K6ERI **DeMoss**, Gerald V. Sr, Oxnard, CA
W6EYP **Lincoln**, Warren S., San Marcos, CA
N6GBF **Fritkin**, Gary B., Woodland Hills, CA
K6HXX **Chatham**, John L., Moorpark, CA
KD6NVW **Takakjian**, Richard S., Fountain Valley, CA
KF6OGC **Wood**, Dr Marjorie F., San Pablo, CA
KC6PFT **Oliver**, Willie M., Rocklin, CA
KA6PVR **Husted**, Paul R., Lakeview Terrace, CA
KA6SRN **Kraft**, Pat, Fresno, CA
KD6UJW **Bush**, Wallace L. Jr, San Diego, CA
♦WA6UPR **Zierold**, Nelson A., Mesa, AZ
W6UYW **Kreager**, Peter C., Carlsbad, CA
W6WAG **Herndon**, Phillip W., Littlerock, CA
WY6X **Strongman**, Benjamin T., Lake Isabella, CA
ex-KL7ACW **Bassler**, John R., Kodiak, AK
WA7EDT **Manes**, Almon D., Kooskia, ID
♦K7EE **Pearson**, Everett R., Seal Beach, CA
KO7E **Adams**, Owen E., Grand Coulee, WA
KA7IRP **Fuller**, Harry R. Jr, Summerfield, FL
W7MWC **Fuchs**, Harold C., Bremerton, WA
K7NLM **Tomminger**, Joseph F., Salem, OR
AH7P **Coan**, Edward M., Lawai, HI
KC7PLD **Vaughan**, Bob L., Albany, OR
KA7QEK **Mason**, Lee E., Sparks, NV
N7SMQ **Ellsworth**, Elman K., Salt Lake City, UT
KC7WDQ **Stockton**, Mary A., Baldwin City, KS
K7YQM **White**, Gene, Grants Pass, OR
K7ZQR **Bryant**, V. E., Ward, AR
K8BD **Howard**, Raymond, Cambridge, OH
K8CVC **Johnson**, Robert F., Washington Court House, OH
WA8GXD **Childers**, William E., Harrisville, WV
KA8ITE **Alexander**, Max D., Bloomingburg, OH
W8MPC **MacDonald**, Malcolm A., E Ellijay, GA
KB8TO **Parcher**, William C., Perrysburg, OH
♦W9AMF **Chichester**, Jack R., Kerrville, TX
KJ9H **Johnson**, Roy B., Granite City, IL
W9HLX **Berroyer**, Paul L., Pana, IL
W9IXD **Belke**, Roger, Dekalb, IL
W9NPO **Moderow**, LeRoy E., Elgin, IL
KC9NTL **Reed**, Patrick J., New Berlin, WI
♦N9QA **Knaus**, David J., Grafton, WI
WA9RSH **Johnson**, Merton E., Sycamore, IL
W9SD **Schlaugat**, Walter C. Jr, Prairie Du Chien, WI
N9SZZ **Kain**, Russell Benton Jr, Lakewood, WI
W9UC **Alter**, Col Charles P., Moline, IL
K9VDQ **McFall**, James W., Terre Haute, IN
KK9W **Lumley**, James W., Marine, IL
KQ9W **Ornee**, David G., Western Springs, IL
NØAPA **Rich**, Robert H., Sioux Falls, SD
KØDVO **Cox**, Robert B., Corning, IA
WØEEJ **Schmidt**, Jesse A., Grand Junction, IA
NUØE **Gorham**, Jay E., Spearfish, SD
KAØFXS **Tridle**, Kenneth N., Lincoln, NE
AAØIP **Fonda**, Arden H., Pueblo, CO
NØJNS **Bentley**, Duane V., Omaha, NE
♦KØJO **Oehlenschlager**, John G., Verndale, MN
♦KAØK **Allan**, Karyn W., Hibbing, MN
WØMMQ **Jorgensen**, Roy J., Vermillion, SD
AAØNG **Diedring**, Kurt A., Pagosa Springs, CO
KØOFO **Stevenson**, Walter T. Sr, Pittsburg, KS
NØPKR **Harford**, Ken L. Sr, Marion, IA
WØRGO **Peterson**, Roger W., Palos Verdes Estates, CA
♦KØZL **Leahy**, William J., Arvada, CO
VE9YM **Clarke**, Bruce, Moncton, NB, Canada
VK9NS **Smith**, James B., Norfolk Island, Australia

♦ Life Member, ARRL

***Note***: Silent Key reports must confirm the death by one of the following means: a letter or note from a family member, a copy of a newspaper obituary notice, a copy of the death certificate, or a letter from the family lawyer or the executor. Please be sure to include the amateur's name, address and call sign. Allow several months for the listing to appear in this column.

Many hams remember a Silent Key with a memorial contribution to the ARRL Foundation or to ARRL. If you wish to make a contribution in a friend or relative's memory, you can designate it for an existing youth scholarship, the Jesse A. Bieberman Meritorious Membership Fund, the Victor C. Clark Youth Incentive Program Fund, or the General Fund. Contributions to the Foundation are tax-deductible to the extent permitted under current tax law. Our address is: The ARRL Foundation Inc, 225 Main St, Newington, CT 06111. QST

Gail Iannone ♦ Silent Keys Administrator ♦ sk@arrl.org

## ARRL Life Members Elected March 14, 2009

◊Steven C. Adams, K4RF; Gregory M. Allen, K6GMA; Firas Alsugair, HZ1FS; Karl W. Austin, KE5DKH; James Bailey, NØIAA; Bradley S. Baker, K8DBA; Rick Barnes, WG3A; Howard E. Basham, KD8FSH; Robert L. Battagin, WB6ONM; Sally N. Baugh, KE6CXH; Jennifer J. Beckey, KG6WME; James Bennight, K4GKJ; Darell F. Brehm, WA3OPY; Jack E. Burris, K6JEB; Ronald F. Cady, K1RKD; Jeffrey D. Capehart, W4UFL; Clyde E. Chavis, NØBDS; Toby L. Clairmont, KH7FR; Donald G. Cofrancesco, KB1FYK; Louise M. Connolly, KI4LNN; Don Davis, AD6PB; Robert R. Dickey, AK5V; Michael R. Dietrich, KB5FLX; Louis Eckert, N9KC; Vernon L. Estes, W7VLE; Gary F. Forister, N6HMR; Treva L. Forister, N6HMS; Kenneth L. Goetz, N2SQW; Jeffrey G. Gomberg, WB6DNU; Mario C. Gutierrez, WQ2F; Paul N. Haggerty, N9RSQ; Salim S. Hameed, VU2LID; Betty Hapeman, KE6VM; Kimberly R. Harrison, KB5YIQ; Lawrence T. Harrison, K3JRR; Lee S. Hatfield, K2HAT; Steven C. Holland, KI4RJZ; George H. Horbal, KG6VSH; David S. Hunt, ALØH; Joseph C. Hutcheson, KB1CJ; Chet Jensen, W6XK; Kevin A. Johnson, KD7MHA; Howard W. Kaufman, WJ3F; Richard W. Kile, WA7BNG; Kenneth A. Kopp, KKØHF; Walter J. Kreis, KD8HWG; Keith A. LaBorde, K4KAL; Gary Lee, KB9ZUV; Kenneth H. Lee, W1YJ; Eugene W. Lightsey, KA5ALZ; John T. Litz, NZ6Q; Joseph F. Lutz, WB8EAS; Thomas O. MacKell, KI4ULM; Richard A. McElravy, NWØJ; Kerry L. Miller, NØWIQ; Michael J. Myers, AC6E; Melisa J. Nordin, KE7KRS; James M. Novak, KA1LOA; Mark E. O Brien, AF6FR; James C. Oberg, N9JO; Alejandro G. Paul, KK4KM; Calvin Paulsell, KD7TYS; Keith E. Pennington, KZ8C; Michael Pitoy, W7ALX; Daniel A. Quist, K1HYL; Robert R. Ramsaur, WA6MQF; John P. Reagles, N5ZSI; Joel C. Reaves, WB4ZLB; Gail Richardson, KI4JVM; Gerald P. Robison, WW5W; Wayne D. Rosenfield, K1WDR; Lois E. Rude, KCØZNY; Gilbert Saez, N2PKB; Tyler C. Sarna, N1TY; Mark R. Scafonas, KDØENZ; William H. Scarlett, AB5PJ; Mark Scheuer, W9MV; Scott A. Seamans, W7RFI; Robert A. Serwy, N9RS; Jerry F. Shaw, KI6RRD; David F. Shearer, WH6AWH; Kenneth Silberman, KB3LLA; William H. Sims, N4RG; Leroy N. Snyder, KBØRCI; Marcial D. Sorrel, K5MDS; David C. Spavin, NØONX; Gary D. Strohm, WBØTOB; Gary M. Taylor, AD5DT; Susan Terregino, KB2SFH; Don Torguson, KE7LYN; John Tramontanis, N4TOL; Marc Vancraeyenest, ON5TT; Jean Pierre Vanlierde, ON4LCY; Markus Walter, HB9HVG; Kenneth A. Webb, AA1RA; Rachel A. Weiss, KC2SGF; Demetria P. White, K4DPW; Harvey A. Wile, KD8CMN; Robert A. Winters, N7XR.

# 75, 50 AND 25 YEARS AGO

## May 1934


■ The cover photo shows a large P.A. tube glowing cheerily.
■ The editorial, commemorating the 20th anniversary of A.R.R.L., publishes anniversary greetings from President Franklin D. Roosevelt; Senatrore Guglielmo Marconi; former President Herbert Hoover; Acting Secretary of the Navy, Admiral W. H. Standley; Chief Signal Officer of the Army, Major General Irving J. Carr; Chief of the Air Corps, Major General Benjamin D. Foulois, and many other leaders in fields that depend on radio communication.
■ A very interesting seven-page article by Clinton B. DeSoto recaps "Twenty Years of Amateur Radio."
■ "A Sketch of Technical Progress" reviews the past 20 years of Amateur Radio.
■ Two pictorial features look at the past 20 years — "Two Decades of Progress in Station Equipment" and "Further Stages in Amateur Station Development."
■ Further honoring the 20th anniversary of ham radio, Rufus Turner, W1AY, discusses "Hamdom's Traditions," especially that of the Wouff Hong.
■ Getting back to the current day, Don Mix, W1TS, discusses "Suppressor-Grid Modulation in the Low-Power 160-Meter 'Phone."
■ LeRoy Moffett, W9IJ, tells about his new homebrew receiver, "A De Luxe Crystal Type S.S. Receiver."
■ George Grammer presents "Completing the Three-Stage Transmitter," via the addition of an 830 amplifier, and discussion of final adjustments and tuning.

## May 1959


■ The cover photo shows one of the several old-time ham stations set up in the museum of the American Wireless Association.
■ The editorial looks back on the 45 years of the A.R.R.L.
■ A. H. Sharbaugh, W2UKL, and R. L. Watters, W2RDL, describe what can be done in "The World above 20,000 Megacycles."
■ R. B. Shreve, W8GRG, tells about his design of "'Monitrol' — A Station Control Center."
■ "A New Material for Ham Construction," by Charles Leiper, W1IPV, describes how printed circuit board stock can be used in place of sheet metal.
■ John Englested, W1VLN, describes his modification to get on "75 Meters with a KWM-1."
■ Cormac Thompson, W7ACA, tells how to build a 32-foot wooden tower for less than $20, in "Self-Supporting Tower for Small Back Yards" — something hams did before the days of commercially built towers.
■ L. U. Kibler, K2MSU, describes "A Transistor Transmitter for 50 Mc," using inexpensive 10 Mc. transistors.
■ Lew McCoy, W1ICP, tells us how to tune "80 through 6 with the BC-454," using a crystal-controlled converter ahead of the popular WW II surplus "command" receiver.

## May 1984


■ The cover photo shows W3BBS's mountaintop full of antennas, with the caption, "Fun and games above 50 MHz."
■ The editorial, "Federal Preemption," discusses how Federal radio laws preempt state and local laws that might threaten Amateur Radio.
■ Frank Noble, W3MT, describes his latest project, "A Crystal-Controlled Q meter."
■ Doug DeMaw, W1FB, continues his tutorial series, with Part 5 presenting "An Introduction to Coils and Transformers."
■ In another article, W1FB discusses "Broadband and Narrow-Band Amplifiers."
■ Edward Swynar, VE3CUI, gives us tips on working DX without spending a fortune, in "40 Meters with a Phased Delta Loop."
■ Dennis Monticelli, AE6C, tells about "A Battery-Powered 30 Meter VFO" that can be used with your good old vacuum-tube rig.
■ "A Simple Function Generator," designed and built by Harry Neben, W9BQ, will help you track down problems in your transmitter's audio.
■ "The Last Days of OSCAR 8" (reprinted, with permission, from AMSAT's *Orbit* magazine), by Frank Weisenmeyer, K9CIS, tells how the satellite's telemetry reported its own demise because of a failed battery.
■ "Eliminate TVI with Common-Mode Current Controls," by Dick Buchan, WØTJF, helps us understand common-mode current, the problems it can cause, and how to cure those problems.

Al Brogdon, W1AB ♦ Contributing Editor

# Field Organization Reports

**February 2009**

## Public Service Honor Roll

This listing recognizes radio amateurs whose public service performance during the month indicated 70 or more points in six categories. Details on the program are at this Web page: **www.arrl.org/FandES/field/pshr/**.

1207
AD4BL
680
W7TVA
615
AC8AR
480
W4CAC
360
KØIBS
288
W7JSW
KØLQB
252
KI4KWR
247
W2MTA
335
N2LTC
316
WB7WOW
290
KA2ZNZ
270
W2LC
227
K1HEJ
210
AK2Z
206
KB2ETO
205
K2HJ
201
N4HUB
195
KI4HGO
189
K7EAJ
187
K7BC
170
W2DWR
165
KE5HYW
W1SGC
N1UMJ
N7CM

160
AG9G
KGØGG
K8MFK
155
W5DY
154
WB2KNS
W9AL
150
WB5ZED
148
WB8RCR
144
K4DND
143
WD9FLJ
142
KB5PGY
WD8USA
140
K7BFL
KE4CB
K9LGU
WØLAW
KK3F
WA4UJC
139
NC4VA
135
W4DNA
137
KA8ZGY
135
N2GJ
K3CSX
W3YVQ
K2ABX
132
KC8NTE
130
NN7H
WB2FTX
W4ZJY
KB5KKT
W4FAL
128
KI4ZJI
W7EKB
125
KB1KRS
123
KAØDBK

120
KA4FZI
K6JT
KW1U
N1LKJ
W1GMF
K1LCQ
W8UL
N2GS
K2UL
K4IWW
119
KT5SR
115
KK5NU
N8IO
K8RDN
111
KK1X
110
W7QM
W7GB
N4ABM
KB2EV
W4BNF
WB4GHU
N1IQI
KB2BAA
W6DOB
NA9L
KB2RTZ
N7XG
N7YSS
KB1NMO
KK5GY
WB9JSR
109
K8AMR
105
KD1LE
NG1A
KA3NZR
K2TV
102
NS7K
100
N7BEC
W7GHT
K4SCL
K2AN
N5OUJ
NR2F
NIØI
NØMEA
WB8SIQ
N8OD
N1JX
NN7D
KD7OED
KB2KLH
W9ILF
W3TWV
W7ELI

AA3SB
NX1Q
N7IE
KM1N
K4GK
KI4YV
W4TTO
99
KK7DEB
KK7TN
98
AC8AL
96
KI4NGD
95
KI4PRX
W8IM
WG8Z
94
W5GKH
W3ZQN
93
KB9KEG
N1CKM
92
K2VX
KD8FNN
91
N2DW
WA1JVV
90
K1JPG
N9MN
NU8K
KI4JQB
N8DD
WD8Q
WA2CUW
KF7GC
WB6UZX
N3ZOC
K3IN
KC4PZA
KA1RMV
NM1K
KA1GWE
WB8OIF
KA8WNO
K4BG
WB4BIK
WA2YBM
N4MEH
89
KC5OZT
W2DSX
KB3LNM
88
K6RAU
KE4PAP
K2GW

W5CU
N8NMA
KBØDTI
87
KJ7NO
86
KS3Z
85
KB8NDS
82
W3CB
K4BEH
81
W8CPG
80
K7MQF
KE7DVV
W5ESE
W3GQJ
WØCLS
W5TY
AB8SY
79
WDØGUF
K5SFM
KE9OH
78
K4DLF
77
N7EIE
W9WXN
NA7G
76
KJ4G
W5XX
N4EJF
K8VFZ
74
W6SX
W7VSE
KB3MXM
73
WA2NDA
70
WØADZ
NØDUW
NØDUX
NUØF
KAØFUI
KBØJKO
NØMHJ
KØOR
KØRXC
NØUKO
WAØVKC
KD7ZUP
N3SW
W1PLW

The following stations qualified for PSHR in previous months but were not recognized in this column: (Jan) W2LTB 480, N2LTC 335, KA2ZNZ 300, AK2Z 210, K2ABX 168, KD1LE 105, K2AN 100, W9WXN 88, KO4OL 82.

## Section Traffic Manager Reports

The following Section Traffic Managers reported: AK, AL, AR, AZ, CO, CT, EB, EMA, EPA, EWA, GA, ID, IL, IN, KS, MDC, ME, MI, MN, MS, NC, NH, NLI, NNJ, NNY, OH, OK, OR, SC, SD, SFL, SNJ, SJV, STX, TN, UT, VA, WI, WMA, WNY, WCF, WV, WY.

## Section Emergency Coordinator Reports

The following ARRL Section Emergency Coordinators reported: AZ, EMA, EWA, GA, KS, LA, MDC, ME, MO, MT, NC, NLI, NV, OH, OK, SD, SFL, SNJ, STX, WNY, WV.

## Brass Pounders League

The BPL is open to all amateurs in the US, Canada and US possessions who report to their SMs a total of 500 or more points or a sum of 100 or more origination and delivery points for any calendar month. Messages must be handled on amateur radio frequencies within 48 hours of receipt in standard ARRL radiogram format. Call signs of qualifiers and their monthly BPL total points follow.

W1GMF 1538, KK3F 1489, KA9KEG 1416, N1IQI 1398, N1UMJ 1178, WB9JSR 841, WB5NKD 838, WB5ZED 1170, WB5NKC 620, K7BDU 844, KW1U 797, W8UL 724, K4IWW 527, NR2F 503.

# 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**.

## Build a Docking Station for Your Handheld

**⅝ λ vertical monopole** — a single element, usually end fed, vertical antenna popular from HF through UHF. The ⅝ λ length is a special length that maximizes the radiation at the horizon more than any other single element antenna. See **www.cebik.com/gp/58.html**.

**Anderson Powerpole connectors** — Trade name for a kind of electrical plug-in connector designed for low power loss and ease of interconnection. For more information, see **www.andersonpower.com**.

**ARES®** — 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**.

**Molex connector** — Nylon-supported two or more pin connector often used for power connections.

**Sealed lead acid battery** — A kind of rechargeable storage battery in which only trace amounts of gas are emitted and to which water need not be added.

## A Cell Phone Headset Adapter for Amateur Radio

**CAT-5 type cable** — Jacket containing four twisted wire pairs designed for use with gigabit (or lower signaling rate) Ethernet local area networks.

**Electret microphone** — Type of mic in which the voice diaphragm is one plate of a capacitor that moves with respect to a fixed plate during speech. The element includes a miniature solid state amplifier.

**RJ-45** — Modular telecommunication type cable connector with eight conductors generally used to terminate Ethernet patch cables and now also Amateur Radio microphone or remote connection cables.

**Tip, ring and sleeve** — The three connection points on a stereo phono type plug. The outermost is called the *tip*, the middle band is the *ring* and the longer portion, usually common, is the *sleeve*.

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

## How I Installed a Ham Shack in My SUV and Fixed the Noise

**APRS** — Automatic position reporting system. System that accepts global positioning system position data from a GPS satellite receiver and processor, formats it into an AX-25 packet for transmission via Amateur Radio, usually on 144.39 MHz. Position data is available via radio or over the Internet. See **www.arrl.org/tis/info/HTML/aprs/pos-reporting.html** for more information.

**RG-214** — Coaxial cable type with 50 Ω characteristic impedance. Similar to the more common RG-8, but with double shielding and a slightly larger, 0.425 inch, outer diameter. Compatible with a PL-259 UHF type coax connector without need for a sizing adapter.

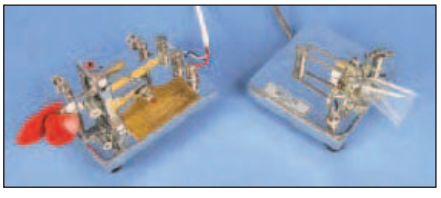
**Top hat** — Capacitance structures placed near the top of a vertical antenna to electrically lengthen it. This is generally more efficient than having inductive loading near the bottom.

**Toroid core** — Circular, donut shaped structure made from metal oxides in a ceramic material. It is used as the basis for inductors that have the property that they are self shielding in that the magnetic fields stay within the core.

## A Lightweight Homemade Keyer Paddle

**Bending brake** — Metal forming tool designed to bend sheet metal at a precise angle with a clean seam.

**Electronic keyer paddles** — Common name for the mechanical portion of an electronic keyer. There is generally a single or dual lever mechanism, one side for dots, one for dashes.



**Iambic keyer** — Form of electronic keyer in which pressing both dot and dash levers results in alternating dots and dashes. It is also possible to insert a dot in a string of dashes, without releasing the dash lever, or vice versa. Such operation requires a dual lever paddle. See **home.att.net/~jacksonharbor/modeab.pdf**.

**Mechanical bug** — Semi automatic telegraph key with horizontal action in which dashes are made manually, usually by pushing a lever to the left, while dots are made automatically by a weight and spring if the lever is pushed to the right.

**Straight key** — Traditional up and down motion telegraph key with no automation.

## Troubleshooting Radios

**Automatic gain control (AGC) —** Circuitry, generally in a receiver, that adjusts the receiver gain automatically so that the output remains nearly constant in the presence of input signals of varying level.

**Bandswitch shaft** — In the days before push button automatic band selection, radios typically used long multi-gang rotary switches to select the circuit elements for different bands. The sections were driven together by a single *bandswitch shaft*.

**CRT screen** — Cathode ray tube. A vacuum tube based display device used in television and radar systems in which the image is formed by electrons driven from a cathode to a phosphorescent display screen.

**Digital multimeter** — Basic test instrument that can be switched to measure the electrical voltage, resistance or current in different ranges. Originally an analog instrument, now more commonly available with a digital display.

**Hamfest** — Organized gathering of Amateur Radio operators often sponsored by a radio club or other ham organization. A hamfest often features a radio fleamarket of used equipment and radio parts, symposia, volunteer license examinations and often displays by dealers and manufacturers.

**Oscilloscope** — Type of electronic test instrument traditionally with a cathode ray display screen that shows time on the horizontal axis and voltage on the vertical axis.

**RCA connector** — Inexpensive coaxial connector type often encountered in home audio equipment. It sometimes is pressed into service as a low power RF connector.

**Shielded lead** — Interconnecting wire enclosed in a tubular braided conductor designed to reduce pick up of extraneous signals.

## Vintage Radio

**Variocoupler** — Two inductors whose mutual inductance can be varied, usually by moving one coil with respect to the other, thus providing variable coupling between two ac circuits.

## What's the Best Height for My HF Beam?

***EZNEC*** — Antenna modeling software that provides a user friendly interface to the powerful *Numerical Electromagnetic Code* (NEC) calculating engine. Several versions of *EZNEC* antenna modeling software are available from developer Roy Lewallen, W7EL, at **www.eznec.com**.

**Stacked array** — Antenna system composed of multiple distinct antennas, often each a Yagi array, one or more above each other. The resulting pattern provided additional gain in the normal direction through compression of the vertical pattern compared to a single antenna.

**Yagi** — Multielement directive antenna in which many of the elements are not directly connected to the driven element(s). The other elements are parasitic and receive and reradiate energy due to electromagnetic coupling. Often used as a rotatable antenna system in the upper HF through UHF regions.

**ANAHEIM, CA**
(Near Disneyland)
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Janet, KL7MF, Mgr.
**anaheim@hamradio.com**

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(818) 842-1786
**(800) 854-6046**
Eric, K6EJC, Mgr.
Magnolia between
S. Victory & Buena Vista
**burbank@hamradio.com**

**OAKLAND, CA**
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**(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**
Jon, K6WV, Mgr.
So. from Hwy. 101
**sunnyvale@hamradio.com**

**NEW CASTLE, DE**
(Near Philadelphia)
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(302) 322-7092
**(800) 644-4476**
Jim, KJ3N, Mgr.
RT.13 1/4 mi., So. I-295
**newcastle@hamradio.com**

**PORTLAND, OR**
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97223
(503) 598-0555
**(800) 854-6046**
Leon, W7AD, Mgr.
Tigard-99W exit
from Hwy. 5 & 217
**portland@hamradio.com**

**DENVER, CO**
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(303) 745-7373
**(800) 444-9476**
John, WØIG, Mgr.
**denver@hamradio.com**

**PHOENIX, AZ**
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(602) 242-3515
**(800) 444-9476**
Gary, N7GJ, Mgr.
1 mi. east of I-17
**phoenix@hamradio.com**

**ATLANTA, GA**
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**(800) 444-7927**
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Doraville, 1 mi. no. of I-285
**atlanta@hamradio.com**

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- Fully Submersible to 3 ft.
- Built-in CTCSS/DCS
- Internet WIRES compatible

**Now available in Black!**

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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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### IC-7800 All Mode Transceiver

• 160-6M @ 200W • Four 32 bit IF-DSPs+ 24 bit AD/DA converters • Two completely independent receivers • +40dBm 3rd order intercept point


### IC-746PRO All Mode 160M-2M

• 160-2M* @ 100W • 32 bit IF-DSP+ 24 bit AD/DA converter • Selectable IF filter shapes for SSB & CW • Enhanced Rx performance

### IC-7000


• 160-10M/6M/2M/70CM • 2x DSP • Digital IF filters • Digital voice recorder • 2.5" color TFT display

### IC-7600 All Mode Transceiver New!

• 100W HF/6m Transceiver, gen cov. receiver • Dual DSP 32 bit • Three roofing filters- 3, 6, 15khz • 5.8 in WQVGA TFT display • Hi-res real time spectrum scope

### IC-7200 HF Transceiver New!

• 160-10M • 100W • Simple & tough with IF DSP • AGC Loop Management • Digital IF Filter • Digital Twin PBT • Digital Noise Reduction • Digital Noise Blanker • USB Port for PC Control


### IC-718 HF Transceiver

• 160-10M* @ 100W • 12V operation • Simple to use • CW Keyer Built-in • One touch band switching • Direct frequency input • VOX Built-in • Band stacking register • IF shift • 101 memories

### IC-7700 Transceiver. The Contester's Rig

• HF + 6m operation • +40dBm ultra high intercept point • IF DSP, user defined filters • 200W output power full duty cycle • Digital voice recorder

### IC-880H 3rd Generation D-STAR Dual Bander

• D-STAR DV mode operation • DR (D-STAR repeater) mode • Free software download • GPS A mode for easy D-PRS operation • One touch reply button (DV mode) • Wideband receiver


### IC-V8000 2M Mobile Transceiver

• 75 watts • Dynamic Memory Scan (DMS) • CTCSS/DCS encode/decode w/tone scan • Weather alert • Weather channel scan • 200 alphanumeric memories


### IC-2200H 2M Mobile Transceiver

• 65W Output • Optional D-STAR format digital operation & NEMA compatible GPS interface • CTCSS/DTCS encode/decode w/tone scan • 207 alphanumeric memories • Weather alert


### IC-T90A Triple Band Transceiver

• 6M/2M/70CM @ 5W • Wide-band RX 495 kHz - 999.999 MHz**


### IC-2820H Dual Band FM Transceiver

• D-STAR & GPS upgradeable 2M/70CM • 50/15/5W RF output levels • RX: 118-173.995, 375-549.995, 810-999.99 MHz** • Analog/digital voice with GPS (optional UT-123) • 500 alphanumeric memories


### IC-92AD Analog + Digital Dual Bander

• 2M/70CM @ 5W • Wide-band RX 495 kHz - 999.9 MHz** • 1304 alphanumeric memories • Dualwatch capability • IPX7 Submersible*** • Optional GPS speaker Mic HM-175GPS


### IC-80AD 3G D-STAR Dual Bander

• D-STAR DV mode operation • DR (D-STAR repeater) mode • Free software download • GPS A mode for easy D-PRS operation


### IC-V82 2M Transceiver

2M @ 7W • CTCSS/DTCS encode/decode w/tone scan • Also available in a sport version and a 70CM version (IC-U82)

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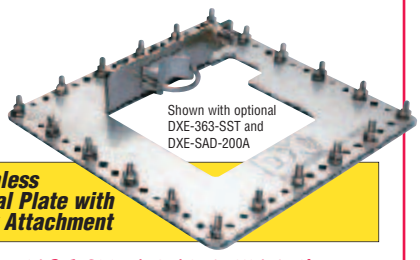


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| DXE-AT1251 | 1.750", one end slit | $8.40 | $2.80 |
| DXE-AT1252 | 1.875", one end slit | $9.15 | $3.05 |
| DXE-AT1253 | 2.000", one end slit | $9.90 | $3.30 |
| DXE-AT1254 | 2.125", one end slit | $11.40 | $3.80 |

**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-020 1/2" and smaller tubing ..... **$1.90**
DXE-ECL-040 5/8" tubing ..... **$1.90**
DXE-ECL-060 3/4" and 7/8" 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 .....Only **$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**

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# Why Wait? Just Work Them First!

## Join the growing list of DXers and Contesters who already know the "DX Secret"!

VP6DX DXPEDITION 2008 DUCIE ISLAND

**Worked the Whole World Using DX Engineering Receiving Antennas!**

PHASED RECEIVE ARRAYS

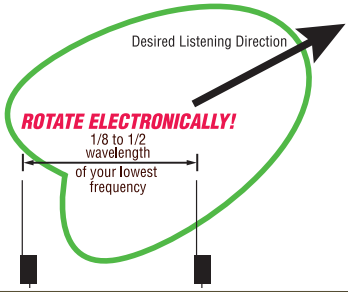
### Receive Antenna Phasing Controller

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 1,000 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 |
| DXE-AAPS-1P | Active Antenna Phasing System with Controller | $995.00 |




### Complete Receive Four-Square Package with DXE-ARAV2-4P Active Antenna Kit

- 4 Active Vertical Antennas
- RFS-2 Four Square Switch
- CC-8 Controller
- 1,000 ft. of direct-bury F6, 75 Ω CATV Coax
- 25 Snap-N-Seal Coax Connectors
- Snap-N-Seal Connector Crimp Tool
- Coax Prep Tool

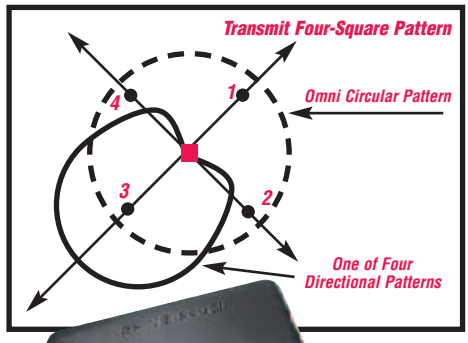
| | | |
|---|---|---|
| DXE-RFS-TS2P | Complete Receive Four-Square Package | $1,525.00 |

### Receiving System Components

| | | |
|---|---|---|
| DXE-F6-1000 | 75 Ω, F6 style direct bury flooded cable, 1,000 ft. | $149.95 |
| DXE-F6-CTL | 75 Ω F6 cable by the foot | $0.19/ft. |
| DXE-SNS6-25 | Watertight F6 Connectors, 25 pack | $25.50 |
| DXE-SNS-CT1 | F6 Connector Installation Tool | $52.00 |

***See Our Complete Selection of Components and Tools at DXEngineering.com***

FOUR-SQUARE TRANSMIT CONTROLLER!



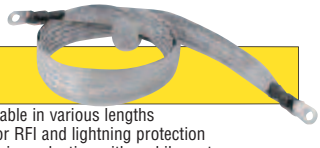

NOW SHIPPING 40 AND 80 METERS!

New!

### Transmit Four-Square Hybrid Controller—4 Directions plus Omni

- Classic Hybrid design—easy to install
- 5 kW CW power rating—high reliability
- Hot switching lock-out—disables amplifier while switching
- Drop-in replacement for Comtek—easy upgrade
- Proven DX Engineering RF relays—high performance
- RF Shielded weatherproof housing—unique protection

| | | |
|---|---|---|
| DXE-TFS4-160 | 160 Meter Four-Square Controller with Control Console | $499.00 |
| DXE-TFS4-80 | 80 Meter Four-Square Controller with Control Console | $499.00 |
| DXE-TFS4-40 | 40 Meter Four-Square Controller with Control Console | $499.00 |



### Ground Strap Assemblies

- Three widths available in various lengths
- Ground your rig for RFI and lightning protection
- Ideal for vehicle noise reduction with mobile systems, ground radial plate or balun to antenna
- Preassembled with lugs for both #10 and 1/4" bolt sizes
- Call to order custom cable/connector assemblies

***See DXEngineering.com for complete information!***

### Low Loss Coax Cable Assemblies


- All connectors are soldered, not crimped
- Connectors have silver plated body and barrel with center Teflon® dielectric
- Highest quality Belden coaxial cable is used
- All cable assemblies are high voltage tested to handle full rated power
- Watertight seal between connectors and coax
- Call to order custom cable/connector assemblies

***See DXEngineering.com for complete information!***

### Coaxial Cable Prep Tools

New!

- Precision, two-step operation
- For foam or solid dielectric cable preparation
- No nicks or scratches to conductor
- Premium, long lasting cutter blades

| | | |
|---|---|---|
| DXE-UT-8213 | Cable Stripper for RG-8, RG-213, etc | $39.95 |
| DXE-UT-808X | Cable Stripper for RG-8X, 9258, etc | $39.95 |

PSK-31 SSTV WSJT

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RTTY & More


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**TIG-SL-USB ..... $86.95**

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Any Radio Interface Cable ..... only **$12.95** when purchased with SignaLink™ unit

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***For your complete digital solution!***

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- Easiest installation and setup—Macintosh or PC
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- Software CD ROM included
- Comprehensive & easy to follow instructions
- Built-in low noise sound card
- USB port powered
- Works with ALL radios
- Uses Mic, Data, or Accy port
- Supports all sound card digital and voice modes
- Requires radio interface cable, sold separately below

### Radio Interface Cables

| | | |
|---|---|---|
| TIG-SL-CAB4R | 4-pin round mic connector | $14.95 |
| TIG-SL-CAB8R | 8-pin round mic connector | $14.95 |
| TIG-SL-CABRJ1 | RJ-11 mic connector | $14.95 |
| TIG-SL-CABRJ4 | RJ-45 mic connector | $14.95 |
| TIG-SL-CAB5PD | 5-pin DIN | $14.95 |
| TIG-SL-CAB8PD | 8-pin DIN | $14.95 |
| TIG-SL-CAB13I | 13-pin DIN Icom | $19.95 |
| TIG-SL-CAB13K | 13-pin DIN Kenwood | $19.95 |
| TIG-SL-CAB6PM | 6-pin mini-DIN | $14.95 |
| TIG-SL-CABNC | Unterminated cable | $7.95 |

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### Remote Antenna Switches

- Best SWR and port isolation on the market
- 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
- High impact, copper coated thermoplastic housing

RR8-HP-P ..... $375.00

**10 kW Key-Down RF Switch**

- Better than 60 dB of port-to-port isolation
- Weatherproof, RF shielded stainless steel housing

RR8-SD-P ..... $495.00

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DX ENGINEERING

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## Amplifiers • Analyzers • Verticals • Tuners

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HF/VHF Antenna Analzyer
*Only $237.50*

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Most Popular 300 Watt Tuner
*Only $154.95*

**MFJ-962D**
1,500 Watt Roller Inductor Tuner
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**MFJ-989D**
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*Only $319.00*

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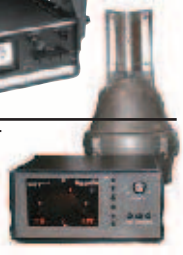
300 Watt Automatic Tuner
*Only $239.00*

hy-gain

**HYG-CD-45II**
Regular Duty Rotator
*Only $419.95*

**HYG-HAM-IV**
Worlds Most Popular Rotator
*Only $594.95*



AMERITRON®

**AMR-AL-811**
600 Watt Amplifier
*Only $679.00*

**AMR-AL-80B**
Famous 1kW Amplifier
*Only $1,274.00*

**MFJ Analyzers**

| | | |
|---|---|---|
| MFJ-259B | HF/VHF Antenna/SWR/RF Analyzer | $237.50 |
| MFJ-269 | HF/VHF/UHF Antenna/SWR/RF Analyzer | $329.00 |

**MFJ Tuners**

| | | |
|---|---|---|
| MFJ-925 | Super Compact MightyMite Intellituner | $169.95 |
| MFJ-926 | Automatic Antenna Tuner for SSB | $389.95 |
| MFJ-927 | 200W Weather Protected Auto-Tuner | $249.95 |
| MFJ-929 | Compact 200W IntelliTuner | $209.95 |
| MFJ-931 | 1.8-30 MHz Artificial Ground | $104.95 |
| MFJ-934 | HF Antenna Tuner/Artificial Ground | $194.95 |
| MFJ-949E | 300W Antenna Tuner | $154.95 |
| MFJ-962D | 1,500W Antenna Tuner/Wattmeter | $259.00 |
| MFJ-969 | Roller Inductor Antenna Tuner | $184.95 |
| MFJ-976 | 1,500W Balanced Antenna Tuner | $479.00 |
| MFJ-989D | 1,500W Antenna Tuner/Dummy Load | $319.00 |
| MFJ-993B | 300W Automatic IntelliTuner | $239.00 |
| MFJ-994B | 600W Automatic IntelliTuner | $320.00 |
| MFJ-998 | 1,500W Automatic IntelliTuner | $639.00 |
| MFJ-9982 | 2,500W Continuous Antenna Tuner | $629.00 |

**Hy-Gain Antennas**

| | | |
|---|---|---|
| HYG-AV-640 | HF Vertical 8 Bands, 40M-6M | $379.95 |
| HYG-DX-77A | HF Vertical 7 Bands, 40M-10M | $439.95 |
| HYG-AV-18HT | Hy-Tower, 50 Feet, 5 Bands | $899.95 |

**Hy-Gain Rotators**

| | | |
|---|---|---|
| HYG-CD-45II | 8.5 SF Wind Load Rotator | $419.95 |
| HYG-HAM-IV | 15 SF Wind Load Rotator | $594.95 |
| HYG-HAM-V | 15 SF Wind Load/Digital Rotator | $919.95 |
| HYG-T2X | 20 SF Wind Load Rotator | $689.95 |
| HYG-HDR-300A | 25 SF Wind Load/Digital Rotator | $1,339.95 |

**Ameritron Tube Amplifiers**

| | | |
|---|---|---|
| AMR-AL-572* | 1,300W, (4) 572B Tubes | $1,519.00 |
| AMR-AL-800* | 1,250W, 3CX800A7 Tube | $1,839.00 |
| AMR-AL-800H* | 1,500W, (2) 3CX800A7 Tubes | $2,739.00 |
| AMR-AL-80B | 1,000W, 3-500Z Tube | $1,274.00 |
| AMR-AL-811 | 600W, (3) 811A Tubes | $679.00 |
| AMR-AL-811H | 800W, (4) 811A Tubes | $819.00 |
| AMR-AL-82* | Maximum Power, (2) 3-500Z Tubes | $2,329.00 |
| AMR-AL-1200* | Maximum Power, 3CX1200A& Tube | $2,949.00 |
| AMR-AL-1500* | Maximum Power, 3CX1500/8877 Tube | $2,949.00 |

**FREE UPS Ground Shipping on these models.*

**Ameritron Solid State Amplifiers**

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| AMR-ALS-500M | 500W Mobile Amplifier, Remote Ready | $739.00 |
| AMR-ALS-500MR | 500W Amplifier, Remote Included | $779.00 |
| AMR-ALS-500RC | Remote Head, SN 13049 and above | $48.95 |
| AMR-ALS-600 | 600W Amplifier with Power Supply | $1,269.00 |
| AMR-ALS-600S | 600W Amp with Switching Power Supply | $1,369.00 |

**Ameritron Accessories**

| | | |
|---|---|---|
| AMR-ARB-704 | Amplifier/Transceiver Buffer Relay | $57.95 |
| AMR-ARB-704I2 | Buffer Relay for Icom 706/7000 | $57.95 |
| AMR-PNP | Interface Cable for ARB-704 (Call) | $16.95 |
| AMR-QSK-5 | External QSK Switch | $324.00 |
| AMR-SPS-75 | 13.6 VDC Switching PS, 75 Amps | $349.95 |

*See our websitesite for more details.*

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Since 1952

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As in the past, we will be featuring awards this year given out to the Amateur of the Year and more to fellow hams who have gone above and beyond! Not licensed as a ham yet? Come and take the test at Hamvention® and have a REAL souvenir to take home!

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- Presentations
- DXCC Card Checking
- ARRL Youth Activities – friends, fun and food!
- ARRL Wouff Hong Ceremony
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**119 Piece Heat Shrink Tubing Set**
Case with Lid Included
5/32, 3/16, 9/32 &
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Less than 2 Inches Long
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Ready To Go
100 Feet With
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Use in Any Position
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Good Quality
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- TX: 144-148 MHz • RX: 136-174 MHz
- Power: 0.5-7W • Memories: 107

## IC-T7H SPORT

### 2M/440 MHz FM HT

- TX: 144-148, 440-450 MHz
- RX: 118-174, 400-470 MHz • Memories: 70
- Power: 2W with AA batteries, 6W with optional 13.8VDC cord


## IC-2200H 2M FM Mobile

- TX: 144-148 MHz • RX: 118-174 MHz
- Power: 65/25/10/5W • Memories: 207
- D-Star upgradable with optional UT-118


## IC-2820H 2M/440 FM Mobile

- TX: 144-148, 430-450 MHz • RX: 118-549.95, 810-999.990 MHz (cell blkd) • Power: 50/15/5W
- Packet ready (9600 BPS – 6-pin DIN) • Upgradable D-Star DV (digital voice) & GPS capabilities w/optional UT-123

## IC-7200 HF/6M Portable/Base

- TX: HF/6M • RX: 0.03-60 MHz • Power: 2-100W
- Memories: 201
- 32-bit IF-DSPs + 24-bit AD/DA Converters
- USB Port for CI-V Format PC Control and Audio In/Out


## IC-756PROIII HF/6M Base

- TX: HF/6M • RX: 0.03-60 MHz • Power: 5-100W
- Memories: 101 • 5 inch color screen • 32-bit floating DSP
- Real time spectrum scope • Automatic antenna tuner
- Improved 3rd order intercept point


## IC-7000

### Multiband Multimode Mobile

- TX: HF/6M/2M/440 MHz • RX: 0.03-199, 400-470 MHz
- Power: 100W (HF/6M), 50W (2M), 35W (440 MHz)
- Memories: 503 • 41 band-widths with sharp or soft filter shape • RMK-7000 included!

## PW-1 HF/6M 1KW Linear Amplifier

- TX: 160-15M/6M • Power: 1000W (180-264 VAC), 500W (90-132 VAC) • Automatic band change & antenna tuner • Easily connects to any current Icom HF transceiver • Two input & Four output connectors


## IC-7800 Multimode HF/6M Base

- TX: HF/6M • RX: 0.03-60 MHz • Power: 5-200W
- Memories: 101 • 7" color screen • Four 32-bit floating DSPs
- Two identical receivers • Three roofing filters
- External VGA connector • Automatic antenna tuner

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**www.arrl.org/join**

# Membership Application

## ☑ Membership options (circle your choice/s)

| | 1 Year | 2 Years | 3 Years | |
|---|---|---|---|---|
| Regular | $39 | $76 | $111 | Monthly *QST* via standard mail for US members |
| Canada | $49 | $93 | $132 | Monthly *QST* via standard mail for Canadian members |
| Intl *QST* | $62 | $118 | $167 | Monthly *QST* via air mail for international members |
| Intl CD | $39 | $76 | $111 | Annual CD-ROM (*QST*, *NCJ* and *QEX*) for international members |
| Blind | $8 | $16 | $24 | No *QST* delivery, all other member benefits apply |
| Family | $8 | $16 | $24 | Reside at the same address as the primary member, no additional *QST*. Membership dates must correspond with primary member. |

Membership includes $15 per year for subscription to *QST*. Memberships and *QST* cannot be separated. Dues subject to change without notice and are nonrefundable.

If you are 21 or younger a special rate may apply. Contact ARRL for more details.

Additional membership options available online at www.arrl.org/join.

Name _____ Call Sign _____

Street _____ City _____ State _____ ZIP _____

E-mail _____ Birth Date _____

Family Member Name _____ Call Sign (if any) _____

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Source Code: QST 4/2009


VX-170


VX-8R

## VX-170 2M FM HT
- TX: 144-148 • RX: 136-174
- Power: 5/2/0.5W • Memories: 200
- Extra large LCD display & speaker

## VX-8R Quad-band HT
- TX: 50-54, 144-148, 222-225, 430-450 MHz
- RX: 0.5-999 MHz (cell blkd) • Memories: 1200+
- Power: 5/2.5/1/0.05W (1.5W on 220)
- Optional GPS Antenna Unit FGPS-2 provides you with real time APRS® data. You may display your exact current position (latitude and longitude), heading direction, moving speed, altitude, and more.

## FT-817ND HF/VHF/UHF Backpack QRP
- TX: HF/VHF/UHF • RX: 0.1-56, 76-154, 420-470 MHz
- Power: 0.7-5W • Memories: 200
- Field operation with AA batteries or Ni-MH pack


## FT-857D 100W HF/VHF/UHF Mobile
- TX: HF/VHF/UHF • RX: 0.1-56, 76-108, 118-164, 420-470 MHz • Power: 5-100W (HF/6M), 5-50W (2M), 5-20W (440 MHz) • Memories: 200 • YSK-857 included!

## FT-1802M 2M FM Mobile
- TX: 144-148 • RX: 136-174
- Power: 50/25/10/5W • Memories: 221

## FT-897D 100W HF/VHF/UHF Portable
- TX: HF/VHF/UHF • RX: 0.1-56, 76-108, 118-164, 420-470 MHz • Power: 5-100W (HF/6M), 5-50W (2M), 5-20W (440 MHz) • Memories: 200


## FT-7800R 2M/440 FM Mobile
- TX: 144-148, 430-450 MHz
- RX: 108-520, 700-999 MHz (cell blkd)
- Power: 50/20/10/5W (2M), 40/20/10/5W (440 MHz)
- Memories: 1055 • YSK-7800 included!

## FT-950 100W HF/6M Base
- TX: HF/6M • RX: 0.03-56 MHz • Power: 10-100W
- Memories: 100 • Auto Antenna Tuner
- 32-bit Floating Point DSP • Requires 12VDC PS
- Built-in high stability TCXO • Optional DMU-2000 Data Management Unit displays various operational conditions
- Optional MTU tune units for 160M, 80/40M and 30/20M bands allowing you to pull through weak signals


## FT-8800R 2M/440 FM Mobile
- TX: 144-148, 430-450 MHz
- RX: 108-520, 700-999 MHz (cell blkd)
- Power: 50/20/10/5W (2M), 35/20/10/5W (440 MHz)
- Memories: 1000 • Crossband repeat
- YSK-8900 included!

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**Radios by YAESU**

## TM-271A 2M FM Mobile

- TX: 144-148 MHz • RX: 136-174 MHz
- Power: 60/25W • Memories: 200

## TM-V71A Dualband FM Mobile

- TX: 144-148, 430-450 MHz
- RX: 118-524, 800-1300 MHz (cell blkd)
- Power: 50/10/5W • Dual receive (V+V) (U+U)
- Cross-band repeat • EchoLink® ready

## TM-D710A

### Dualband FM Mobile w/TNC

- TX: 144-148, 430-450 MHz
- RX: 118-524, 800-1300 MHz (cell blkd)
- Power: 50/10/5W • Dual receive (V+V) (U+U)
- Built-in TNC for APRS (needs GPS)
- Cross-band repeat • AvMap G5 & EchoLink® ready

## AvMap G5 APRS GPS Navigator

- Bright non-glare 5 inch color touchscreen
- Preloaded Tele Atlas street maps of N. America
- AV input; enjoy films, video games & pictures
- Import extra POI's with no extra costs
- Kenwood ready APRS cable included

TH-K2AT

TH-F6A

## TH-K2AT 2M FM HT

- TX: 144-148 • RX: 136-174
- Power: 5/1.5/0.5W • Memories: 100

## TH-F6A Triband FM HT

- TX: 144-148, 222-225, 438-450 MHz
- RX: 0.1-1300 MHz (cell blkd) • Power: 5/0.5/0.05W
- Memories: 435 • Dual band RX

## TS-480HX

### 200W HF/6M Mobile/Base

- TX: HF/6M • RX: 0.5-60 MHz
- Power: 10-200W (with two optional 22A PS's)
- Memories: 99 • IF/stage DSP on main band, AF/stage DSP on sub-band

## TS-480SAT

100W version with built-in auto antenna tuner.

## TS-2000 100W HF/VHF/UHF Base

- TX: HF/6M/2M/440 MHz • RX: 0.03-60, 142-152, 420-450 MHz • Power: 10-100W (10-50W on 440 MHz)
- Memories: 99 • HF/6M Auto Antenna Tuner
- IF/stage DSP on main band, AF/stage DSP on sub-band

## TS-B2000

Same as the TS-2000 with high-tech "silver box" look & no front panel controls. Includes PC control software.

## TS-2000X

The TS-2000 with 1.2 GHz @ 10W.

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**Lightweight HF Linear**

This world-class compact HF amplifier has built-in switch mode power supply to save the weight. It is compatible with wide AC line of 100 to 250V, and is best suited for DX-peditioners. 22.5 lbs.

### HL-1.5KFX
**HF/50MHz Linear**

The amp utilizes an advanced 16 bit MPU (microprocessor) to run the various high speed protection circuits such as overdrive, high antenna SWR, DC overvoltage, band miss-set etc.

### HL-2.5KFX
**HF Linear Amplifier**

The HL-2.5KFX is the lightest and most compact self-contained 1.5kW output HF LINEAR amplifier in its class. The amplifier's decoder changes bands automatically with most modern HF transceivers.

### HL-1.2KFX
**750W PEP HF Desktop Linear**

This Solid State, world-class compact 750W HF amplifier is the easiest to handle and operate. The amplifier's broadband characteristics require no further tuning once the operating band is selected.

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### HC-1.5KAT
**HF 1.5KW Auto Tuner**

### HC-200AT
**HF/6m 200W Auto Tuner**

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Universal band decoder, with more features than any decoder made.

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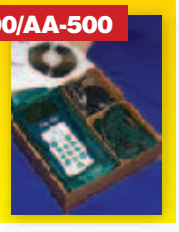

**CG-3000 Remote Auto Tuner –** 200 Watt Model
The CG-3000 is a further development based on the CG-2000 model. This new addition to the range has an even more professional and versatile case made from ABS and includes an "o" ring seal between the two halves of the body.

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# The #1 Line of Autotuners

LDG ELECTRONICS


## NEW! YT-100

An autotuner for several popular Yaesu Radios. An included cable interfaces with your FT-857, FT-897 and FT-100 (and all D models) making it an integrated tuner, powered by the interface. Just press the tune button on the tuner, and everything else happens automatically: mode and power are set, a tune cycle runs, and the radio is returned to its original settings. It's the perfect complement to your Yaesu radio.

***Suggested Price $199.99***

## NEW! Z-817

The ultimate autotuner for QRP radios including the Yaesu FT-817(D). Tuning is simple; one button push on the tuner is all that is needed - the Z-817 takes care of the rest. It will switch to PKT mode, transmit a carrier, tune the tuner, then restore the radio to the previous mode! 2000 memories cover 160 through 6 meters. The Z-817 will also function as a general purpose antenna tuner with other QRP radios. Just transmit a carrier and press the tune button on the tuner. Powered by four AA internal Alkaline batteries (not included), so there are no additional cables required. A coax jumper cable is also induced for fast hook up. ***Suggested Price $129.99.***

## AT-200Pro

The AT-200 features LDG's new "3-D memory system" allowing up to eight antenna settings to be stored for each frequency. Handles up to 250 watts SSB or CW on 1.8 – 30 MHz, and 100 watts on 54 MHz (including 6 meters). Rugged and easy-to-read LED bar graphs show power and SWR, and a function key on the front panel allows you to access data such as mode and status. All cables included. ***Suggested Price $249***

## NEW! KT-100

LDG's first dedicated autotuner for Kenwood Amateur transceivers. Easy to use - just right for an AT-300 compatible Kenwood transceiver. The KT-100 actually allows you to use the Tune button on the radio. The LEDs on the front panel indicate tuning status, and will show a match in seconds, or even less of you've tuned on or near that frequency before. Has 2,000 memories for instant recall of the tuning parameters for your favorite bands and frequencies. If you have an AT-300 compatible Kenwood radio, you can simply plug the KT-100 into your transceiver with the provided cable; the interface powers the tuner, and the Tune button on the radio begins a tuning cycle. The supplied interface cable makes the KT-100 a dedicated tuner for most modern Kenwood transceivers. ***Suggested Price $199.99***

***See AT-1000Pro Review in Nov. '08 CQ***

## AT-1000Pro

Building on the success of the AT-1000, LDG Electronics has refined and expanded its 1KW tuner. The AT-1000Pro has an Automode that automatically starts a tuning cycle when the SWR exceeds a limit you set. Operates at any power level between 5 and 1,000 watts peak. RF Relay protection software prevents tuning at greater than 125 watts. Tunes from 1.8 to 54.0 MHz (inc. 6 meters), with tuning time usually under 4 seconds, transmitting near a frequency with stored tuning parameters, under 0.2 seconds. 2000 memories. 2 Antenna connections. All cables included. ***Suggested Price $599***

## The #1 Line of Autotuners - Now With 2 Year Transferable Warranty!

A warranty is a promise, a promise of quality and service life. The #1 line of autotuners in the industry now comes standard with a no-questions-asked 2-Year Transferable Warranty.

When something is wrong with an autotuner, switch, or meter, LDG will fix it - period. LDG is the leader in tuner technology and now leads the industry in customer support as well.

Our customers tell us we do the right things to meet their support expectations. Customers feel good about owning LDG products because service life and support is something they can count on - even when they are ready to sell a unit to another ham.

# Now With 2 Year Transferable Warranty!

## AT-100Pro

This desktop tuner covers all frequencies from 1.8 – 54 MHz (including 6 meters), and will automatically match your antenna in no time. It features a two-position antenna switch, allowing you to switch instantly between two antennas. The AT-100Pro requires just 1 watt for operation, but will handle up to 125 watts. All cables included. ***Suggested Price $219***

radio not included

## 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 and takes power directly from the CAT port of the FT-897 and provides a second CAT port on the back of the tuner so hooking up another CAT device couldn't be easier. ***Suggested Price$199***

radio not included

## FT Meter

LDG's new version of its popular FT-Meter presents a lush, highly readable 2.5" meter face with calibrated scales for signal strength and discriminator reading on receive, and power output, SWR, modulation, ALC action and supply voltage on transmit. Each function is selectable from the radio's menu. On/Off switch for the light. ***Still Only $49***

**NEW! FTL Meter** For Yaesu's popular FT-857(D) and FT-897(D) transceivers, our FTL-Meter presents a lush, highly readable 4.5 inch meter face with calibrated scales for signal strength and discriminator reading on receive, and power output, SWR, modulation, ALC action and supply voltage on transmit. Each function is selectable from the radio's menu. Best of all, it plugs into the meter jack on the bottom of the front panel. ***Suggested Price $79.99***

**NEW! M-7700** The LDG M-7700 provides a lavish 4.5" meter for IC-7700. It will display S-meter on receive, or power out, SWR, ALC level or supply voltages, all selectable from the rig's setup menu. What's more, the M-7700 and the virtual meter on your radio can work together; for example, you can display SWR on the radio's meter and power output on the M-7700. ***Suggested Price $79.99***

## Z-11Pro

Meet the Z-11Pro, everything you always wanted in a small, portable tuner. Designed from the ground up for battery operation. Only 5" x 7.7" x 1.5", and weighing only 1.5 pounds, it handles 0.1 to 125 watts, making it ideal for both QRP and standard 100 watt transceivers from 160 - 6 meters. The Z-11Pro uses LDG's state-of-the-art processor-controlled Switched-L tuning network. It will match dipoles, verticals, inverted-Vs or virtually any coax-fed antenna. With an optional LDG balun, it will also match longwires or antennas fed with ladder-line. All cables included. ***Suggested Price $179***

## NEW! IT-100

Matched in size to the IC-7000 and IC-706, the new IT-100 sports a front panel push-button for either manual or automatic tunes, and status LEDs so you'll know what's going on inside. You can control the IT-100 and its 2000 memories from either its own button or the Tune button on your IC-7000 or other Icom rigs. It's the perfect complement to your Icom radio that is AH3 or AH-4 compatible. ***Suggested Price $179.99***

## NEW! Z-100Plus

LDG's popular Z-100 economy tuner is now the Z-100Plus. Still small and simple to use, the Z-100Plus sports 2000 memories that store both frequency and tuning parameters. It will run on any voltage source from 7 to 18 volts; six AA batteries will run it for a year of normal use. Current draw while tuning is less than 100ma. The Z-100Plus now includes an internal frequency counter so the operating frequency is stored with tuning parameters to make memory tunes a blazingly fast 0.1 seconds; full tunes take an average of only 6 seconds. ***Suggested Price $159.99***

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**$289.95**

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### 2 Position Coax Switch

**JTCS2M** 2 Position Coax Switch, DC - 1 Ghz, Connector: SO239, **Power rating**: 2kw DC-30Mhz, 1kw 30-200Mhz, 500w 200-500Mhz, 250w 500Mhz-1Ghz, **Insertion loss:** DC-500 Mhz < .05db, 500Mhz-1Ghz < .1db, **Isolation:** DC-500 Mhz > 70db, 500Mhz-1Ghz > 60db, **VSWR:** DC-500 Mhz < 1.15db, 500Mhz-1Ghz < 1.25db

**$32.95**

### 200 Watt Dummy Load

**JTDL200M** 200 watt dummy load, DC - 1 Ghz, Connector: PL259, Continuous 35 watts, 200 watts for 5 seconds

**$39.95**

### Cage Dipole Insulators

The answer for broad band dipoles! These are a necessity for 20, 40, 80 and 160 when you don't want to use an antenna tuner!

JTCAGE **$ .35/each**

*VX8R* *VX6R* *FT60R* *VX3R*

## VX8R

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| **BH1** Bluetooth Headset Stereo | **84.95** |
| **BH2** Bluetooth Headset Mono | **82.95** |
| **BU1** Bluetooth Unit | **71.95** |
| **CD40** Charger Cradle BH1 & BH2 | **25.95** |
| **CD41** Rapid Charger Cradle | **32.95** |
| **CSC93** Softcase | **14.95** |
| **FBA39** Alkaline Battery Tray | **26.95** |
| **FGPS2** GPS Unit | **79.95** |
| **FNB101LI** 7.4V 1100mAh LI-Ion | **57.95** |
| **FNB102LI** 7.4V 1800mAh LI-Ion | **69.95** |
| **MH74A7A** Speaker Mic | **43.95** |
| **NC85B** Wall Charger for CD40 | **16.95** |

## VX3R

| | |
|---|---|
| **ADMSVX3** Software/Cable | **39.95** |
| **CSC92** Soft Case | **14.95** |
| **EDC21** DC Cable w/Noise Filter | **36.95** |
| **FBA37** AA Battery Case | **17.95** |
| **FNB82LI** 7.2V 1400mAh Ni-MH | **34.95** |
| **MH34B4B** Speaker Mic | **33.95** |

## FT60R

| | |
|---|---|
| **ADMS1J** Software/Cable | **39.95** |
| **EDC5B** DC Cable w/Noise Filter | **23.95** |
| **EDC6** DC Cable | **7.95** |
| **FBA25A** AA Battery Case | **21.95** |
| **FNB83** 7.2V 1400mAh Ni-MH | **49.95** |
| **MH34B4B** Speaker Mic | **33.95** |
| **VAC370B** Rapid Charger | **62.95** |

## VX6R

| | |
|---|---|
| **ADMSVX6** Software/Cable | **39.95** |
| **CD15A** Desktop Rapid Charger | **32.95** |
| **CLIP14** Swivel Belt Clip | **8.95** |
| **CSC91** Soft Case | **14.95** |
| **CT91** Mic Adapter | **10.95** |
| **EDC5B** DC Cable w/Noise Filter | **23.95** |
| **EDC6** DC Cable | **7.95** |
| **FBA23** AA Battery Case | **28.95** |
| **FNB80LI** 7.4V 1400mAh LI-Ion | **62.95** |
| **MH57A4B** Speaker Mic | **27.95** |
| **MH73A4B** Waterproof Speaker/Mic | **47.95** |

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## FT8800R

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| **ADMS2I** Software and cable | **39.95** |
| **JTPS14M** Jetstream Power Supply | **49.95** |
| **MLS100** External Speaker | **46.95** |
| **MMB60** Quick Release Mobile Bracket | **29.95** |
| **YSK8900** Separation Kit | **39.95** |

## FT7800R

| | |
|---|---|
| **MEK2** Microphone Extension Kit | **42.95** |
| **JTPS14M** Jetstream Power Supply | **49.95** |
| **MLS100** External Speaker | **46.95** |
| **MMB60** Quick Release Mobile Bracket | **29.95** |
| **YSK7800** Separation Kit | **41.95** |

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## FT2000/D

**DMU2000** Data Management Unit.....**889.95**
**FH2** Remote Keypad.....**84.95**
**SP2000** External Speaker.....**175.95**
**UTUNINGKIT** A, B, or C model.....**479.95**
**YF122C** 500 hz CW filter.....**159.95**
**YF122CN** 300 hz CW filter.....**164.95**

## FT950

**DMU2000** Data Management Unit.....**889.95**
**FH2** Remote Keypad.....**84.95**
**MD100A8X** Desk top mic.....**139.95**
**MD200A8X** Desk top mic.....**379.95**
**SP2000** External Speaker.....**175.95**
**UTUNINGKIT** A, B, or C model.....**479.95**

## FT450/AT

**ATAS120** Auto tuning antenna.....**289.95**
**ATU450** Auto antenna tuner.....**149.95**
**FC40** Auto antenna tuner.....**249.95**
**MD100A8X** Desk top mic.....**139.95**
**MD200A8X** Desk top mic.....**379.95**
**MMB90** Mobile mount.....**33.95**

*VX150*

*VX170*

## FT897D

**ADMS4B** Programming software/cable**51.95**
**ATAS120** Auto tuning antenna.....**289.95**
**CD24** Charge adapter for FNB78.....**119.95**
**CT39** Packet Cable.....**9.95**
**CT62** Computer Interface Cable.....**32.95**
**FC30** Bolt on auto antenna tuner.....**189.95**
**FNB78** NiMH Internal Battery.....**115.95**
**FP30** Internal Power Supply.....**209.95**
**MD100A8X** Desk top mic.....**139.95**
**MH59A8J** Remote Control Mic.....**64.95**
**YF122S** 2.3 kHz SSB Filter.....**164.95**

## FT857D

**ADMS4B** Programming software/cable**51.95**
**ATAS120** Auto tuning antenna.....**289.95**
**CT39** Packet Cable.....**9.95**
**CT62** Computer Interface Cable.....**32.95**
**FC30** Auto antenna tuner.....**189.95**
**JTPS28** Jetstream Power Supply.....**84.95**
**MD100A8X** Desk top mic.....**139.95**
**MH59A8J** Remote Control Mic.....**64.95**
**YF122S** 2.3 kHz SSB Filter.....**164.95**
**YSK857** Separation Kit.....**39.95**

## VX150

**SMAUHF** SMA-UHF Adapter.....**3.50**
**SMABNC** SMA-BNC Adapter.....**3.50**
**ADMS1F** Software and cable.....**38.95**
**EDC5B** Cigarette Lighter Cable.....**23.95**
**FBA25A** AA Battery case.....**21.95**
**MH34B4B** Speaker Mic.....**33.95**
**VC25** Vox Headset.....**62.95**

## VX170

**SMAUHF** SMA-UHF Adapter.....**3.50**
**SMABNC** SMA-BNC Adapter.....**3.50**
**ADMSVX170** Software and cable.....**43.95**
**EDC5B** Cigarette Lighter Cable.....**23.95**
**FBA25A** AA Battery case.....**21.95**
**MH57A4B** Speaker Mic.....**27.95**
**VC27** Earpiece Microphone.....**27.95**

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## FTM10R/SR

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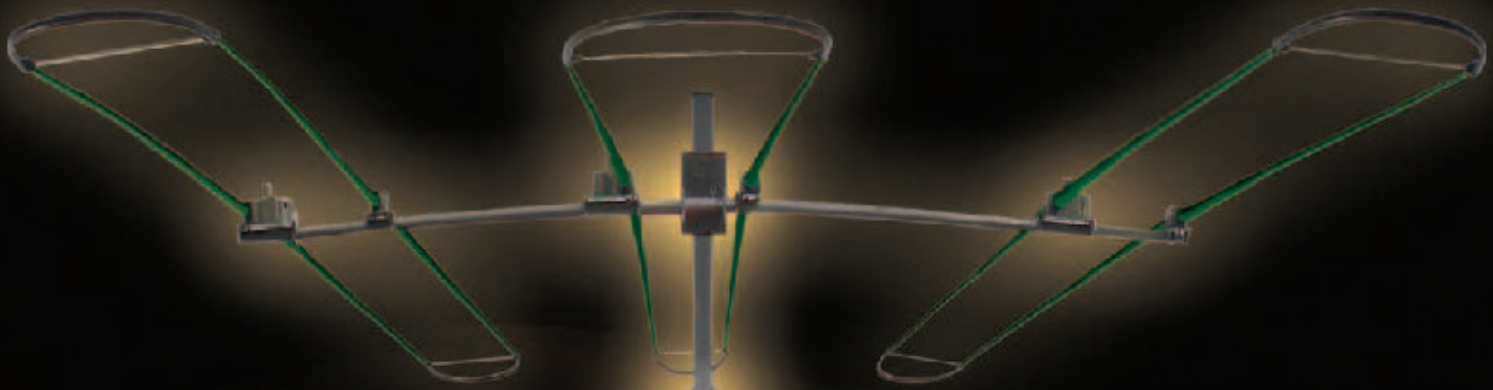

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DREAM BEAM 18 E

### DREAM BEAM 18

- WEIGHT – 70 lbs / 31.75 kg
- WIND LOAD – 10.1 sq ft / .93 sq m
- TURNING RADUIUS – 21.58 ft / 6.57 m
- FREQUENCY COVERAGE – 6.8 MHz-54 MHz
- BOOM LENGTH – 18 ft / 5.48 m
- POWER RATING – 3 KW continuous

**PRICE $2550.00**

### DREAM BEAM 18 E

- WEIGHT – 78 lbs / 35.38 kg
- WIND LOAD – 12.1 sq ft / 1.12 sq m
- TURNING RADUIUS – 21.58 ft / 6.57 m
- FREQUENCY COVERAGE – 6.8 MHz-54 MHz
- BOOM LENGTH – 18 ft / 5.58 m
- POWER RATING – 3 KW continuous

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## $2950.00

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Picture is an artistic rendition to show the entire antenna.

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Mount Not Included

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## TARHEEL ANTENNAS

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Mount Not Included

Mount Not Included

## Back by Popular Demand

## The Little Tarheel

The Little Tarheel our original compact motorized antenna, with continuous coverage from 7.0 to 54 MHz and higher power rating of 500 watts P.E.P. Both antennas are constructed of the best materials and top of the line workmanship.

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Lower Mast Size -- 1 1/2"
Lower Mast Length -- 16”
Whip Length -- 32”
Total Length of Antenna at Highest Freq. -- 48"
Total Length of Antenna at Lowest Freq. -- 54"
Freq. Coverage Continuous -
LITTLE TARHEEL -- 7.0 to 54 MHz
LITTLE TARHEEL II -- 3.5 to 54 MHz
Power Rating --
LITTLE TARHEEL -- 500 watts P.E.P.
LITTLE TARHEEL II -- 200 watts P.E.P.
Typical SWR 1.5 or less
Weight -- 1.9 lbs.

Little Tarheel
500 Watts P.E.P.
7.0 Mhz - 54.0 Mhz
$379
Mount Not Included

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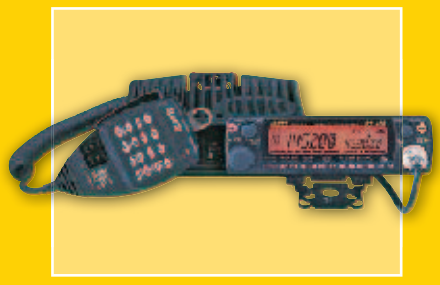

## Work the DX on 6 and 10 Meter FM

- **DR-03T** (pictured) 10 meters
- **DR-06T** 6 meters

- Same key-operations as DR-135-435 series mobile radios.
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- DR-03T 10 watts, H(10W)/M(5W)/L(2W) power settings.
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- 100 memory channels
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- Stays in mode you select (voice/packet) through power off cycles
- Ten autodial memories

## Work simplex and the VHF and UHF Repeaters

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- **220 MHZ DR-235TMkIII** (pictured) 25 watts, H/M/L power settings
- **440 MHZ DR-435TMKIII** 35 watts, H/M/L power settings

- EJ-41U internal TNC board is available as an option for 1200/9600bps packet
- 100 memory channels
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- 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

## Dual Band fun and versatility

- **DR-635T** 144 MHz/440MHz

- 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
- Illuminated DTMF EMS-57 microphone allows direct VFO frequency entry and remote control of transceiver
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- AM Aircraft band reception
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- Ignition key activated power on/off feature
- Optional Accessories
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  - EJ-50U TNC unit
  - EDS-9 Front-control unit separation kit



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**PROMOTION PERIOD.** The Promotion Period begins March 28, 2009 and ends June 26, 2009. All mail-in entries must be received by June 26, 2009. Online entries must be received by our server before noon (US Central time) on June 26, 2009.

**ELIGIBILITY.** To participate, you must be at least 18 years of age at time of entry and an FCC licensed US amateur operator or the legal guardian of a minor who is so licensed. Due to restrictive laws in many countries, this promotion is only valid within the United States, its territories, and possessions. Winners located outside of the 50 states but within a territory or possession will be responsible for all applicable freight charges. Entries with insufficient or inaccurate information will be disqualified. This promotion is VOID where prohibited by law. If you enter a club callsign, you may not enter, on the same day, the callsign of the trustee or another club callsign for which the same person is the trustee. Licensed amateur operators under legal age should have their legal guardians submit entries and claim any prizes on their behalf. GigaParts employees/ex-employees and their immediate family are not eligible to win.

**WINNER SELECTION.** The Grand Prize winner will be randomly selected on or after June 26, 2009. The winner's callsign will be announced at www.gigaparts.com as soon as the winner's information and qualification have been verified. To receive the winner's name by mail, send a self-addressed stamped envelope to GigaParts Sweepstakes Winner Request, PO Box 11367, Huntsville, AL 35814 to be received no later than July 10, 2009. The winner will be notified by email and/or telephone on or after June 26, 2009. The odds of winning are dependent upon the number of entries submitted by the participant and the total number of entries received during the Sweepstakes.

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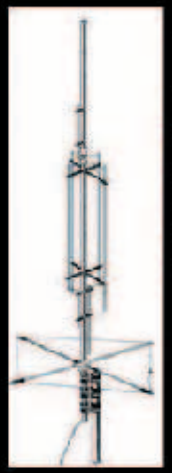

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10m, 12m, 15m, 17m, 20m, 30m, 40m, & 80m

25' tall 25 lbs

Mounts on 1-1/4" OD mast

No radials required.

*VSWR under 2:1 on 80m 100 KHz

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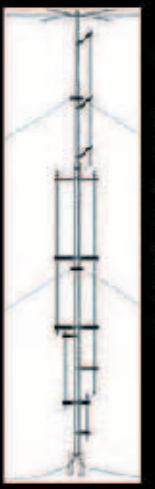
*VSWR under 2:1 on 80m 130 KHz



### VOYAGER DX

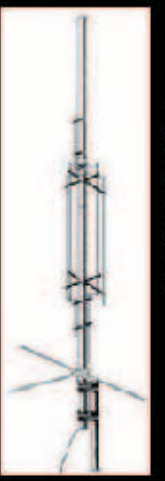
20m, 40m, 80m, & 160m

45' tall 39 lbs

Supplied with hinged ground mount.

3 counterpoises required 57' long.

*VSWR under 2:1 on 160m 90 KHz



### EAGLE DX

10m, 12m, 15m, 17m, 20m & 40m

21' tall 19 lbs

Mounts on 1-1/4" OD mast

No radials required.

*40m limited to 300 watts

## QUICK TILT

The easy way to raise and lower your antenna, support mast or flagpole. Works with most antennas

GROUND MOUNT

Accomodates 1 1/4" 2" OD Mast

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HFSOC-HF4

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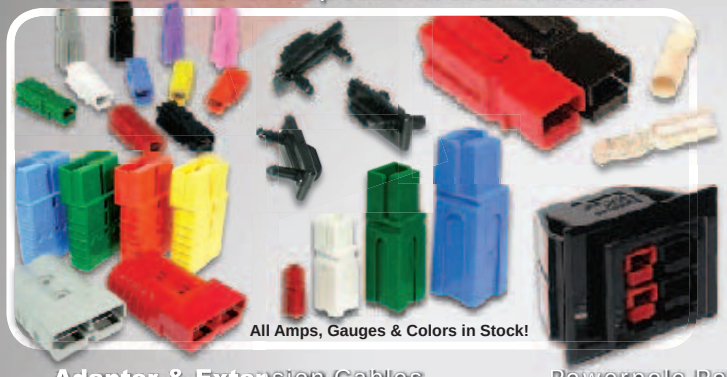
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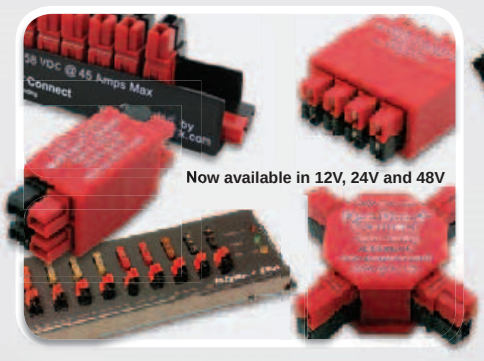
## Adapter & Extension Cables

## Powerpole Power Splitters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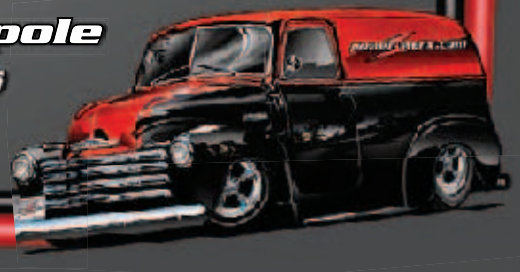

# MIRAGE. . .160 Watts on 2 Meters!

***Turn your mobile, base or handheld into 160 Watt powerhouses and talk further, longer, clearer. . . All modes: FM, SSB, CW . . . Superb GaAsFET preamp . . . Overdrive, high SWR, Over-temperature protection . . . Remote controllable . . .***


B-5018-G
$329.95

***The MIRAGE B-5018-G gives you 160 Watts output for 50 Watts input on all modes -- FM, SSB, or CW!***

**Ideal** for 25-50 Watt 2 Meter mobile or base. Weak signals pop out with its low noise *GaAsFET* preamp and its excellent 0.6 dB noise figure. Selectable 5, 8 or 14 dB preamp gain.

***Exclusive*** MIRAGE *ActiveBias*™ circuit gives *crystal clear SSB* without splatter or distortion.

**B-5018-G** is legendary for its ruggedness and is fully protected -- high SWR or excessive input power automatically bypasses the B-5018-G to prevent damage.

**Heavy-duty** heatsink spans entire length of cabinet. Power transistors protected by MIRAGE's *Therm-O-Guard*™.

**Has** adjustable delay *RF sense* Transmit/Receive switch *and* remote external keying. 16-20 Amps at 13.8 VDC.12x3x5½ inches.

**B-1018-G, $409.95.** MIRAGE's most popular *dual purpose* HT or mobile/base amplifier. 160 Watts out for 10 Watts in. For 0.25-10 Watt rigs.

**B-2518-G, $329.95.** Same as B-5018-G but for 10 to 25 Watt mobile or base. 160 Watts out for 25 Watts in.

**RC-2, $49.95.** Remote Control. On/Off,pre-amp On/Off, selects SSB/FM. With 25 foot cable.

***Power Curve -- typical output power in Watts***

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **B-1018-G** | 25 | 50 | 140 | 150 | 160 | 160 | -- | -- | -- | -- |
| **B-2518-G** | 5 | 7 | 40 | 60 | 80 | 100 | 125 | 160 | 160 | 160 |
| **B-5018-G** | -- | 2 | 15 | 25 | 40 | 50 | 70 | 100 | 130 | 160 |
| ***Watts In*** | .25 | .5 | 3 | 5 | 8 | 10 | 15 | 25 | 35 | 50 |

## 35 Watts for 2 Meter HT

B-34-G
$119.95

**For** handhelds up to 8 Watts. 35 Watts out for 3-8 Watts in (18 W out/1W in)! 18 dB *GaAsFET* preamp. All modes: FM, SSB, CW. RF sense T/R switch. Reverse polarity protection. Includes mobile bracket, 1 year warranty. 5¼Wx1¾Hx4¾D in.

***35 Watts, $99.95, FM only***

**B-34, $99.95.** 35 Watts out for 2 Watts in. Like B-34-G, FM only, less preamp, mobile bracket. 3⅛Wx1¾Hx4¼D in

## MIRAGE Dual Band 144/440 MHz Amp

BD-35
$179.95

**Boost** your *dual band* 144/440 MHz handheld to a powerful mobile/base -- 45 Watts on 2 Meters/ 35 Watts on 440 MHz! Works with all FM handhelds to 7 Watts. Includes *full duplex* operation -- lets you talk on one band, listen on other at same time. Auto band selection, RF sense T/R switch, single connector, reverse polarity protection, 5Wx1¾Hx5D in. Mobile bracket. One year warranty.

## 100 Watts for 2M HT

**100** Watts out for 2-8 Watts in! Great for HTs up to 8W. FM, SSB, CW. 15 dB *GaAs-FET* preamp, RF sense T/R, high-SWR protected.

B-310-G
$229.95

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***800-647-1800***

**Tech:** 662-323-8287 **Fax:** 662-323-6551

**MIRAGE**

***300 Industrial Park Rd Starkville, MS 39759***

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***MIRAGE . . . the world's most rugged VHF/UHF amplifiers!***

# the *finest* antenna tuner made!

***. . . the VECTRONICS HFT-1500***

- ***High Current Roller Inductor***
- ***SSB*Analyzer Bargraph™***
- ***Cross-Needle Meter***
- ***6 Position Antenna Switch***
- ***Built-in 4:1 Balun***
- ***Gear driven Turns Counter***

***The VECTRONICS HFT-1500 is not just an antenna tuner . . . it's a beautifully crafted work of art, using the finest components available and the highest quality construction.***

***Every*** HFT-1500 aluminum cabinet is carefully crafted with a super durable paint that won't scratch or chip.

**Attractive** two-color Lexan front panel is scratch-proof. Take a quarter. Scratch the front panel. You won't leave a mark!

***Arc-Free Operation***

**Two** 4.5 kV transmitting variable capacitors and a massive roller inductor gives you arc-free operation up to 2 kW PEP SSB.

***Precision Resetability***

**A** sturdy hand cranked roller inductor lets you quickly fly from band to band. A precision 5-digit gear driven turns counter lets you accurately retune.

HFT-1500
$479.95

**Large** comfortable knobs and smooth vernier drives make tuning precise and easy. Bright red pointers on logging scales make accurate resetability a breeze.

***Absolute Minimum SWR***

**You** can tune your SWR down to the absolute minimum! **Why?** Because all network components -- roller inductor and variable capacitors are fully adjustable.

***Tune any Antenna***

**You** can tune any *real* antenna from 1.8 to 30 MHz, including all MARS and WARC bands. You can tune verticals, dipoles, inverted vees, Yagis, quads, long-wires, whips, G5RVs, and more.

***SSB*Analyzer Bargraph™***

**Exclusive** 21 segment bargraph lets you visually follow your instantaneous voice peaks. Has level and delay controls.

***Accurate SWR/Power Meter***

**A** shielded directional coupler and backlit Cross-Needle meter displays accurate SWR, forward and reflected power simultaneously. Reads both peak and average power on 300/3000 Watt scales.

***6 Pos. Ceramic Antenna Switch***

**Select** two coax fed antennas (tuned or bypassed), balanced line/wire or bypass.

***Built-in Balun***

**A** heavy duty two ferrite core 4:1 balun feeds dual high voltage Delrin terminal posts for balanced lines. 5.5x12.5x12 inches. One year limited warranty.

***Call toll-free, 1-800-363-2922***

**Order** the HFT-1500 from Vectronics. Try it for 30 days. If you are not completely satisfied, return it for a full refund, less shipping and handling -- no hassles.

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Yuri Sushkin, N3QQ - Chuginadak Island

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***And more!***

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**Learn to stand out from the crowd.**

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# MFJ 160-6 Meter Antenna

## *Self-supporting 43 foot vertical -- no guy wires required . . . 1500 Watts . . . exceptional performance . . . low-profile . . . includes base mount and legal limit balun . . . assembles in an hour . . .*

MFJ-2990
$359.95

New!

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

### *Exceptional Performance*

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

### *With an automatic antenna tuner there's no fuss -- just talk!*

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

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

### *Fully self-supporting, Extremely low wind loading, Very low visibility . . .*

**With** just 2 square feet wind load, the fully self-supporting MFJ-2990 -- *no guy wires needed* -- has the lowest wind-loading and lowest visibility of any vertical antenna! The key is a six foot section of tapering diameter *stainless steel* whip that flexes in strong wind instead of stressing the bottom sections. Its 2-inch O.D. and .120 inch thick walled tubing bottom section makes it incredibly strong -- it'll stay up!

**Weighs** just 20 pounds -- you can easily put it up by yourself because its corrosion resistant *6063 aircraft aluminum* tubing and stainless steel construction make it light *and* super-strong.

### *Assembles in an hour*

**You** can easily assemble it in an hour! Ground mounting lets you completely hide its antenna base in shrubbery. Includes ATB-65 high-strength antenna mount. Requires ground system -- at least one radial. More extensive ground system will give much better performance.

### *Great for Stealth Operation in antenna restricted areas*

**This** very low-profile antenna is perfect for stealth operation in antenna restricted areas. Hide it behind trees, fences, buildings, bushes. Use it as a flagpole. Telescope it down during the day. Put it up at night and take it down in the morning before the neighbors even notice!

**Quick** and easy installation makes it great for DXpeditions, field day and other portable and temporary operations.


## MFJ *Automatic* Tuners

MFJ-998
$699.95

**For** legal limit 1500 Watt SSB/CW amplifiers. Auto-ranging LCD and Cross-Needle SWR/Wattmeter, antenna switch, amp bypass, matches 12-1600 Ohms, 1.8-30 MHz.

MFJ-993B
$259.95

**Dual** power range -- 300 Watt range matches 6-1600 Ohms. 150 Watt/6-3200 Ohms. Auto-ranging LCD and Cross-Needle SWR/Wattmeter, antenna switch, 1.8-30 MHz.

## MFJ *Manual* Tuners

MFJ-989D
$389.95

**1500** Watts SSB/CW, 1.8-30 MHz. Active peak-reading Cross-Needle SWR/Wattmeter, balun, dummy load, antenna switch, aircore roller inductor.

MFJ-949E
$179.95

**World's** most popular tuner! 300 Watts, 1.8-30 MHz. Peak/Average Cross-Needle SWR/Wattmeter, 8 pos. antenna switch, dummy load, 1kV capacitors.

## Window Feedthru

MFJ-4602
$69.95

**Bring** 3 coaxes, balanced line, random wire, ground thru window. Connectors mounted on *stainless steel* panel. 3/4" thick *pressure-treated* weather-proof wood.

## *Free* MFJ Catalog

***Visit: http://www.mfjenterprises.com or call toll-free 800-647-1800***

• 1 Year *No Matter What*™ warranty • 30 day money back guarantee (less s/h) on orders direct from MFJ

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TM-G707A

TM-V7A

TM-D700A

With the supplied accessories the RC-D710 is a full upgrade to the TM-V71A. The TM-V71A will have full functionality of the TM-D710A by exchanging the TM-V71A panel with the RC-D710.

## This is where it gets interesting!

PG-5J connection kit makes the RC-D710 a complete standalone APRS/TNC for your current radio. This option allows connectivity with previous and current Kenwood models* as an external modem.

**Compatible models include: TM-D710A / TM-V71A / TM-D700A / TM-G707A / TM-V7A / TM-733A / TM-255A / TM-455A*
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# MFJ *IntelliTuner*™ Automatic Tuners

## *More hams use MFJ tuners than all other tuners in the world!*

***World's most advanced Automatic Antenna Tuners feature world renowned MFJ AdaptiveSearch™ and AutomaticRecall™ algorithms -- world's fastest ultra-wide range tuning. Nine World Class models! Choose your features: Digital/Analog/Audio SWR-Wattmeter, Antenna Switch, Balun, Radio Interface, Digital frequency readout, Remoteable, Coax/Balanced Lines/Wire Tuning, Field Upgradeable . . .***

## MFJ-998 1500 Watt *Legal Limit IntelliTuner*™


***Only the MFJ-998 gives you fully automatic antenna tuning for your legal limit full 1500 Watts SSB/CW linear amplifier!***

MFJ-998 $699.95

***Ultra-fast Automatic Tuning***

**Instantly** match impedances from 12-1600 ohms using MFJ's exclusive *IntelliTune*™, *Adaptive Search*™ and *InstantRecall*™ algorithms with over 20,000 *VirtualAntenna*™ Memories.

***Safe auto tuning protects amp***

**MFJ's** exclusive *Amplifier Bypass Control*™ makes tuning safe and "stupid-proof"!

***Digital/Analog Meters***

**A** *backlit* LCD meter displays SWR, forward/reflected power, frequency, antenna selected, an auto-ranging bargraph power indication, and much more.

**Has** quick-glance auto-ranging Cross-Needle SWR/Wattmeter.

***MFJ VirtualAntenna™ Memory***

**MFJ** new *VirtualAntenna*™ Memory system gives you 4 antenna memory banks for *each* of 2 switchable antenna coax connectors. Select up to 4 antennas on each antenna connector. Each antenna has 2500 memories, 20,000 total. Has binding post for end-fed long wire antennas.

***Download & Upgrade Remotely***

**Download** from internet and upgrade your MFJ-998 firmware as new features are introduced.

***Plus Much More!***

**Built-in** radio interface controls most transceivers.

**Automatically** bypasses with excessive tuning power.

**Use** balanced line antennas with external **MFJ-912, $59.95**, 1.5 kW 4:1 balun.

**Small** 13Wx4Hx15D inches easily fits into your ham station. 8 pounds. Requires 12-15VDC at 1.4 amps maximum or 110 VAC with **MFJ-1316, $21.95**.

### *for 600 Watt amps*

***AL-811/ALS-600/ALS-500***


**For** 600 Watt amps like Ameritron AL-811/ALS-600/ALS-500M. Matches 12-800 Ohms. 10,000 *Virtual Antenna*™ memories. Cross-Needle SWR/Wattmeter. 10Wx2¾Hx9D inches.

MFJ-994B $359.95

***No Matter What*™ Warranty**

**Every** MFJ tuner is protected by MFJ's famous one year *No Matter What*™ limited warranty. We will repair or replace your MFJ tuner (at our option) for a full year.

### 300 Watt...Best Seller

***Digital Meter, Ant Switch, Balun***

**The** *world's best selling* automatic antenna tuner is *highly acclaimed the world over* for its ultra high-speed, wide matching range, reliability, ease-of-use! Matches virtually *any* antenna.

MFJ-993B $259.95

### 300 Watt...Extra Wide Range

***SWR/Wattmeter, 10000 VA Memories***


***Extra*** *wide matching range at less cost.* Exclusive dual power level: 300 Watts/6-1600 Ohms; 150W/6-3200 Ohms. Cross-Needle SWR/Wattmeter.

MFJ-991B $219.95

### 200 Watt ...Compact

***Digital Meter, Ant Switch, Wide Range***

**World's** fastest compact auto tuner uses MFJ *Adaptive Search*™ and *InstantRecall*™ algorithms. 132,072 tuning solutions instantly match virtually any antenna with near perfect SWR.

MFJ-929 $219.95

### 200 Watt ...Econo

***Small, Ant Switch, 20K VA Memories***

**High-speed**, wide matching range and compactness at low cost! Leave in-line and forget it -- your antenna is *always* automatically tuned! 2-position antenna switch.

MFJ-928 $199.95

### 200 Watt *MightyMite*™

***Matches IC-706, FT-857D, TS-50S***

***No*** *extra space needed!* Just set your IC-706/7000, FT-857D, TS-50S on top of this matching low-profile automatic tuner -- it's all you need for a completely automated station using *any* antenna! Just tune and talk!

MFJ-925 $179.95

### *G5RV Antenna*

MFJ-1778 $44.95

**Covers** all bands, 160-10 Meters with antenna tuner. 102 ft. long. Can use as inverted vee or sloper. Use on 160 Meters as Marconi.1500 Watts. Super-strong fiberglass center/feedpoint insulators. *Glazed ceramic* end insulators. All hand-soldered connections. Add coax, some rope and you're *on the air!*

**MFJ-1778M, $39.95.** G5RV Junior. Half-size, 52 ft. 40-10M with tuner, 1500 Watts.

### 200W...Weather-sealed

***for Remote/Outdoor/Marine***

MFJ-926 $399.95

***Fully*** *weather-sealed for remote Outdoor/Marine use*! Tough, durable, built-to-last the elements for years.

### 200 Watt...Remote

***Coax/Wire Ant, No pwr cable needed***

MFJ-927 $259.95

**Weather** protected fully automatic *remote* auto tuner for wire ***and*** *coax* antennas -- an MFJ exclusive. Powers through coax -- No separate power cable needed.

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**FAX:**(662)323-6551 8-4:30 CST, Mon.-Fri. ***Add shipping.***



***http://www.mfjenterprises.com for instruction manuals, catalog, info***

# 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

***More*** *hams use MFJ-949s than any other antenna tuner in the world!*

MFJ-949E $179.95

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

***The*** *most for your money!*

MFJ-941E $139.95

Handles 300 Watts PEP, covers 1.8-30 MHz, *lighted* Cross-Needle SWR/Wattmeter, 8 position antenna switch, 4:1 balun, 1000 volt capacitors, Lexan front panel. Sleek $10^{1}/_{2}$Wx$2^{1}/_{2}$Hx7D in.

### MFJ-945E HF/6M ***mobile*** Tuner

MFJ-945E $129.95

**Extends** your mobile antenna bandwidth so you don't have to stop, go outside and adjust your antenna. Tiny 8x2x6 in. *Lighted* Cross-Needle SWR/Wattmeter. Lamp and bypass switches. Covers 1.8-30 MHz *and* 6 Meters. 300 Watts PEP. **MFJ-20, $6.95,** mobile mount.

### MFJ-971 ***portable/QRP*** Tuner

MFJ-971 $119.95

**Tunes** coax, balanced lines, random wire 1.8-30 MHz. Cross-Needle Meter. SWR, 30/300 or 6 Watt QRP ranges. Matches popular MFJ transceivers. Tiny 6x$6^{1}/_{2}$x$2^{1}/_{2}$ in.

### MFJ-901B ***smallest*** Versa Tuner

MFJ-901B $99.95

**MFJ's** smallest (5x2x6 in.) and most affordable wide range 200 Watt PEP Versa tuner. Covers 1.8 to 30 MHz. Great for matching solid state rigs to linear amps.

### MFJ-902 ***Tiny Travel*** Tuner

MFJ-902 $99.95

***Tiny*** $4^{1}/_{2}$x$2^{1}/_{4}$x3 inches, full 150 Watts, 80-10 Meters, has tuner bypass switch, for coax/random wire.

**MFJ-904H, $149.95.** Same but adds Cross-needle SWR/Wattmeter and 4:1 balun for balanced lines. $7^{1}/_{4}$x$2^{1}/_{4}$x$2^{3}/_{4}$ inches.

### MFJ-16010 ***random wire*** Tuner

MFJ-16010 $69.95

**Operate** all bands anywhere with MFJ's reversible L-network. Turns random wire into powerful transmitting antenna. 1.8-30 MHz. 200 Watts PEP. Tiny 2x3x4 in.

### MFJ-906/903 ***6 Meter*** Tuners

MFJ-906 $99.95

**MFJ-906** has lighted Cross-Needle SWR/Wattmeter, bypass switch. Handles 100 W FM, 200W SSB. **MFJ-903, $69.95**, Like MFJ-906, less SWR/Wattmeter, bypass switch.

### MFJ-921/924 ***VHF/UHF*** Tuners

MFJ-921/924 $89.95

**MFJ-921** covers 2 Meters/220 MHz. **MFJ-924** covers 440 MHz. SWR/Wattmeter. 8x$2^{1}/_{2}$x3 in.

### MFJ-931 ***artificial*** RF Ground

MFJ-931 $109.95

**Eliminates** RF hot spots, RF feedback, TVI/RFI, weak signals caused by poor RF grounding. Creates artificial RF ground or electrically places far away RF ground directly at rig. **MFJ-934, $209.95**, Artificial ground/300 Watt Tuner/Cross-Needle SWR/Wattmeter.

**Dealer/Catalog/Manuals**

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# 462-463-464-465-469-470-471-472

## Feedline Solutions!

Time to upgrade your station? Our quality feedline and accessories put your power where it belongs. Baluns, ladder line, coax, feed through panels, premium grade connectors and more.

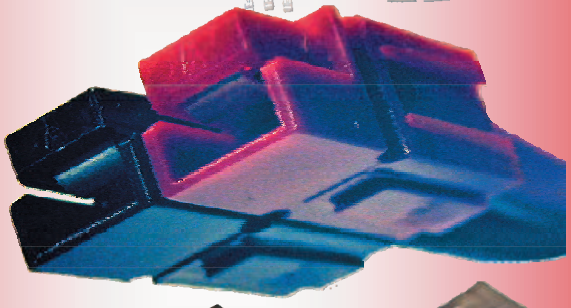
*Hot tip: Replacing old lossy coax will boost performance on both transmit and receive.*



## DC Power Solutions!

15A-30A-45A-50A-75A-120A
Panel, Cable & Chassis Mounts
Pre-Assembled Cables
More Powerpole Stuff Than

***ANYBODY!***



New! Exclusively from Quicksilver Radio, these handy Powerpole splitters are great in the shack, in the field, or in your go-kit. Compact heavy

## Antenna Solutions!

To build the right wire antenna, you need the right antenna wire. We have a wide variety of styles and lengths. Plus insulators, UV-proof rope, marine-grade pulleys, and handy gadgets.

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# www.qsradio.com

**Don't miss our huge display at the Dayton Hamvention, with special pricing on a wide variety of popular items**

# 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 1500 Watt ***Fully Balanced*** Antenna Tuner

## *Fully balanced MFJ-976 handles 1500 Watts legal limit . . . Extra-wide 12-2000 Ohms matching range . . . continuous 1.8 to 30 MHz coverage including all WARC bands . . . Four separate 500 pF in two gangs gives you a total of 2000 pF capacitance . . . Heavy duty 1:1 current balun . . . more!*


MFJ-976
**$499.95**

**The** MFJ-976 is a 1500 Watt Legal Limit *fully balanced* antenna tuner.

**You** get *superb* current balance, very wide matching range (12-2000 Ohms) and *continuous* 1.8-30 MHz coverage including all WARC bands. Handles *full* 1500 Watts SSB *and* CW.

**You** can tune *any* balanced lines including 600 Ohm open wire line, 450/ 300 Ohm ladder lines, 300/72 Ohm twin lead -- shielded or unshielded. Also tunes random wires and coax fed antennas.

**MFJ's** *fully balanced* extremely wide-range T-network gives you simple, fast three knob tuning. No complicated switching between high and low impedance and switching in additional capacitance of L-networks.

**Four** separate 500 pF in two gangs gives you a total of 2000 pF for highly efficient low loss operation on 160 Meters.

**You** get superb 10 Meter performance due to MFJ's low minimum capacitance and exclusive *Self-Resonance Killer*™ high-Q *AirCore*™ roller inductor with silver plated contacts.

**Heavy** duty 1:1 current balun gives you *superb balance* and stays cool even at 1.5kW.

**True** *active* peak reading lighted Cross-Needle SWR/Wattmeter lets you read SWR, *true peak* or average forward and reflected power all at a glance on 300/ 3000 Watt ranges. 12Wx6Hx15¾D inches.

# Ladder line, Twin lead, Insulators, Copper wire . . .

### Super-strong fiberglass 450 Ohm ladder line insulators

**MFJ-16D01, $8.95.** *Center* insulator. Double weave ladder line stress-relief. Strong wire tie points. Hang hole.

**MFJ-16E01, $9.95.** Feedpoint *End* Insulator. Double weave ladder line stress relief. Built-in SO-239 connector.

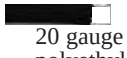
**MFJ-16F01, $8.95.** *Middle* insulator. High-strength coax connection at mid-point with SO-239, quadruple weave-through ladder line stress relief.

**MFJ-16C06, $4.56.** Authentic *glazed ceramic* Insulator, 6-pack.

### 450 Ohm Ladder Line

Extremely low loss, open-frame construction. Heavy duty black polyethylene. Solid 18 gauge wire. MFJ-18H050, **50 Ft.**, $19.95. MFJ-18H100, **100 Ft.**, $34.95. MFJ-18H250, **250 Ft.**, $89.95.

### 300 Ohm Twin-Lead



20 gauge stranded copper wire. Black polyethylene. MFJ-18T050, **50 Ft.**, $24.95. MFJ-18T100, **100 Ft.**, $44.95. MFJ-18T250, **250 Ft.**, $99.95.

### Copper Antenna Wire

Flexible, 7-strand, 14 gauge, hard solid-copper wire. Strong/long-lasting. MFJ-18G100, **100 Ft.**, $24.95. MFJ-18G250, **250 Ft.**, $59.95.

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***MFJ . . . The World Leader in Ham Radio Accessories***

# MFJ-259B *1.8-170 MHz* SWR Analyzer

## *World's most popular SWR analyzer is super easy-to-use*

***Reads SWR . . . Complex RF Impedance: Resistance(R) and Reactance(X) or Magnitude(Z) and Phase(degrees) . . . Coax cable loss(dB) . . . Coax cable length and Distance to fault . . . Return Loss . . . Reflection Coefficient . . . Inductance . . . Capacitance . . . Battery Voltage. LCD digital readout . . . frequency counter . . . side-by-side meters . . . Battery charger . . . battery saver . . . low battery warning . . . smooth reduction drive tuning . . .***

***World's most popular SWR analyzer! The famous MFJ-259B gives you a complete picture of your antenna's performance. You can read your antenna's SWR and Complex Impedance from 1.8 to 170 MHz.***

***You can read Complex Impedance as series resistance and reactance (R+jX) or as magnitude (Z) and phase (degrees).***

***You can determine velocity factor, coax cable loss in dB, length of coax and distance to a short or open.***

***You can read SWR, return loss and reflection coefficient at any frequency simultaneously.***

***You can read inductance in uH and capacitance in pF at RF frequencies.***

***Large easy-to-read two line LCD screen and side-by-side meters clearly display your information.***

***It has built-in frequency counter, Ni-MH/Ni-CD charger circuit, battery saver, low battery warning and smooth reduction drive tuning.***

***Super easy to use! Just set the bandswitch and tune the dial -- just like your transceiver. SWR and Complex Impedance are displayed instantly!***

### Here's what you can do

**Find** your antenna's true resonant frequency. Trim dipoles and verticals.

**Adjust** your Yagi, quad, loop and other antennas, change antenna spacing and height and watch SWR, resistance and reactance change instantly. You'll know exactly what to do by simply watching the display.

**Perfectly** tune critical HF mobile antennas in seconds for super DX -- without subjecting your transceiver to high SWR.

**Measure** your antenna's 2:1 SWR bandwidth on one band, or analyze multiband performance from HF to VHF -- 1.8-170 MHz!

**Check** SWR outside the ham bands without violating FCC rules.

**Take** the guesswork out of building and adjusting matching networks and baluns.

**Accurately** measure distance to a short or open in a failed coax. Measure length of a roll of coax, coax loss, velocity factor and impedance.

**Measure** inductance and capacitance. Troubleshoot and measure resonant frequency and Q of traps, stubs, transmission lines, RF chokes, tuned circuits and baluns.


*Call your favorite dealer for your best price!*

MFJ-259B
$289.95

**Adjust** your antenna tuner for a perfect 1:1 match without creating QRM.

**And** this is only the beginning! The MFJ-259B is a complete ham radio test station including -- frequency counter, RF signal generator, *SWR Analyzer*™, RF Resistance and Reactance Analyzer, Coax Analyzer, Capacitance and Inductance Meter and more!

### *Free* Manual: call, write or download

**MFJ's** comprehensive instruction manual is packed with useful applications -- all explained in simple language you can understand.

### Take it anywhere

**Fully** portable, take it anywhere -- remote sites, up towers, on DX-peditions. It uses 10 AA or Ni-Cad batteries (not included) or 110 VAC with MFJ-1312D, $15.95. Its rugged all metal cabinet is a compact 4x2x6¾ in.

### How good is the MFJ-259B?

**MFJ** *SWR Analyzers*™ work so good, many antenna manufacturers use them in their lab and on the production line -- saving thousands of dollars in instrumentation costs! Used worldwide by professionals everywhere.

### More MFJ SWR Analyzers™

**MFJ-249B, $269.95.** Like MFJ-259B, but reads SWR, true impedance magnitude and frequency only on LCD. No meters.

**MFJ-209, $159.95.** Like MFJ-249B but SWR meter only. No LCD/frequency counter.

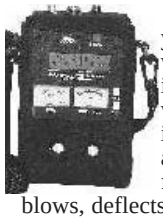
**MFJ-219B, $119.95. UHF *SWR Analyzer*** covers 420-450 MHz. External frequency counter jack. 7½x2½x2¼ in. *Free* "N" to SO-239 adapter.

### SWR Analyzer Accessories

### Dip Meter Adapter

**MFJ-66, $24.95.** Plug a dip meter coupling coil into your MFJ *SWR Analyzer*™ and turn it into a sensitive and accurate bandswitched dip meter. Takes guesswork out of winding coils and determining resonant frequency of tuned circuits and Q of coils. Set of two coils cover 1.8-170 MHz depending on your *SWR Analyzer*.

### *Genuine* MFJ Carrying Case



**MFJ-29C, $24.95.** Tote your MFJ-259B anywhere with this MFJ custom carrying case. Has back pocket with security cover for carrying dip coils, adaptors and accessories. Made of special foam-filled fabric -- cushions blows, deflects scrapes, and protects knobs, meters and displays from harm. Wear it around your waist, over your shoulder, or clip it onto the tower while you work -- the fully-adjustable webbed-fabric carrying strap has snap hooks on both ends. Has clear protective window for frequency display and cutouts for knobs and connectors so you can use your MFJ *SWR Analyzer*™ without taking it out of your case.

**MFJ-99, $60.85.** Accessory Package for MFJ-259/B/249/B/209. Includes MFJ-29C carrying case, MFJ-66 dip meter adapter, MFJ-1312D 110VAC adapter. ***Save $5!***

### *Tunable Measurement Filter*

**MFJ-731, $99.95.** *Exclusive* MFJ tunable RF filter allows accurate SWR and impedance measurements 1.8-30 MHz in presence of strong RF fields. Virtually no effect on measurements. Works with *all* SWR Analyzers.

### MFJ *No Matter What*™ warranty

**MFJ** will repair or replace (at our option) your MFJ *SWR Analyzer*™ for one full year.

### *Free* MFJ Catalog

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## 1.8-170 MHz *plus* 415-470 MHz SWR Analyzer

All-in-one handheld antenna test lab lets you quickly check/tune HF, VHF, ***UHF*** antennas anywhere. Measures: SWR, Return Loss, Reflection Coefficient, R, X, Z, Phase Angle, Coax cable loss, Coax cable length, Distance to short/open in coax, Inductance, Capacitance, Resonant Frequency, Bandwidth, Q, Velocity Factor, Attenuation, more!

MFJ-269
$389.95


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## *More hams use MFJ SWR Analyzers™ than any others in the world!*

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ARRL
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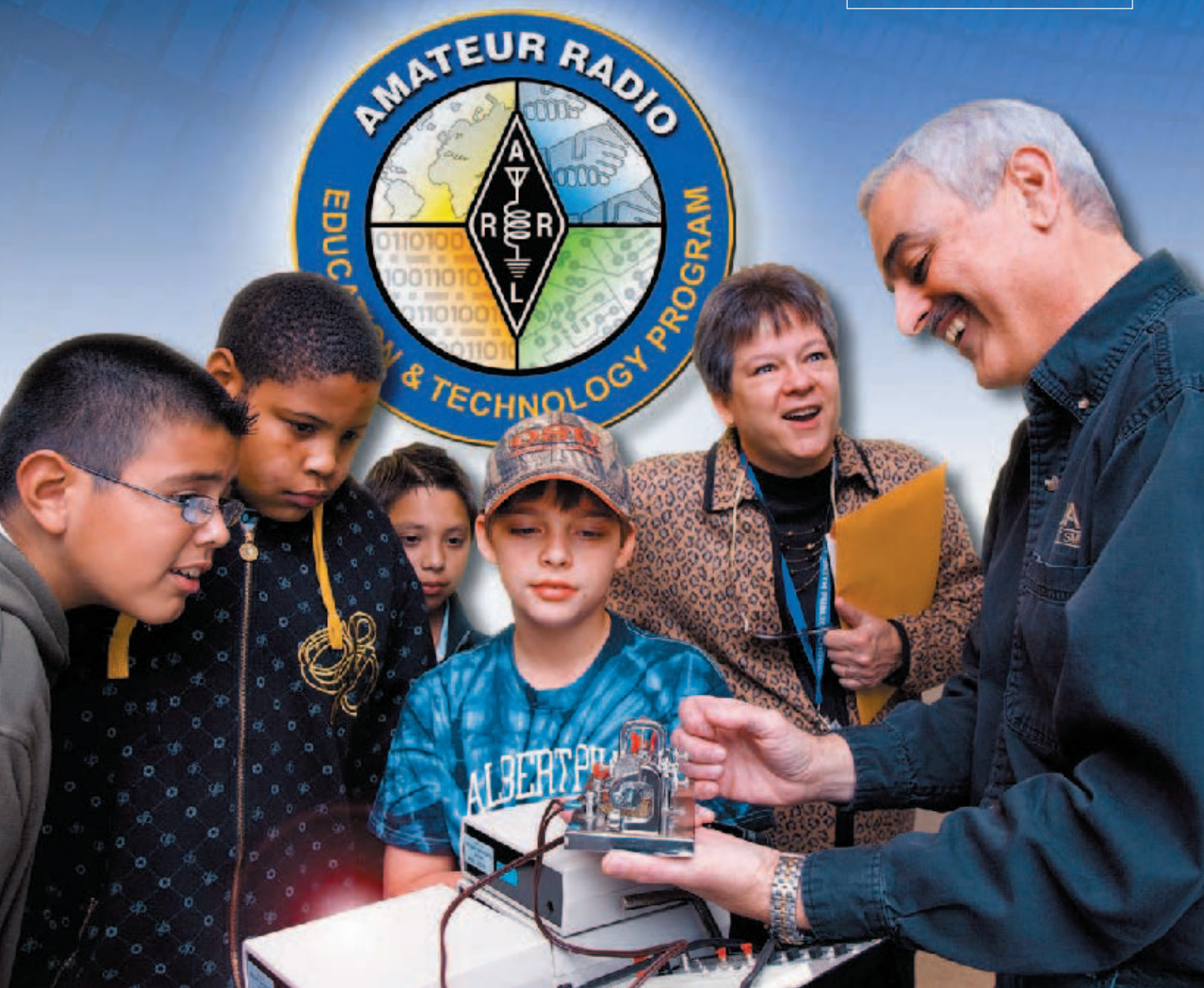
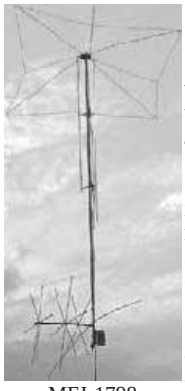


# 10 Bands -- 1 MFJ Antenna!

***Full size performance…No ground or radials Operate 10 bands: 75/80, 40, 30, 20, 17, 15, 12, 10, 6 and 2 Meters with one antenna . . . Separate full size radiators . . . End loading…Elevated top feed… Low Radiation Angle…Very wide bandwidth…Highest performance no ground vertical ever . . .***



MFJ-1798
$299.95

**Operate** 10 bands -- 75/80, 40, 30, 20, 17, 15, 12, 10, 6 and 2 Meters with this MFJ-1798 vertical antenna and get *full size performance* with no ground or radials!

**Full** size performance is achieved using separate full size radiators for 2-20 Meters and highly efficient end loading for 30, 40, 75/80 Meters.

**Get** very low radiation angle for exciting DX, automatic bandswitching, omni-directional coverage, low SWR. Handles 1500 Watts PEP SSB.

**MFJ's** unique *Elevated Top Feed*™ elevates the feedpoint *all the way to the top* of the antenna. It puts the maximum radiation point high up in the clear where it does the most good -- your signal gets out even if you're ground mounted.

**It's** easy to tune because adjusting one band has minimum effect on the resonant frequencies of other bands.

**Self-supporting** and just 20 feet tall, the MFJ-1798 mounts easily from ground level to tower top -- small lots, backyards, apartments, condos, roofs, tower mounts.

**Separate** *full size* quarter wave radiators are used on 20, 17, 15, 12, 10 and 2 Meters. On 6 Meters, the 17 Meter radiator becomes a 3/4 wave radiator.

**The** active radiator works as a stub to decouple everything beyond it. *In phase* antenna current flows in all parallel radiators. This forms a very large equivalent radiator and gives you incredible bandwidths. Radiator stubs provide automatic bandswitching -- absolutely *no loss* due to loading coils or traps.

**On** 30, 40, 75/80 Meters, end loading -- the most efficient form of loading -- gives you highly efficient performance, excellent bandwidth, low angle radiation and automatic bandswitching.

**MFJ's** unique *Frequency Adaptive L-Network*™ provides automatic impedance matching for lowest SWR on these low bands. Tuning to your favorite part of these bands is simple and is done at the *bottom* of the antenna.

**You** don't need a ground or radials because an effective counterpoise that's 12 feet across gives you *excellent* ground isolation. You can mount it from ground level to roof top and get awesome performance.

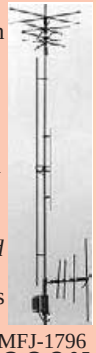
**The** feedline is decoupled and isolated from the antenna with MFJ's exclusive *AirCore*™ high power current balun. It's wound with *Teflon*® coax and can't saturate, no matter how high your power.

**Incredibly** strong solid fiberglass rod and large diameter 6061 T-6 aircraft strength aluminum tubing is in the main structure.

**Efficient** high-Q coils are wound on tough *low loss* fiberglass forms using highly weather resistant *Teflon*® covered wire.

## MFJ *6-Band* Halfwave Vertical Antenna

***6 bands: 40, 20, 15, 10, 6, 2 Meters . . . No radials or ground needed***



MFJ-1796
$229.95

**MFJ-1796,** is only 12 feet high and has a tiny 24 inch footprint! Mount anywhere -- ground level to tower top -- apartments, small lots, trailers. Perfect for field day, DXpedition, camping.

**Efficient** end-loading, no lossy traps. Entire length is always radiating. Full size halfwave on 2/6 Meters. High power *air-wound* choke balun eliminates feedline radiation. Adjusting one band has minimum effect on other bands.

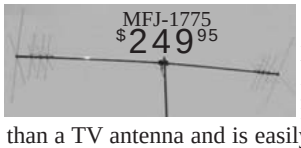
**MFJ-1796W, $229.95.** WARC Band version for 12, 17, 30, 60 Meters only.

**MFJ-1792, $189.95.** Full size 1/4 wave radiator for 40 Meters. 33 ft., handles 1500 Watts PEP. Requires guying and radials.

**MFJ-1793, $209.95.** Like MFJ-1792 but has full size 20 Meter 1/4 wave also.

## 6-Band, 40-2 Meters ***Rotatable*** Mini-Dipole

***Low profile 14 feet . . .7 ft. turning radius . . . 40, 20, 15, 10, 6, 2 Meters…1500 Watts . . .***



MFJ-1775
$249.95

**MFJ-1775** is inconspicuous and low profile -- not much bigger than a TV antenna and is easily turned by a lightweight rotator like Hy-Gain's *AR-35*.

***It's no Wimp!*** Its *directivity* reduces QRM/noise and lets you *focus* your signal in the direction you want -- work some *real* DX.

**You** can operate 6 bands -- 40, 20, 15, 10, 6 and 2 meters -- and run *full 1500 Watts* SSB/CW on all HF bands!

**Features** automatic band switching and uses highly efficient end-loading with its *entire length* always radiating. With 6 and 2 Meters thrown-in, you have ham radio's most versatile *rotatable* dipole!

**Each** HF band uses a separate, efficient end-loading coil wound on fiberglass forms with *Teflon*™ wire, and capacitance hats at each end (no lossy traps). 6 and 2 meters are *full-length* halfwave dipoles.

***Built-to-last*** -- incredibly strong solid rod fiberglass center insulator and 6063 T-6 aircraft strength aluminum tubing radiator. Assembles in an afternoon. Adjusting one band has little effect on other bands.

**MFJ-1775W, $249.95.** WARC band version for 12, 17, 30, 60 Meters only.

## MFJ *80/40/20* Meter ***Rotatable*** Dipole

MFJ-1785
$369.95

**Now** you can operate the *low bands* on 80, 40, and 20 Meters with a true rotatable dipole that'll blend in with the sky! Take advantage of excellent low band propagation during this low sunspot cycle. Handles 1500 Watts SSB/CW. 80/40 meter end-loading coils are wound on fiberglass forms with *Teflon*™ wire, and resonated with capacitance hats to ensure an extremely low-losses. Full-size on 20 Meters gives incredible DX. Balun included! 33 ft., low-profile, inconspicuous. Easily rotatable with a medium duty rotator like Hy-gain's AR-40.

## *MFJ's Super High-Q Loop™ Antennas*

MFJ-1786
$419.95

**MFJ's** *tiny* 36 inch diameter loop antenna lets you operate 10 through 30 MHz *continuously* -- including the WARC bands!

**Ideal** for limited space -- apartments, small lots, motor homes, attics, or mobile homes. Enjoy DX and local contacts mounted vertically. Get both low angle radiation for excellent DX and high angle radiation for local, close-in contacts. Handles 150 watts.

**Super** easy-to-use! Only MFJ's super remote control has *Auto Band Selection*™. It auto-tunes to desired band, then beeps to let you know. No control cable is needed.

**Fast**/slow tune buttons and built-in two range Cross-Needle SWR/Wattmeter lets you quickly tune to your exact frequency.

**All** welded construction, welded butterfly capacitor with no rotating contacts, large 1.050 inch diameter round radiator -- *gives you the highest possible efficiency.*

**Each** plate in MFJ's tuning capacitor is welded for low loss and polished to prevent high voltage arcing, welded to the radiator, has nylon bearing, anti-backlash mechanism, limit switches, continuous no-step DC motor -- gives smooth precision tuning. Heavy duty thick ABS plastic housing has ultraviolet inhibitor protection.

**Cover 40-15 Meters MFJ-1788, $469.95.** Like MFJ-1786 but covers 40-15 Meters continuous. Includes remote control.

## *MFJ's G5RV Antenna*

MFJ-1778
$44.95

**Covers** all bands,160-10 Meters with antenna tuner. 102 ft. long. Can use as inverted vee or sloper. Use on 160 M as Marconi.1500 Watts. Super-strong fiberglass center/feedpoint insulators. *Glazed ceramic* end insulators. All hand-soldered connections. Add coax, some rope and you're *on the air!*

**MFJ-1778M, $39.95.** G5RV Junior. Half-size, 52 ft. 40-10M with tuner, 1500 Watts.

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***MFJ . . . the world leader in ham radio accessories!***

# MFJ *Speech Intelligibility* Enhancer

## *. . . makes barely understandable speech highly understandable!*


MFJ-616
$189.95

***"What did you say?"*** ***Can you hear but . . . just can't always understand everything people are saying?***

**As** we get older, high frequency hearing loss reduces our ability to understand speech. Here's why . . .

**Research** shows that nearly *half* the speech intelligibility is contained in 1000 to 4000 Hz range, but contains a miniscule 4% of total speech energy.

**On** the other hand, the low frequencies, 125 to 500 Hz have most of the speech energy (55%) but contribute very little to intelligibility -- only 4%.

**To** dramatically improve your ability to understand speech, you must:

***First***, drastically increase the speech energy above 500 Hz, where 83% of the speech intelligibility is concentrated.

***Second***, drastically reduce speech energy below 500 Hz where only 4% of speech intelligibility lies.

**The** MFJ-616 splits the audio speech band into four overlapping octave ranges centered at 300, 600, 1200 and 2400 Hz. You can boost or cut each range by nearly 20 dB.

**A** balance control and separate 2½ Watt amplifiers let you equalize perceived loudness to each ear so both ears help.

**By** boosting high and cutting low frequencies and adjusting the balanced control, speech that you can barely understand become highly understandable!

**Even** if you *don't* have high frequency hearing loss, you'll dramatically improve your ability to understand speech. You'll get an edge in contesting and DXing and enjoy ragchewing more.

**Here's** what *QST* for April, 2001 said . . . *"I expected a subtle effect at best, but I was astonished . . . The result was remarkably clean, understandable speech without hissing, ringing or other strange effects . . . made a dramatic improvement . . ."*

**Immuned** to RFI. Has phone jack, on/off speaker switch, 2 inputs, bypass switch. 10Wx2½Hx6D". Needs 12 VDC.

**MFJ-1316, $21.95.** For 110 VAC operation. Provides 12 VDC/1.5 Amps.

**MFJ-72, $69.80.** *All-in-one MFJ-616 Accessory Pack.* Includes MFJ-392 headphones, two MFJ-281 speakers and MFJ-1316 power supply. ***Save $7!***

***Try it for 30 Days***

**Order** from MFJ and try it -- No obligation. If not delighted, return it within 30 days for refund less shipping.

## MFJ Contest Voice Keyer

***Transformer-coupled -- No RFI, hum or feedback . . . 75 seconds total, 5-messages . . . Records received audio . . .***


MFJ-434B
$199.95

**Let** this *new* microprocessor controlled MFJ *Contest Voice Keyer*™ call CQ, send your call and do contest exchanges for you in your own natural voice!

**Store** frequently used phrases like "CQ Contest this is AA5MT", "You're 59" . . . "Qth is Mississippi" . . . Contest by pressing a few buttons and save your voice.

**Record** and playback 5 natural sounding messages in a total of 75 seconds. Uses *eeprom* -- no battery backup needed. Use your mic or its built-in mic for recording.

**You** can repeat messages continuously and vary the repeat delay from 3 to 500 seconds. Makes a great voice beacon and calling CQ is *so* easy.

**You** can also record and play back off-the-air signals -- great help if you didn't get it right the first time! No more "*Please repeat*".

**A** playing message can be halted by the *Stop Button*, your microphone's PTT/VOX, remote control or computer.

**Has** jack for remote or computer control (using CT, NA or other program). Lets you select, play and cancel messages.

**Your** mic's audio characteristics do not change when your MFJ-434B is installed.

**All** audio lines are RF filtered to eliminate RFI, audio feedback and distortion. An audio isolation transformer totally eliminates hum and distortion caused by ground loops.

***New!*** **It's** easy to use -- just plug in your 8 pin round or modular mic plug, set the internal jumpers for your transceiver and plug in the appropriate (included) cable for your rig.

**Built-in** speaker-amplifier. Speaker/phone jack. Use 9 Volt battery, 9-15 VDC or 110 VAC with optional MFJ-1312D, $15.95. 6½Wx2½Hx6½D in.

**MFJ-73, $34.95.** MFJ-434B Remote Control with cable.

## 60 dB Null ***wipes out*** noise and interference

MFJ-1026
$199.95


**Wipe** out noise and interference *before* it gets into your receiver with a 60 dB null!

**Eliminate** all types of noise -- severe power line noise from arcing transformers and insulators, fluorescent lamps, light dimmers, touch controlled lamps, computers, TV birdies, lightning crashes from distant thunderstorms, electric drills, motors, industrial processes . . .

**It's** *more effective* than a noise blanker! Interference much stronger than your desired signal can be completely removed without affecting your signal.

**It** works on *all modes* -- SSB, AM, CW, FM -- and frequences from BCB to lower VHF.

**You** can null out strong QRM on top of weak rare DX and then work him! You can null out a strong local ham or AM broadcast station to prevent your receiver from overloading.

**Use** the MFJ-1026 as an *adjustable phasing network.* You can combine two antennas to give you various directional patterns. Null out a strong interfering signal or peak a weak signal at a push of a button.

**Easy-to-use!** Plugs between transmitting antenna and transceiver. To null, adjust amplitude and phase controls for minimum S-meter reading or lowest noise. To peak, push reverse button. Use built-in active antenna or an external one. MFJ's exclusive *Constant Amplitude Phase Control*™ makes nulling easy.

**RF** sense T/R switch automatically bypasses your transceiver when you transmit. Adjustable delay time. Uses 12 VDC or 110 VAC with MFJ-1312D, $15.95. 6½x1½x6¼ in.

**MFJ-1025, $179.95. Like** MFJ-1026 less built-in active antenna, use external noise antenna.

## MFJ ***tunable*** Super DSP filter

MFJ-784B
$279.95

**Only** MFJ gives you *tunable* and *programmable* "brick wall" DSP filters.

**You** can continuously *tune* low pass, high pass, notch and bandpass filters and continuously *vary* bandwidth to pinpoint and eliminate interference.

**Only** MFJ gives you 5 factory pre-set and 10 programmable pre-set filters you can customize. **Automatic** notch filter searches for and eliminates multiple heterodynes. Advanced adaptive noise reduction silences background noise and QRM.


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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 . . . More!***


***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 mis-copy 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.***

**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. Digs out weak signals. Phase-Lock-Loop even tracks slightly drifting signals.

MFJ-461 $89.95

**Of** course, nothing can clean up and copy a sloppy fist, especially weak signals with lots of QRM/QRN.

**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.

**When** it's too noisy for its microphone pickup, you can connect the MFJ-461 to your receiver with a cable. A battery saving feature puts the MFJ-461 to sleep during periods of inactivity. It wakes up and decodes when it hears CW.

**Uses** 9 Volt battery. Fits in your shirt pocket with room to spare - smaller than a pack of cigarettes. Tiny 2¼x3¼x1 inches. 5½ ounces.

**Super** easy-to-use! Just turn it on -- it starts copying instantly!

**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, $16.95.** 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 Morse Code *Reader and Keyer* Combination

**Plug** MFJ's CW Reader with 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're still learning the code!* 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-551, $39.95.** RFI suppressed keyboard, a must to avoid RFI problems.

MFJ-464 $199.95 *(Keyboard, paddle not included.)*

## MFJ Iambic Paddles

MFJ-564 Chrome
MFJ-564B Black
$69.95

**MFJ** *Deluxe Iambic Paddles*™ feature a full range of adjustments in tension and contact spacing. Self-adjusting nylon and steel needle bearings, contact points that almost never need cleaning, precision machined frame and non-skid feet on heavy chrome base. Works with all MFJ and other electronic keyers.

***Miniature* Travel Iambic Paddle**

**MFJ-561, $24.95.** 1¾Wx1¾D x¾H inches. *Formed* phosphorous bronze spring paddle, stainless steel base. 4 ft. cord, 3.5 mm plug.

## 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. 8½x2¼x3¾ inches.

**MFJ-550, $14.95.** Telegraph Key Only with adjustable contacts. Handsome black.

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**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-418 $89.95

## MFJ *ClearTone*™ Speaker

**MFJ-281, $12.95.** Makes copying easier, enhances speech, improves intelligibility, reduces noise, static, hum. 3" speaker, 8 Watts, 8 Ohms.

## MFJ 24/12 Hour Station Clock

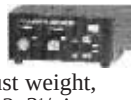
**MFJ-108B, $21.95.** Dual 24/12 hour clock. Read UTC *and* local time *at-a-glance.* High-contrast 5/8" LCD, brushed aluminum frame. Batteries included. 4½Wx1Dx2H in.

## MFJ Deluxe CW Keyer

***Deluxe*** MFJ Keyer has all controls on front panel for easy access -- speed, weight, tone, volume knobs, and tune, semi/auto, on/off push-buttons. You get all keyer modes, dot-dash memories, self completing dots and dashes, jam-proof spacing, sidetone, built-in speaker, type A or B keying. RF proof. Solid state keying. 7x2x6 in.

MFJ-407D $69.95

**MFJ-401D, $49.95.** MFJ Econo Keyer II has front-panel volume/speed controls (8-50 wpm), tune switch. Internal adjust weight, tone. Solid state keying. Tiny 4x2x3½ in.



## Keyer/Paddle Combo

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**Best** of all CW worlds -- a *deluxe MFJ Curtis*™ *keyer* that fits right on *Bencher paddle*! Adjustable weight and tone, front panel volume and speed controls (8-50 WPM), built-in dot-dash memories, speaker, sidetone, semi-automatic/tune or automatic modes. Use 9V battery or 110 VAC with MFJ-1312D, $15.95. 4½x2⅝x5¼ in.

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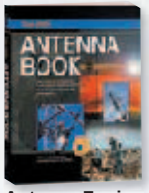

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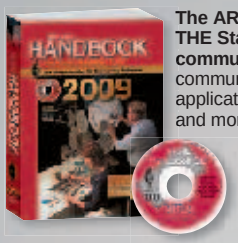


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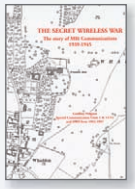

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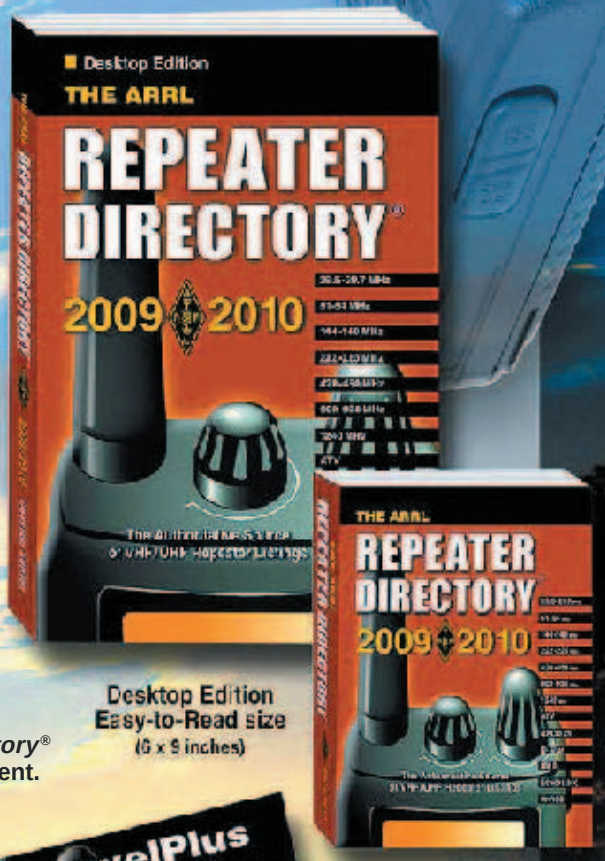


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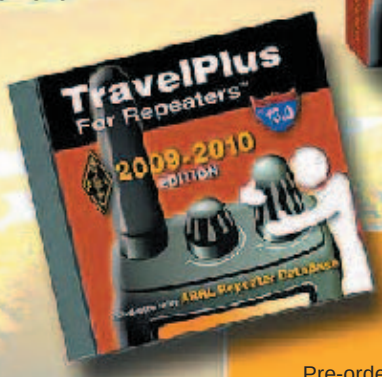


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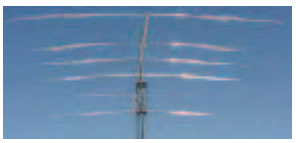

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