SPECIAL FIELD DAY ISSUE

QST

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June 2011 WWW.ARRL.ORG

Gear Up and Get on the Air!

QST reviews:

Inside:

Field Day Ad Section
page 16A

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Field Gear That Goes The Distance!

FT-897D

HF/VHF/UHF Portable Operation Powerful Transceiver

- The Ultimate Emergency Communications Radio
- Rugged, Innovative Multi-Band
- Operates on the SSB, CW, AM, FM, and Digital Modes
- Wide Frequency Coverage
- 20-Watt Portable Operation Using Internal Batteries
- 100 Watts When Using an External 13.8-Volt DC Power Source

FT-817ND

The Ultimate Backpack, Multi-Mode Portable Transceiver

- Self-Contained
- Battery-Powered
- Covering the HF, VHF, and UHF Bands
- Provides up to Five Watts of Power Output
- SSB, CW, AM, FM, Packet, or SSB-based Digital Modes like PSK31

FT-857D

The World's Smallest HF/VHF/UHF Mobile Transceiver

- Ultra-Compact Package
- Ideal for Mobile or External Battery Portable Work
- Wide Frequency Coverage
- Optional Remote-Head
- High-Performance Mobile Operation

FT-450D

HF/50 MHz 100 W Easy to Operate All Mode Transceiver

- Illuminated Key Buttons
- 300Hz / 500Hz / 2.4 kHz CW IF Filter
- Foot Stand
- Classically Designed Main Dial and Knobs
- Dynamic Microphone MH-31 A8J Included

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Choice of the World's top DX'ers℠

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A TECHNOLOGY BREAKTHROUGH

New Advanced VX-8 Series GPS/APRS® Handheld Transceivers
Choose the Yaesu that meets your APRS® operating preferences in the field

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

Actual Size

144/430 MHz
FM 5 W Dual Band Handheld
VX-8GR
(7.4V 1,100 mAh Lithium Ion battery/FNB-101LI and battery charger/NC-86A included)

Actual Size

VX-8DR NEW

All-in-one Prestigious Tri-band Transceiver
Bluetooth® for hands-free Operation with optional accessories
Waterproof/Submersible IPX 7 rated - 3 ft for 30 minutes

Optional GPS and antenna unit for GPS/APRS® operation

Attached to the radio (microphone input) using the optional GPS Antenna Adapter CT-136

The optional GPS Antenna Unit FGPS-2 attached to the optional speaker Microphone MH-74A7A

Bluetooth®

VX-8GR NEW

144/430 MHz Dual Band Transceiver with GPS unit included
Built-in GPS Antenna - Waterproof
Wide Band Receive for 108-999 MHz (Cellular blocked – US Version)

Supports APRS® communication by the Built-in Worldwide Standard AX.25 Data TNC

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

- SmartBeaconing™ Function
- Memories to list 50 stations
- Memories to store 30 APRS® messages
- DIGI-PATH routing indication function
- 8 DIGI-PATH routing settings
- GPS Compass Display - "Heading Up" or "North Up"
- APRS® Symbol Icon pre-set function
- Clearly displayed APRS® Beacon Messages
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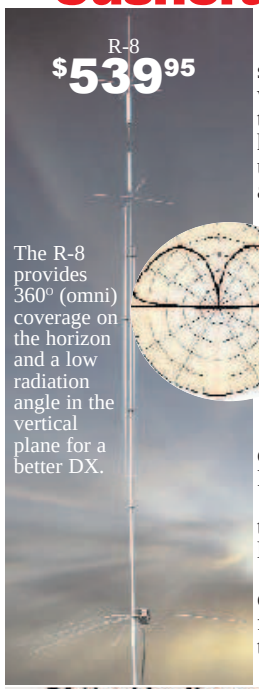
Cushcraft R8 *8-Band Vertical*

Covers 6, 10, 12, 15, 17, 20, 30, and 40 Meters!



The R-8 provides 360° (omni) coverage on the horizon and a low radiation angle in the vertical plane for a better DX.

The Cushcraft R8 is recognized as the industry gold standard for multi-band verticals, with thousands in use worldwide. Efficient, rugged, and built to withstand the test of time, the R8's unique ground-independent design has a well-earned reputation for delivering top DX results under tough conditions. Best of all, the R8 is easy to assemble, installs just about anywhere, and blends inconspicuously with urban and country settings alike.

Automatic Band Switching: The R8's famous "black box" matching network combines with traps and parallel resonators to cover 8 bands. You QSY instantly, without a tuner!

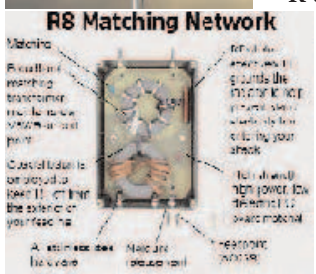
Rugged Construction: Thick fiberglass insulators, all-stainless hardware, and 6063 aircraft-aluminum tubing that is double or triple walled at key stress points handle anything Mother Nature can dish out.

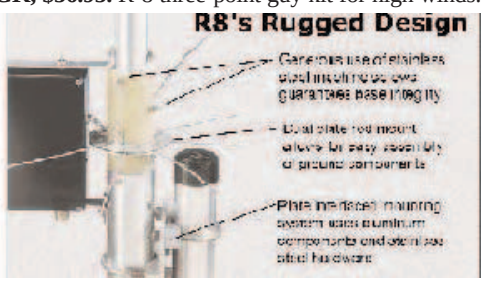
Compact Footprint: Installs in an area about the size of a child's sandbox -- no ground radials to bury and all RF-energized surfaces safely out of reach.

Legal-Limit Power: Heavy-duty components are contest-proven to handle all the power your amplifier can legally deliver and radiating it as RF rather than heat.

The sunspot count is climbing and long-awaited band openings are finally becoming a reality. Now is the perfect time to discover why Cushcraft's R8 multi-band vertical is the premier choice of DX-wise hams everywhere!

R-8GK, $56.95. R-8 three-point guy kit for high winds.





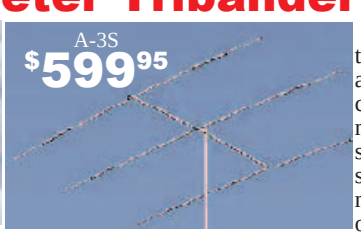
MA-5B *5-Band* Beam

Small Footprint -- Big Signal

The MA-5B is one of Cushcraft's most popular HF antennas, delivering solid *signal-boosting directivity* in a bantam-weight package. Mounts on roof using standard TV hardware. Perfect for exploring exciting DX without the high cost and heavy lifting of installing a large tower and full-sized array. Its 7 foot 3-inch boom has less than 9 feet of turning radius. Contest tough -- handles 1500 Watts.

The unique MA-5B gives you 5-bands, automatic band switching and easy installation in a compact 26-pound package. On 10, 15 and 20 Meters the end elements become a two-element Yagi that delivers solid power-multiplying gain over a dipole on all three bands. On 12 and 17 Meters, the middle element is a highly efficient trap dipole. When working DX, what really matters are the interfering signals and noise you *don't hear*. That's where the MA-5B's impressive side rejection and front-to-back ratio really shines. *See* ***cushcraftamateur.com*** *for gain figures.*

Cushcraft 10, 15 & 20 Meter Tribander Beams



Only the best tri-band antennas become DX classics, which is why the Cushcraft World-Ranger A4S, A3S, and A3WS go to the head of the class. For more than 30 years, these pace-setting performers have taken on the world's most demanding operating conditions and proven themselves every time. The key to success comes from attention to basics. For example, element length and spacing has been carefully refined over time, and high-power traps are still hand-made and individually tuned using laboratory-grade instruments. All this attention to detail means low SWR, wide bandwidth, optimum directivity, and high efficiency -- important performance characteristics you rely on to maintain regular schedules, rack up impressive contest scores, and grow your collection of rare QSLs!

It goes without saying that the World-Ranger lineup is also famous for its rugged construction. In fact, the majority of these antennas sold years ago are still in service today! Conservative mechanical design, rugged over-sized components, stainless-steel hardware, and aircraft-grade 6063 make all the difference.

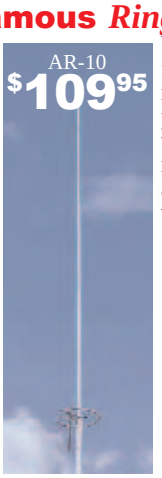
The 3-element A3S/A3WS and 4-element A4S are world-famous for powerhouse gain and super performance. **A-3WS**, **$499.95,** 12/17 M. **30/40 Meter** *add-on kits* available.

Cushcraft Dual Band Yagis

One Yagi for Dual-Band FM Radios

Dual-bander VHF rigs are the norm these days, so why not compliment your FM base station with a dual-band Yagi? Not only will you eliminate a costly feed line, you'll realize extra gain for digital modes like high-speed packet and D-Star! Cushcraft's A270-6S provides three elements per band and the A270-10S provides five for solid point-to-point performance. They're both pre-tuned and assembly is a snap using the fully illustrated manual.

Cushcraft Famous *Ringo* Compact FM Verticals



W1BX's famous *Ringo* antenna has been around for a long time and remains unbeaten for solid reliability. The Ringo is broad-banded, lighting protected, extremely rugged, economical, electrically bullet-proof, low-angle, and more -- but mainly, it just plain works! To discover why hams and commercial two-way installers around the world still love this antenna, order yours now!

***Free* Cushcraft Catalog**
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Call your dealer for your best price!

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308 Industrial Park Road, Starkville, MS 39759 USA
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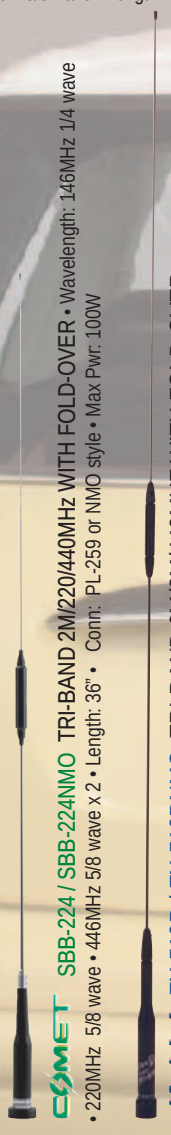
Life is a JOURNEY. Enjoy the ride!

Maldol MH-511 TRI-BAND 6M/2M/70CM HT ANTENNA • Length: 4" • Conn: Male SMA

Maldol MH-510 TRI-BAND 6M/2M/70CM HT ANTENNA • Wavelength: 6M 1/4 wave top-load • 2M 1/4 wave • 440MHz 1/2 wave • Length: 20.75" • Conn: Male SMA

COMET HT-224 TRI-BAND 2M/220/70CM HT ANTENNA • Wavelength: 2M 1/4 wave • 220MHz 1/2 wave • 440MHz 1/2 wave • Length: 11.5" • Conn: Male SMA

Maldol MH-610 TRI-BAND 2M/220/70CM HT ANTENNA • Wavelength: 2M 1/4 wave • 220MHz 1/2 wave • 70cm 5/8 wave • Length: 14" • Conn: Male SMA

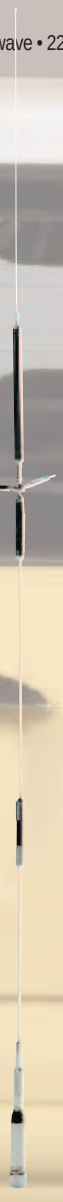


COMET SBB-224 / SBB-224NMO TRI-BAND 2M/220/440MHz WITH FOLD-OVER • Wavelength: 146MHz 1/4 wave • 220MHz 5/8 wave • 446MHz 5/8 wave x 2 • Length: 36" • Conn: PL-259 or NMO style • Max Pwr: 100W

Maldol EX-510B / EX-510BNMO TRI-BAND 6M/2M/440MHZ WITH FOLD-OVER • Wavelength: 52MHz 1/4 wave • 146MHz 1/2 wave • 446MHz 5/8 wave x 2 VSWR • Length: 37" • Conn: PL-259 or NMO style • Max Power: 50W FM

COMET SB-15 TRI-BAND 6M/2M/440MHZ WITH FOLD-OVER • Wavelength: 52MHz 1/4 wave • 146MHz 6/8 wave • 446MHz 5/8 wave x 3 • Length: 58" • Conn: PL-259 • Max Pwr: 120W

COMET UHV-4 QUAD-BAND 10M/6M/2M/440MHZ WITH FOLD-OVER • Wavelength: 10M & 6M 1/4 wave • 2M 1/2 wave • 70cm 5/8 wave x 2 • Length: 55" • Max Power: 10M 120W SSB 6M2M/70cm 100W FM • Conn: PL-259 • 10M and 6M bands have individual tuning stubs



COMET UHV-6 HF/6M/2M/440MHZ MOBILE ANTENNA *80/*20/*17/40/15/10/6/2M/70cm Mobile antenna with fold-over hinge• Wavelength: 2M 1/2 wave • 70cm 5/8 wave x 2 • VSWR: HF 1.6:1 or less, 6M-70cm 1.5:1 or less • Length: 44" (min), 78"(max) • Max Pwr: HF 120W SSB, 6M 200W SSB/100W FM, 2M/70cm 100W FM • **L-14 optional 20M coil *L-18 optional 17M coil *L-3.5 optional 80/75M coil • Features: • 6M/2M/ 70cm operation is constant. You CHOOSE the HF coils you want to add, up to four stock or optional. One vertical, the rest horizontal. • Easily mounts to standard trunk/door mount in minutes • Economical • Fold-over hinge built in• Select the duplexer or triplexer for your specific radio(s). CF-706A, CF-530, CFX-514N • Conn: PL-259

UHV-6 in fold-over position.
Fold-over hinge included for easy entry to garage, parking structure, drive-thru etc... SB-15 / UHV-4 / UHV-6 / HMC-6S fold-over hinge has a threaded collar to lock the hinge vertically in place. It can't fold-over by itself at highway speed!

Maldol HMC-6S *40/20/15/10/6/2/440MHZ MOBILE ANTENNA WITH FOLD-OVER Wavelength: HF 1/4 wave • 2M 1/2 wave • 70cm 5/8 wave x 2 • VSWR: HF-6M 1.6:1 orless 2M/70cm 1.5:1 or less • Length: 66" • Max Power: HF 120W SSB 6/2/70cm 150W FM*HMC-7C optional 40M coil • Conn: PL-259

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 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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Field Day Issue

This Month in QST

June 2011 ■ Volume 95 Number 6

Technical

News and Features

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Radiosport

Our Cover
The fourth full weekend in June is when hundreds of thousands of Amateur Radio operators head out to a field, a fire station or an EOC — or even their driveway! — to practice operating in less than optimal conditions. *Top photo:* Tom Dunbar, W6ESL, operates the VHF station of the West Valley Amateur Radio Association's Field Day site on Mora Hill, overlooking Silicon Valley. Photo by Bill Frantz, AE6JV. *Middle photo:* North American hams aren't the only ones who get on the air for Field Day. Kurt Kronqvist, SMØLQI, of Kramfors, Sweden, operates SSB during the IARU Region 1 HF Field Day in September. *Bottom photo:* Paul Chominski, WA6PY, looks in on John Musselman, N6EP, inside the Escondido (California) Amateur Radio Society's VHF tent. Both photos by Henryk Kotowski, SMØJHF.

Departments

June 2011 ■ Volume 95 Number 6

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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

"The Best of the Best Just Got Better"

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

COMPACT HF/50 MHz 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

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

FT-897D TCXO DSP 60 m Band

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

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

FT-857D DSP 60 m Band

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

Real Performance,
Really Portable

FT-817ND

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

60 m Band

Automatic Matching for FT-897/857 Series Transceivers

FC-40

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

WATERPROOF

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

ATAS MICRO

ATAS-25

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NEW COMPACT HF TRANSCEIVER WITH IF DSP

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

Compact size: 9" X 3.3" X 8.8" and Light weight: 7.9 lb

HF/50 MHz 100 W All Mode Transceiver

FT-450D

With Built-in Automatic Antenna Tuner

NEW **Illuminated Key buttons**

NEW **300 Hz/500 Hz/2.4 kHz CW IF Filters**

NEW **Foot stand**

NEW **Classically Designed Main Dial and Knobs**

NEW **Dynamic Microphone MH-31A8J Included**

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

■ **The IF DSP guarantees quiet and enjoyable high performance 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 - 300 Hz/500 Hz/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-450D 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

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 warm-up) stability ●CAT System (D-sub9 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 (from 400 to 800 Hz, in 100 Hz steps) ●CW Spotting (Zero-Beating) ●CW Training Feature ●CW Keying using the Up/Down keys on the microphone ●Two Voice Memories (SSB/AM/FM), store up to 10 seconds each ●20 second 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 ●Dynamic Microphone included ●IMPORTANT FEATURES FOR THE VISUALLY IMPAIRED OPERATOR – Digital Voice Announcement of the Frequency, Mode or S-meter reading

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http://www.vertexstandard.com

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GPS / APRS® / Bluetooth® Features
FTM-350AR

New Vacuum Cup-Mounting Bracket permits Angle Adjustment
New APRS® Operation Capability, and newly Expanded User Friendly Functions

144/(220)*/430 MHz 50 W FM Dual Band Transceiver

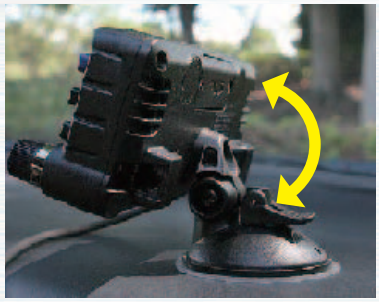
FTM-350AR NEW

220 MHz 1 W (USA version only)

New Features of The FTM-350AR

1. New Vacuum Cup-Mounting Bracket with Angle Adjustment

The new MMB-98 Mounting bracket allows easy installation of the radio control display to your Dashboard by placing the vacuum mount in the desired location and pressing a lever. You may then adjust the display to the optimum viewing angle.



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"It Seems to Us"

Putting Our Best Foot Forward

"The fourth weekend in June offers the best opportunity for radio amateurs to explain our passion to the general public, community leaders, and one another."

ARRL Field Day, held this year on June 25-26, is by far the most popular Amateur Radio operating event in the United States and Canada. For 27 hours the bands buzz with FD activity, mostly from multi-operator stations in temporary locations using "off the grid" electric power. For many participants, Field Day is the most intense dose of Amateur Radio that they get all year. Phone (SSB) and CW predominate, but digital modes are the fastest growing in terms of the number of contacts made.

For most participants, the goal of the weekend is to experience Field Day — not to win. The bonds that are forged in planning, assembling, and operating a Field Day station can last a lifetime. So can the lessons learned, whether it's how to solder a coax connector or how to coax information from weak signals on a crowded band. FD occupies a prominent position on most successful radio clubs' calendars because team-building is an essential component of any group activity. Nor is it all about radio; many FD regulars will tell you that the most valuable member of the team is not the best operator, but the cook.

FD has evolved from its roots as a test of portable equipment to an exposition of most aspects of our multi-faceted hobby. While it was not originally intended as such, years ago the ARRL realized that Field Day is a great public relations opportunity. It allows us to demonstrate the skills and capabilities that make our avocation a valuable resource for our communities and our nation. Hundreds of stories about Field Day appear in the media each year. Two from last year stood out as exemplary, and earned the ARRL Bill Leonard, W2SKE, Professional Media Awards in the categories of print and video. While the awards go to the media professionals, the subjects of their pieces are equally deserving of kudos.

The Loudon Amateur Radio Group, K4LRG, provided the material for *Washington Post* staff writer Phillip Lucas, who visited its FD site in Lovettsville, Virginia and conveyed how Amateur Radio blends traditional radio communications techniques with cutting-edge technology to readers as far away as India. You can learn all about this family oriented club and its record of success at its outstanding website, **www.k4lrg.org**.

The Contoocook Valley Radio Club, K1BKE, was the subject of a seven minute segment on WMUR-TV by Jennifer Crompton, producer for *New Hampshire Chronicle*, a weekday half hour news magazine. Ms. Crompton visited the club's FD site in Henniker, interviewed several of the operators, and captured their passion on video to be shared with her viewers. She also captured some humor. When asked the perennial question, "What's the farthest away you've talked to someone?" Dale, AF1T posed a clarifying question of his own: "On Earth?"

These two clubs and many others used Field Day to put their best foot forward to the media and ultimately to the general public. They helped dispel the myth that Amateur Radio is yesterday's news. One of the many striking images in the WMUR-TV program is of a waterfall display of a moonbounce signal recorded by Lee, AA1YN at his home station and played on a computer at the site.

Many clubs invite the public, not just the media, to observe their Field Day activity. It takes careful preparation to make this a success. Advance publicity and effective signage are essential. There are safety, security and liability issues to be considered. Club members must be assigned to welcome visitors, explain what's going on, and give them something to take away as a reminder to learn more by visiting websites or by attending a future club meeting or open house.

Field Day is not simply useful to explain Amateur Radio to our community neighbors. It is equally useful to share our personal passions with one another and to learn from each other. Amateur Radio today encompasses such a broad field and is developing simultaneously in so many different directions that it is impossible for one person to keep up with it all. Chances are that our explorations over the past year have taken us to different places than our friends'. What's more, we can show our new hardware or demonstrate that new software right at the FD site. This may not add to the score but it will enrich the experience.

Hundreds of FD groups take advantage of the "Get-On-The-Air" (GOTA) station to give both new and recently inactive licensees a special opportunity to participate. This year the rules also encourage groups in some categories to add a VHF station. In June six meters, and sometimes even two meters, can come alive with sporadic E propagation and deliver ear-splitting signals from 1,000 miles away. The more stations are active, the less likely it is that such an opening will escape unnoticed.

Finally, and above all else — whatever you do on Field Day, do it safely. Endangering yourself or those around you should not be a part of the FD experience. Temperatures can be brutal, especially for those who are not accustomed to strenuous activity. Storms can be dangerous. Portable generators and temporary electrical wiring must be treated with respect. Be sure every member of your team has reviewed the safety tips in the Field Day Information Packet that's available at **www.arrl.org/fieldday**.

Let's make this year's event the best ever.
CQ Field Day!

David Sumner, K1ZZ
ARRL Chief Executive Officer

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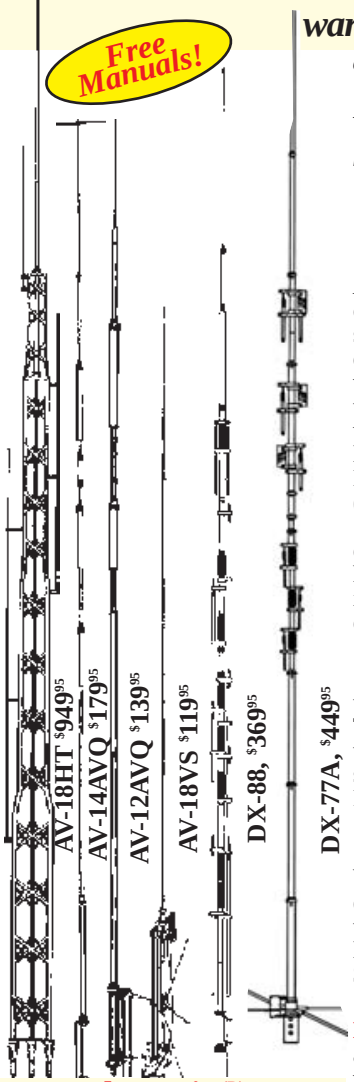

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AV-14AVQ, $179.95. (10,15,20,40 Meters). 18 ft., 9 lbs. **The** Hy-Gain AV-14AVQ uses the same trap design as the famous Hy-Gain Thunderbird beams. Three separate air dielectric Hy-Q traps with oversize coils give superb stability and 1/4 wave resonance on all bands. Roof mount with Hy-Gain AV-14RMQ kit, $89.95.

AV-12AVQ, $139.95. (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, $119.95 (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.

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AV-14AVQ	**$179.95**	**10,15,20,40**	**1500 W PEP**	**18 feet**	**9 pounds**	**80 MPH**	**1.5-1.625"**
AV-12AVQ	$139.95	10/15/20 M	1500 W PEP	13 feet	9 pounds	80 MPH	1.5-1.625"
AV-18VS	**$119.95**	**10 - 80 M**	**1500 W PEP**	**18 feet**	**4 pounds**	**80 MPH**	**1.5-1.625"**
DX-88	$369.95	10 - 80 M	1500 W PEP	25 feet	18 pounds	75 mph no guy	1.5-1.625"
DX-77A	**$449.95**	**10 - 40 M**	**1500 W PEP**	**29 feet**	**25 pounds**	**60 mph no guy**	**1.5-1.625"**

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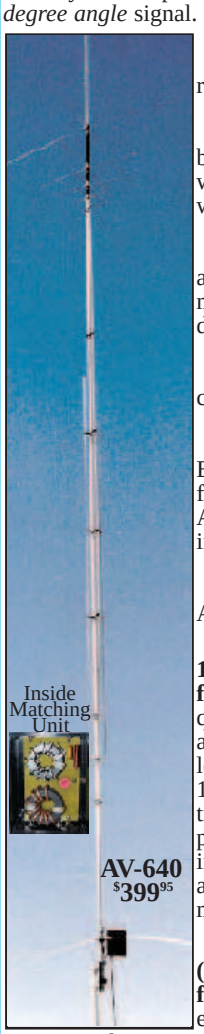

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This Just In

Joel P. Kleinman, N1BKE
jkleinman@arrl.org

In Brief

- The FCC has granted parts of an ARRL *Petition for Reconsideration* in the ARRL's ongoing dispute with ReconRobotics over a device that operates in the Amateur Radio 70 cm band. For details, see **www.arrl.org/news/arrl-scores-partial-victory-in-reconrobotics-proceeding**.
- Amateur Radio operators were involved in alerting the NWS about the wind-fanned Rock House fire near Marfa, Texas. In Westmoreland County, Pennsylvania, a public service VHF net activated before an F2 tornado touched down.
- The International Amateur Radio Union and its more than 160 Member-Societies celebrated World Amateur Radio Day on April 18.
- The March 2011 edition of the *Spectrum Defense Matters* newsletter has been posted to the ARRL website.
- In the wake of several severe aftershocks that rocked Japan, the ARRL asked that 7.030 MHz and other frequencies be kept clear for emergency use.
- The Federal Communications Commission has launched a complete overhaul of its website.
- The winners of the first ARRL Video Contest were announced.
- The ARRL filed a *Petition for Rulemaking* and a *Request for Temporary Waiver* with the FCC to authorize the use of single-time-slot Time Division Multiple Access (TDMA) emissions in the amateur bands at and above 50 MHz.
- The new Spread Spectrum rules went into effect April 29.
- Two more astronauts have received their Technician licenses. Chris Cassidy, KF5KDR, and Luca Parmitano, KF5KDP, will head to space in 2013.
- The *ARES® E-Letter* is now available in an audio version and on iTunes.
- Field Day merchandise is available on the ARRL website. This year's product line includes a polo-style shirt, a hat, a pin and a pack of posters.

Media Hits

Allen Pitts, W1AGP
Media & Public Relations Manager

- The problem with Section 207 of House Bill HR 607, the part that would take 420-440 MHz and sell it for commercial use at auction, made news this month as hams responded to the ARRL's call for action. The first article spotted was "Commissioners discuss taxes, legislation" in the *Alpine Avalanche* (TX) where David Cockrum, N5DO, of the Big Bend Amateur Radio Club discussed the bill and how it could impede the club's ability to provide emergency services in far West Texas. He even got a resolution passed against selling our frequencies. After that, more articles came in quickly. The story "Congressman should protect disaster radio system" in the News-Leader.com (Springfield, MO) reported, "Opposition has emerged to provisions of the bill calling for the sale to commercial interests of the frequency that is being used by amateur radio operators." Politicians took notice that something was not right as another News-Leader article pointed out, "Ham radio operators are upset over bill" and Representative Billy Long "says he was unaware of complaints by ham radio enthusiasts." KFBB-TV (MT) nailed the main issue, pointing out "...it's how the law would pay for setting it up that has amateur radio operators up in arms."
- Major media outlets soon joined in, such as the RadioResource Media Group's story **"**Industry Expresses Concerns with Parts of D Block Reallocation Bills," which found many more problem areas with the bill in addition to our concerns. *PC Magazine* published in **"**Government Wants to Control App Market" that "Now, another Legislator, Peter King wants to ban the ham radio folks — the only people who manage to communicate during real emergencies — from operating. Again there is a bogus rationale." Didi Tang and Malia Rulon wrote a major national article, "Ham radio operators concerned about losing band," in *USA Today* and NewsFactor Network. "Ham radio enthusiasts nationwide are concerned about a bill in Congress that they say would limit their ability to help in disasters and emergencies." Even the homeland security people were concerned as reported in *Homeland Security Today's* briefing "Bill Upsets Amateur Radio Operators": "It's a tiny clause deeper down in the legislation that has ham radio enthusiasts and emergency responders all worked up. Under the bill, in the next 10 years the government would sell the 420-440 MHz frequencies..."
- Meanwhile, young hams were also making news as Matt Stuart reported in "Students' space balloon produces breathtaking photos of the earth" appearing in the *Madison County Journal*. "Members of the Olde Towne Middle School Robotics, Radio & Technology Club were amazed as they gazed at the high-definition pictures that showed shots from inside a thunderstorm and eventually from the top of the world." Indeed, high altitude ballooning has become popular enough with hams that balloon maker Raven Industries did a special promotional press release via GlobeNews Wire which proudly stated, "The involved teams have designed and constructed the payload tracking systems and radio frequency data links using amateur radio systems."
- Emergency communications work also got media coverage. In "Ham radios find place in high-tech world" published in *Stars and Stripes*, Japan Amateur Radio League (JARL) International Section Manager Ken Yamamoto told how "In the fairly early stages after the earthquake, several radio amateurs were able to activate their stations with car batteries or small-engine generators."
- And then there was the story of the "Elderly Man and His Dog Rescued at Sea" that appeared on ABC News and in the *Los Angeles Times* and on NBC in San Diego. "Shortly after 1 PM, amateur HAM Radio operator Rex Weinheimer [KC5AGO] picked up a mayday call in Stonewall, Texas, near Austin."
- But for a feel-good piece, the best came from *PN Magazine's* large pictorial article about Bill Sturridge, KI4MMZ. *PN* specializes in veterans with disabilities. "[Bill] might be paralyzed, but he's rescued many sailors. He hears faint cries for help from the middle of the Atlantic..."

YACHT at Superfest

ARRL President Kay Craigie, N3KN, was the guest of honor at AES Superfest in Milwaukee in early April. During the event, she spent some time with a group of young people who belong to YACHT — Young Amateurs Contest Ham Team.

"We've set up a display at Superfest promoting youth and ham radio for the past three years, and this one was the best thus far," commented Ed Engleman, KG8CX, Assistant Section Manager for Youth, ARRL Wisconsin Section. "The boys appreciated the complimentary ARRL materials, and that has motivated one to start serious work on upgrading to Extra and another to work toward his Technician."

COURTESY ED ENGLEMAN, KG8CX

ARRL President Kay Craigie, N3KN, and YACHT coordinator Ed Engleman, KG8CX, with several members of the group at AES Superfest.

First Guam 160 Meter WAS

If you think it's a challenge to dig out Rhode Island or North Dakota while you're looking for your last couple of states for the ARRL Worked All States Award, try hunting for them from Guam on 160 meters. David Mueller, N2NL, did and wound up with the first WAS award earned by a resident of Guam. He tells us he's also submitted cards for WAS on 9 bands (no 6 meters yet).

CWO3 WILLIAM EPPERSON

BOSN4 Troy Riedel, the assistant school chief for the US Coast Guard Chief Warrant Officer Professional Development course (right) awards the WAS certificate to ENG2 David Mueller, N2NL. The ceremony took place at the Coast Guard Academy in New London, Connecticut, but David is stationed on Guam until 2013.

Leonard Award Presented to TV News Producer

In March, ARRL New England Division Vice Director Mike Raisbeck, K1TWF, presented the ARRL Leonard Video Award to Jennifer Crompton, producer for *New Hampshire Chronicle* on WMUR-TV, Manchester, New Hampshire. Her news magazine piece showed a New Hampshire club's 2010 Field Day effort.

COURTESY PETE STOHRER, K1PJS

From the left: Chris Shepherd, videographer; Jennifer Crompton; K1TWF, and Peter Stohrer, K1PJS, ARRL New Hampshire Public Information Coordinator.

Inside HQ

Field Day

On June 10-11, 1933, the ARRL held its first "International Field Day." About 50 station participation reports were received. 1933 technology was technically challenging and F. E. Handy reported in *QST* that the first Field Day was a "real trial for portables (and) too many stations are often designed piecemeal, without coordinating the receiver, transmitter and power supply….often parts are weak and unwieldy in operation." But, some things haven't changed. Even in 1933, "participants reported insect and weather hazards" and the article noted that on-air operations should be "combined with a good time for all."

Field Day participation has increased during the last 78 years. In 2010, an estimated 35,000 radio amateurs and 1300 ARRL Affiliated Clubs participated in Field Day. 2400 logs were submitted. [Don't forget to submit your electronic summary to **www.b4h.net/cabforms/**.]

While the essence of Field Day remains the same, the rules have changed to accommodate new technology, FCC regulations, and operating modes. For example, in 1933 there were no SSB transmitters, satellites or PSK31. How are the rules changed? The ARRL Board's Programs and Services Committee, working with ARRL Field Day Manager Dan Henderson, N1ND, review Field Day rules, as needed, each year. This year a new rule was added permitting an additional VHF station for all Class A and Class F stations. This rule was added to expand VHF participation particularly on the 6 meter band since 6 meter capability is included in most modern HF transceivers.

Here inside HQ, we endeavor to make Field Day an enjoyable and worthwhile event for our members. Each year, our graphics staff, led by Sue Fagan, KB1OKW, and David Pingree, N1NAS, creates a unique logo and product line for Field Day. They design good-looking Field Day pins, shirts, hats and customizable posters for FD announcements. These items make us look more professional and promote Amateur Radio overall.

During the last few years, one of our most popular Field Day services has been the Field Day Station Locator at **www.arrl.org/field-day-locator**. This interactive web application lets you enter the location of your public Field Day operation so that visitors can find your Field Day site. Over 1600 Field Day station locations were entered in 2010.

W1AW Station Manager Joe Carcia, NJ1Q, and crew will be on the bands during Field Day making QSOs and transmitting the customary W1AW Field Day bulletins. K6KPH will rebroadcast the bulletins on the West Coast. W1AW will be testing our own emergency communications capabilities including our back-up power.

In this issue, we have published several articles relevant to Field Day, including an article on a single element vertical beam; a safe, a portable and easily erected antenna mast, and a look at the fun that GOTA stations provide to newcomers. Check our website at **www.arrl.org/field-day** for the latest FD information.

Whatever your Field Day plans, in the spirit of the first Field Day, I hope that a good time is had by all.

73,

Harold Kramer, WJ1B
ARRL COO/Publisher *QST*
wj1b@arrl.org

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Eight conservatively rated MRF-150 FETs mounted on two *huge* heat sinks spreads heat evenly. *Four* whisper quiet temperature controlled fans keep the FETs at a safe temperature. You get *unparalleled* Ameritron reliability and trouble-free service. Competing amplifiers using a single expensive device concentrate heat at a single hotspot that greatly reduces reliability.

50-Volt operation gives you highly linear operation with a superbly clean signal.

Put out-of-the-way and Remote Control

The ALS-1300 amplifier and its matching power supply can be placed out-of-the-way and controlled remotely. *Remote Control Head*, **ALS-500RC, $49.95**, lets you monitor data and manually switch bands. *Radio Interface*, **ARI-500, $119.95**, reads band data from your transceiver and automatically bandswitches the ALS-1300 as you change bands on your transceiver.

Features Galore!

An Operate/Standby switch lets you run "barefoot" and *instantly* switch to full power when you need it.

Fast 5 millisecond T/R relays (10 million operation lifetime specs) give you full QSK operation. The T/R relay sub-board is easily replaced if the relays ever fail.

Ameritron's *exclusive* front-panel ALC control prevents overdriving your transceiver.

The ALS-1300 can be keyed by any transceiver that can sink 15 mA at 12 VDC without requiring a special interface.

Super-clean modular construction makes service quick and easy.

Fully Protected!

The ALS-1300 is fully protected to prevent amplifier damage if you: switch to a band different from your transceiver, use the wrong antenna or have overly high SWR, if the heat sink temperature exceeds a safe level, if the dual 600 Watt modules are significantly RF unbalanced. Whenever the amplifier faults, it is automatically bypassed.

If output forward or reflected power exceeds a safe level, output power is automatically reduced to prevent amplifier damage by controlling ALC to the transmitter.

Fully Metered!

Two accurate Cross-Needle meters use *LEDs* with adjustable brightness for backlighting -- no more burned-out meter lamps.

The left meter continuously monitors DC current of both 600 watt amplifier modules.

The right meter is a multi-meter. Read antenna SWR, forward, reflected output power simultaneously (has adjustable PEP meter hold time) . . . amplifier balance . . . ALC between amplifier and transceiver . . . DC drain voltage of each power amplifier.

LEDs show which band is selected (manually bandswitched or automatically with optional ARI-500 Radio Interface) . . . ALC activity . . . when the amplifier is keyed . . . high SWR . . . power amplifier fault.

The desktop size amplifier is a compact 10½Wx6¾Hx19D in. Weighs just 23 lbs.

Hash-Free Switching Power Supply!

The *hash-free* fully regulated 50 VDC, 50 Amp switching power supply is wired for 220 VAC but can be rewired for 110 VAC. Includes six foot cable to ALS-1300. Draws 12 Amps at 220 VAC, 25 Amps at 110 VAC. Has inrush current protection, current-limited outputs, exceptional filtering and RFI suppression. Works on 50-400 Hz, 200-260/ 100-135 VAC making it ideal for remote DX-peditions. 10Wx6½Hx9½D inches. 12 pounds.

Options

MOD-10MK $39.95, low-pass filter assembly gives you 12 and 10 Meter operation. Requires FCC ham license.

QSK-5, $359.95, pin-diode T/R switch gives lightning fast silent QSK operation.

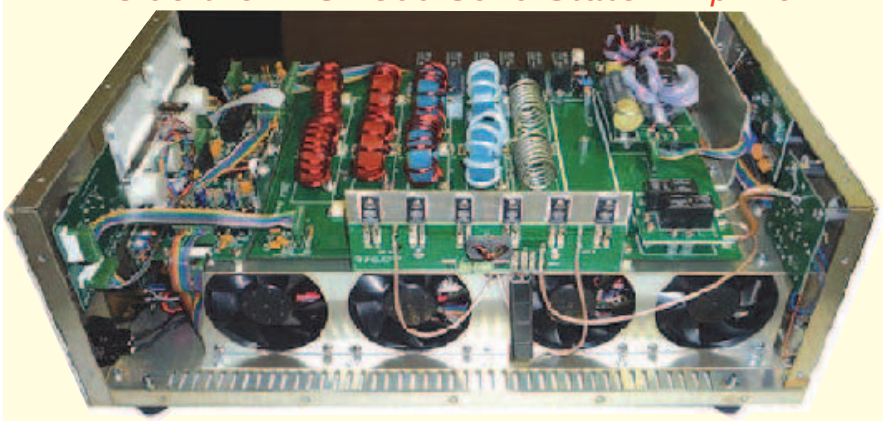
Here's what they say . . .

I have had my amp now for a few days and WOW! I picked the amp up at the factory and Mike was very helpful in showing me the ins & outs of the amp. Mine is S/N 8 and these amps are in high demand. It will truly talk 1200 watts all night long and never get warm. Thanks to Ameritron for the way they treat their customers and taking time that I was satisfied. N5SBZ

I've been using SN3 for about six weeks now. No processors or digital read-outs, but very easy to use and it puts out 1200 watts on most bands with no problem. I have been operating QSK as the internal relays are plenty fast enough. AD5X

I have had this fine amp now for a week and have made a number of QSO's (20). It can make the difference, and has in a number of occasions, getting thru the QRN and making a contact. Some of my QSO's have lasted up to 1 hour and there has not been a single problem...runs cool and gives me excellent results. KB4KKX

Inside the ALS-1300 Solid State Amplifier



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Two Continents, Two Field Days

Henryk Kotowski, SMØJHF

Like many of us, until I attended a Field Day for the first time, I did not realize how much fun it is. It is Amateur Radio at its best. If I wanted to explain the benefits of our hobby to someone who knows nothing about Amateur Radio, I would take them to a Field Day site.

My first encounter with live Field Day activity took place in Southern California. I was impressed by the number of sites and the amount of hardware. The California climate makes Field Day a true summer event. The participants must protect themselves from the scorching sun and avoid dehydration. In Sweden, the month of June is unpredictable — it can even snow. The participants must bring warm clothing and actually provide some heating during the night.

The Stockholm Field Day I witnessed took place during the IARU Region 1 Field Day in 2009 using the call sign 8SØDAY. It was a joint effort of a few local clubs and the National Voluntary Radio Organization (FRO). Usually the clubs arrange their individual events in their own areas, but in 2009 they shared a location on the commons in the heart of Stockholm to attract visitors — both hams and nonhams — to the site. Each participating club had a tent and provided members who demonstrated Amateur Radio in action to the visitors.

The emphasis was on low power, advanced modes, microwaves and computer applications. In order to attract young people to Amateur Radio we have to be modern and technologically progressive. I noticed that many participants were quite young.

In California I visited the sites of Escondido Amateur Radio Society near Dixon Lake and the Palomar ARC in San Marcos. Both were loaded with equipment and vehicles. Traditional HF bands and modes prevailed with many vintage rigs in use.

The Swedish Field Day is a social event. The emergency aspect is not emphasized since Amateur Radio plays only a small role in most European countries in emergencies. Its main purpose is to expose the public to the hobby.

Although the details may vary from continent to continent, the general idea is the same — get together and practice Amateur Radio in the open air and in public.

Photos by Henryk Kotowski, SMØJHF

The CW tent of Escondido Amateur Radio Society was a real sauna bath. Inside the VHF tent is John, N6EP. Peeking into the tent is a visitor, Paul, WA6PY.

There is space for several rigs and operators inside the largest tent at the large HF station. At left is Peter, SAØAWS, with Lars, SMØYYM.

Hiro Nagasawa, 7K1PYG, from Japan attempts to raise a contact on 20 meter CW using his very low-power setup. The batteries are visible on the right foreground and his keyer is the black box on the left with a red button. He signed SMØ/7K1PYG while in Stockholm.

This is the 8SØDAY site sponsored by the National Voluntary Radio Organization. FD was held on the common in Sweden's capital city — the perfect spot to bring Amateur Radio to the public.

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CORRESPONDENCE

SAFTY FIRST — AND ALWAYS

♦ Yesterday, while working at our Field Day site, I watched a friend who was trying to put up an antenna using the sinker/slingshot method. When I saw how the sinker came flying back when he freed it from a tree branch, I told him to stop immediately, went to my car and came back with my hardhat and safety glasses.

I am a project engineer for a major company and we have to wear personal protective equipment (PPE) on all jobsites. I wear my PPE whenever I am doing a potentially hazardous home or ham project because there isn't much difference between what I do for a living and what I do for myself, as far as safety is concerned.

Every ham should own, and use when appropriate, a hard hat, safety glasses, safety shoes — preferably electrically rated safety shoes — and work gloves. The total cost for all of these items is less than a decent, new handheld transceiver.

JOSEPH J. BIRSA PE, N3TTE
Pittsburgh, Pennsylvania

HUZZAH FOR HANDS-ON RADIO!

♦ As H. Ward Silver, NØAX, crosses the century mark, penning his 101st edition of "Hands-On Radio" [see page 60], I just want to say thanks for this great resource of information that is capsulated into bite-sized tasty nuggets in *QST* each month.

First licensed in 1971, I hold an Advanced class license, along with the FCC GROL/PG commercial license. I spend my work days as a Senior Communications Technician for a major metropolitan police agency, so radio is a big part of my life — both from a professional and hobby standpoint. The big difference between the two is while one is mostly spent working at a computer these days, the other still has that sense of adventure and "hands-on" fun working with circuits, antennas and a hot soldering iron close at hand. I recently have been reviewing some of the basics just to ensure I stay well grounded in theory and practical electronics and Silver's "Hands-On Radio" has been the perfect prescription.

No matter if you are a career communications professional or just stepped out of your VE exam with that Technician certificate in your hand, "Hands-On Radio" is the place where you can always learn a new twist on technology — and have fun along the way. Here's to another 100!

RON PARKS, WB5DYG
Gilbert, Arizona

CHECKING OUT

♦ Just recently, I was monitoring one of the nets on 14.300. The net control was doing a fine job from his location in Mexico City. A QRP station in the US decided to check in, but the net control station was having some trouble hearing him.

Much to my dismay, the net control decided to chastise the QRP operator for checking in with low power. He informed this operator that he should be operating a high power station. He stated that while QRP operators seemed to think that they were doing a good thing by operating low power, the fact was a ham should be running high power or not bother to check into a net.

I have to disagree with this self-appointed keeper of good operating practices. We are required to use the minimum power necessary to maintain communications. Maybe the NCS had trouble hearing this QRP station, but the pertinent information was passed on. One could be running a full kW and still not be heard by any specific control op. It could have been propagation, and not power, that was the issue.

In any case, would this guy not take a check-in from a QRP station in an emergency? The attitude of the NCS was not only uncalled for, but wrong; it is totally out of bounds to chastise a fellow ham for not running high power.

JOHN VEACH, KE4D
Brackettville, Texas

CHANGING TO THE DELTA

♦ The article by Don McMinds, K7DM ["Nested Full Wave Delta Loops for 20 and 10 Meters," Apr 2011, pages 30-32], was particularly interesting to me. I have tried many types of wire antennas over the years, but until about three years ago, I had never tried a loop antenna.

I felt I needed a 20 meter antenna that was better oriented toward Europe, and I decided to try a loop. I used the formula in the *ARRL Antenna Book* that gave a length of 72 feet, 8 inches for the loop. I chose an equilateral triangle hanging vertically with the apex down as the feedpoint. Using my bow and arrow, I got the ropes into two treetops. This antenna is practically invisible, especially when the trees are in leaf.

I used a quarter wavelength (11 feet, 5 inches) of RG6 coax connected to the feedpoint, and RG8X coax to the shack. The SWR measured with my analyzer is less than 1.2:1 across the entire 20 meter band and no tuner is required. Boy, does this antenna perform! I work Europe with ease and usually get a 59 report. I recommend this antenna to everyone, as it's simple to make and easy to put up. If I can do it, anyone can — I was 79 when I put it up!

COLIN PAVEY, VA3FP
Lyndhurst, Ontario, Canada

IN THE BEGINNING...

♦ Alan Crosswell, N2YGK ["Correspondence," Apr 2011, page 24], presents research showing that a predecessor of Columbia University's Amateur Radio club — now W2AEE — was founded in November 1908, thus possibly making it the oldest college radio club in existence.

Be that as it may, it would not be the oldest radio club. As far as is known, that distinction still belongs to the Radio Club of America, whose earliest predecessor was formed in 1907 by five young boys, also in New York City. It was incorporated in 1909 and adopted its present name in 1911. Interestingly, a number of Columbia University people, including Professor Michael Pupin of whom Alan writes, were active in both clubs. Further information can be found at **www.radioclubofamerica.org**.

RAY SOIFER, W2RS
Fellow, Radio Club of America
Green Valley, Arizona

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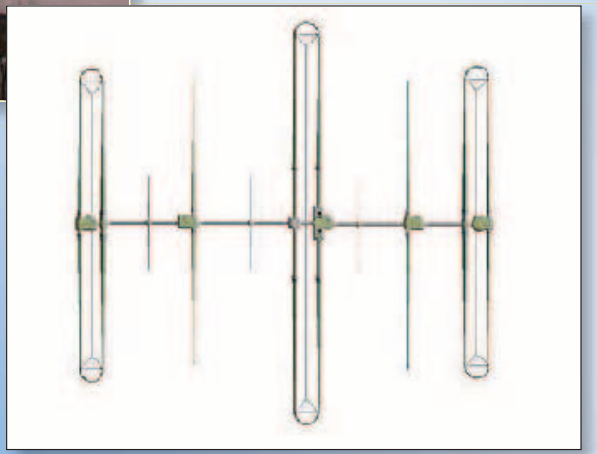

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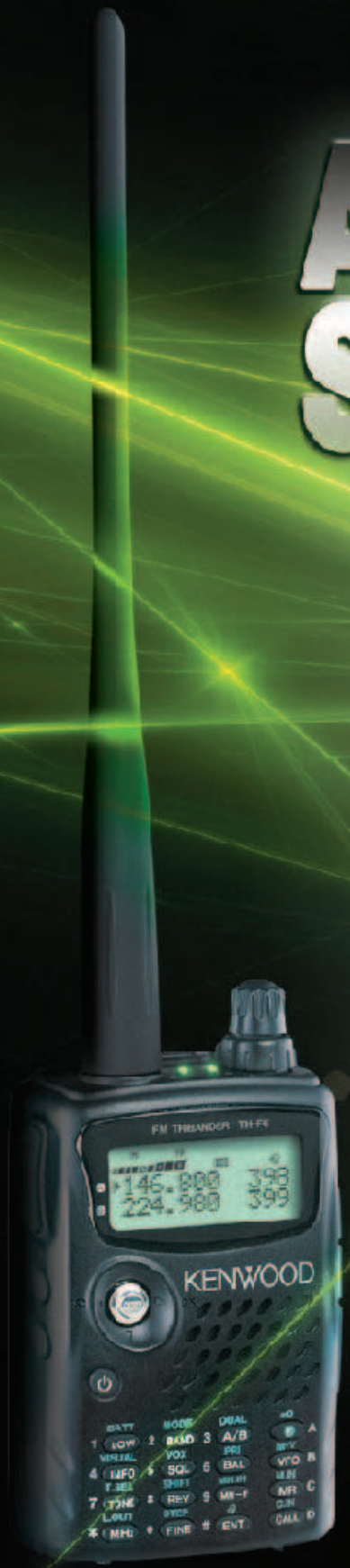
[1]Note that certain frequencies are unavailable. [2]5W output



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A One Person, Safe, Portable and Easy to Erect Antenna Mast

Consider this approach to Field Day antenna installation — especially if you're short of trees!

Bob Dixon, W8ERD

Widely available military surplus mast sections can be used in a variety of ways to make excellent amateur antenna masts. The key to making them work well, in my experience, is the mast tripod available from Barans (**stores.shop.ebay.com/barans-military-surplus-and-radio**). The tripod consists of three downward angled sockets that the mast sections plug into, and a vertical central shaft that the mast sections can slide through. This makes four contact points on the ground, providing a stable base. Note that this is different from the military GRA-4 tripod, which does not work for this purpose. Figure 1 illustrates the tripod and masts, and shows the general idea of how they all fit together.

Many of us have had bad experiences with push-up type masts that are difficult to erect, even with a crew of several people, regardless of whether you stand on a ladder and push each section up, or use the tilting up technique. Attempting to raise these masts by tilting often breaks them off in the middle. Either approach can be dangerous for the erectors. The mast erection system described here eliminates all those problems.

The military surplus mast sections are often available at hamfests and on the Internet (see Table 1). Their original purpose was to hold up camouflage netting. Each section is about 4 feet long, and the aluminum ones are about 1¾ inch outside diameter and 1½ inch inside. I don't recommend any other size. They are also available in fiberglass, but be careful if you buy those. Many of them are defective rejects and break easily at the joints. They must have the reinforcing ring at the ends. For this mast project, fiberglass sections can be used for the tripod lower legs if you wish, but they are not suitable for the vertical portion because they will not fit thru the tripod.

Assembling and Erecting the Mast

One example of a 40 foot mast that can be constructed with these materials is explained here in detail, although many other combinations are possible, and are limited only by your imagination. See Figure 2 for the general concept. You need six mast sections for the legs. The vertical part is 10 sections high, and must be aluminum. You will need a total of 16 mast sections.

You will also need guy ropes, a guy ring (see Figure 3) and a mast clamp (see Figure 4) to fasten the ropes to the masts. If you plan to use the mast to hold up a wire antenna, mount a pulley and pull rope (halyard) at the top, so you can pull up the antenna after the mast is erected. Snap rings are also available to make it easier to attach the guy ropes to the guy rings, mast clamp, guy ring and ground stakes.

The erection process is what makes this design so nice. Make sure you have a level surface to start with. Start with one mast section and plug it into a tripod angled socket. Continue around the tripod with two more mast sections and set the initial tripod structure upright. Then start with one leg, tilt the structure backwards, and add another mast section. Again continue this around the base until you have two mast sections in each leg. Now put two mast sections up the middle. This puts the initial top of the structure at a height that is easy to work with, while adding things to the mast. Add the top guy ring (with loose guy ropes attached) and the pulley (with a loose loop of rope equal to at least the height of the mast, threaded through the pulley) to the top. Or attach a small antenna and coax to the top if desired. Then grasp the center mast below the tripod, lift it up about 4 feet and insert another mast section. Slide more sections up from the bottom, one at a time. One person can do this, and it will easily support itself to 40 feet, as long as it is level and there is little wind.

When you reach the halfway point, install the mast clamp, along with its loose guy ropes. Note that a normal guy ring will not work there, because you can't get it

Figure 1 — Lower portion of the mast, with my wife Judy and dog Olivia for scale.

Table 1

Some Suppliers of Masts and Accessories

Barans Surplus, **baranoskybunch@aol.com**

Bayway Deals, **stores.shop.ebay.com/bayway-deals**

TeeVee Supply, **www.teeveesupply.com/product_pages/antennas/antenna_mounting_hardware.htm**

The Mast Company, **www.tmastco.com**

Note that the dealers do not always list all their materials on their web pages. If necessary, send them e-mail and inquire.

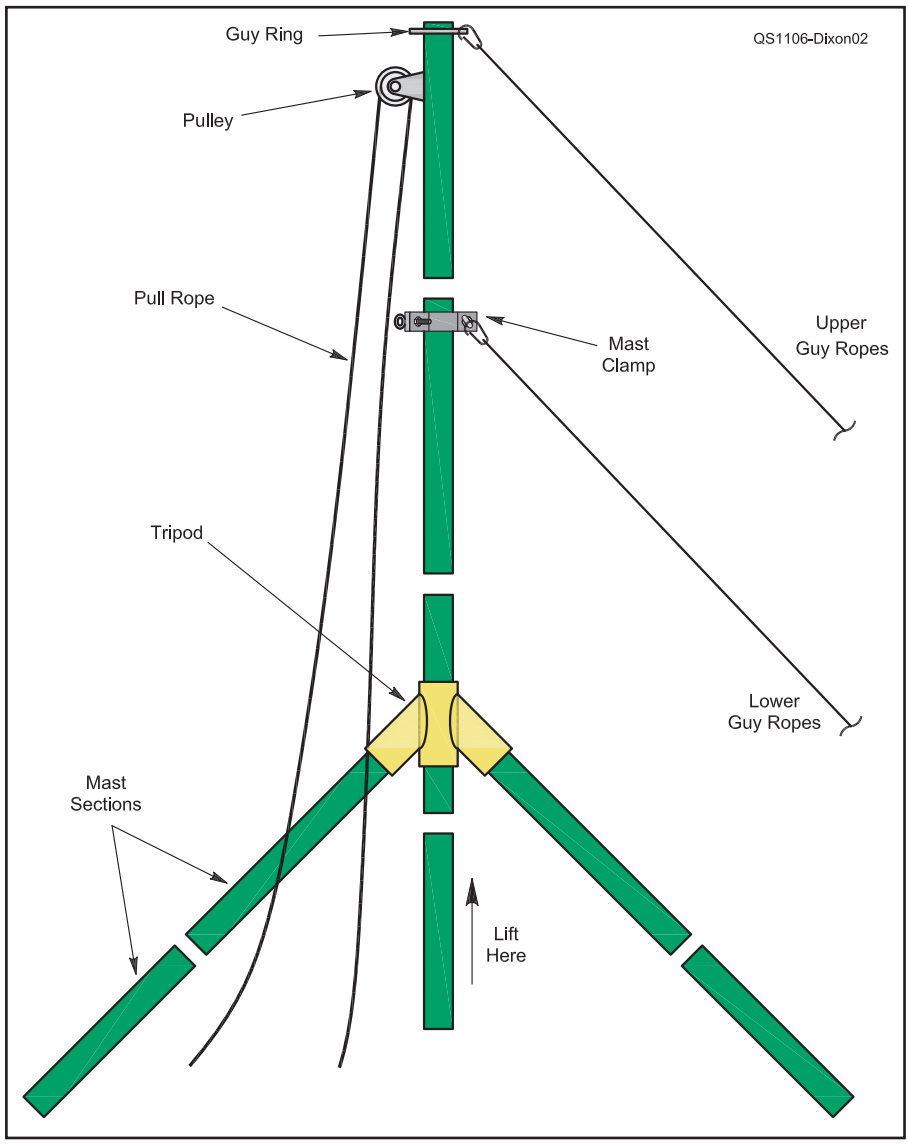


Figure 2 — Portable mast functional diagram — not to scale.

Figure 3 — Guy ring used to fasten guy ropes to the top section of the mast.

Figure 4 — Mast clamp used to fasten guy ropes at intermediate heights.

onto the mast once you start the erection process.

When the mast is fully up, pound in the guy rope stakes at suitable locations, and tighten all the guy ropes evenly so the mast stands straight. Attach a wire antenna to the pulley rope and pull it up. A video of the installation process is available on the QST-in-Depth website.[1]

Disassembly and Storage of the Mast

To take it down, just reverse the above process. It slides down very easily. Start by detaching all the guy ropes from the guy stakes. Leave the other ends of the ropes attached to the guy ring and mast clamp permanently.

After the mast is completely down and disassembled, wind each rope up separately starting from the inner end, and tape each in two places. Then tape all the rope loops together at each level. Next, tape both levels of rope together to leave you with a single coil of tangle free guy ropes for the next time. Also wind up and tape the pulley rope and leave it on the pulley.

The mast sections usually come with canvas storage bags. I have found that home supply stores offer a medium size latching

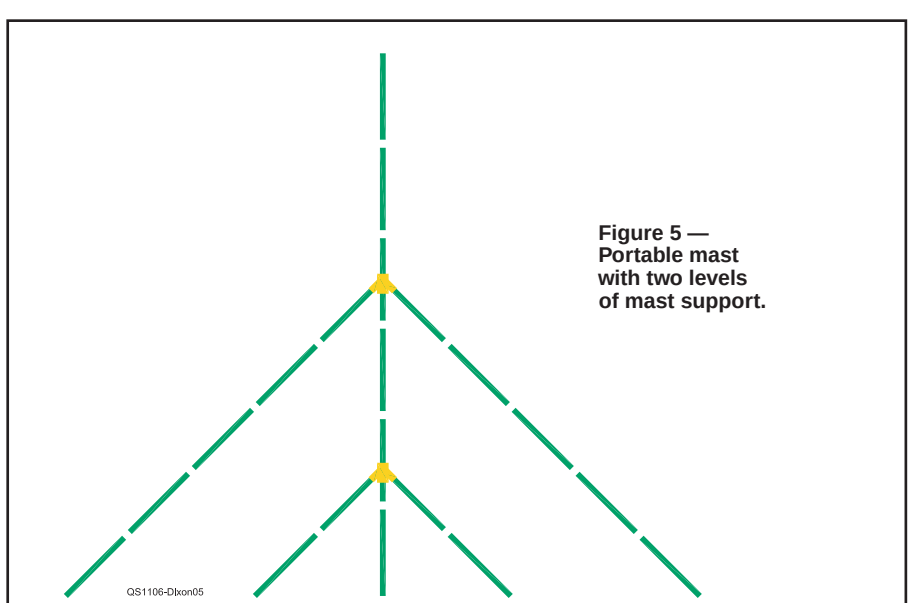


Figure 5 — Portable mast with two levels of mast support.

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

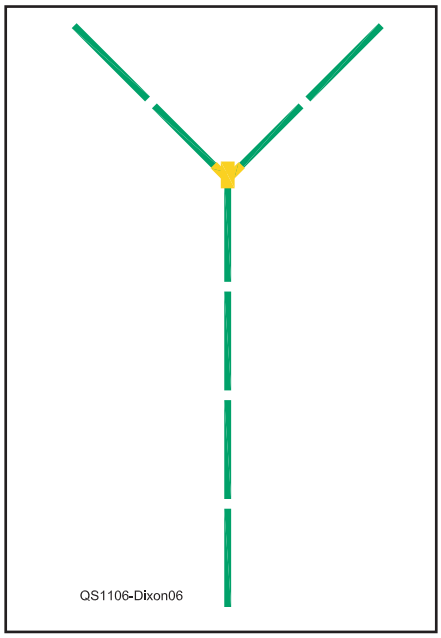


Figure 6 — Mast with inverted tripod and top loading for a vertical antenna.

plastic storage bin that perfectly holds all the other parts. The Home Depot store calls theirs Sterilite.

Keep in mind that gravity and the guy ropes are what holds all the mast sections and the tripod together, so if there is a strong upward wind or the guy ropes come off, the sections could separate. These masts can also be used nicely for fixed antennas, and in that case you should drill holes and insert bolts at each joint.

The Delaware Amateur Radio Association (Delaware County, Ohio) used two of these masts with great success at the last ARRL Field Day.

Other Possibilities

Other mast configurations are possible, and some are illustrated in Figures 5 and 6. You could have more than one level of "guy masts," for a strong higher mast. Or you could invert a tripod and put it at the top and make a top-loaded vertical antenna. In that case, drill small holes in each top mast section and use tap screws and wire to be sure there is good contact between the masts and the tripod. The masts themselves make good electrical contact with one another, but the tripod may not make contact through the paint on the mast sections.

This mast is also very useful as a temporary mounting for an antenna, such as a VHF or small HF Yagi that is being assembled, tested and tuned. It will easily support such antennas at a low working height for assembly and initial testing, and can then be temporarily extended to 16 or 20 feet to determine the effect of height on tuning.

Photos by the author.

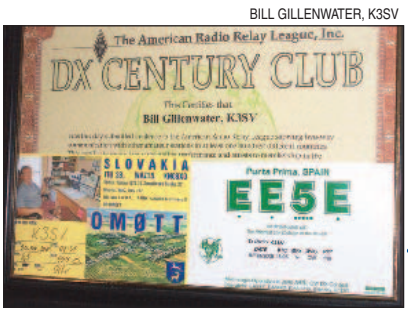
ARRL Life Member and Amateur Extra class operator Bob Dixon, W8ERD, was first licensed in 1955 as WN9OKN, and then progressed to W9OKN before receiving his current call. He prefers operating CW on the HF bands and 6 meters, and is active with the Delaware County (Ohio) Amateur Radio Association and ARES®. He has confirmed every DXCC entity except North Korea. He is partially retired, but continues to work in the field of computers for the Ohio Academic Resources Network, where he has worked with video conferencing, satellite Internet and providing Internet services to tiny Appalachian towns. He received BS and MS degrees in Electrical Engineering from the University of Wisconsin, and a PhD from Ohio State University, working with John Kraus, W8JK. He is a Senior Life member of IEEE, and a licensed Professional Engineer. He has worked in the field of SETI for many years at Ohio State, and now with the North American Astrophysical Observatory, developing a new omnidirectional radio telescope concept called Argus (**www.naapo.org**). *You can reach Bob at 2131 Klondike Rd, Delaware, OH 43015 or at* **w8erd@hughes.net**.

Strays

ARRL FOUNDATION AWARDS 2011 GOLDFARB SCHOLARSHIP TO PETER YAO, AC8EF

♢The Board of Directors of the ARRL Foundation has unanimously awarded the prestigious four year William R. Goldfarb Memorial Scholarship to Peter Yao, AC8EF, of Hudson, Ohio. Peter will graduate from Hudson High School this year with a 4.0 grade point average and a rank of second in his class of 422 students. Peter holds an Amateur Extra class Amateur Radio license. He has been accepted into the prestigious Whiting School of Engineering at Johns Hopkins University to pursue a degree in biomedical engineering. Peter credits his Amateur Radio experience as the catalyst for his interest in science. He has already experienced research and clinical study as an intern at the Akron City Hospital and volunteered at the Rainbow Babies & Children's Hospital.

BILL GILLENWATER, K3SV



Dahs meet dits: **Bill Gillenwater, K3SV, of Carlyle, Pennsylvania, is the proud owner of a QSL card from an all-dit station as well as one from an all-dah station.**

HAROLD KRAMER, WJ1B

Ham volunteers support Boston Marathon: **The busy group of hams at Course Net Control for the Boston Marathon held April 18. Net control was located at the Clay Center for Science and Technology in Brookline, Massachusetts. More than 250 hams provided communications assistance for this year's Marathon.**

Is There an Optimum Height for an HF Antenna?"

Higher isn't always the best answer for an HF antenna — here's why.

Kazimierz "Kai" Siwiak, KE4PT

An *aluminum cloud* of antennas placed on a high tower has been my ever present DXing dream. So questions arise. How high is high enough? Is there an optimum height? Much has been written about antenna designs that have a low *take-off* angle. But what exactly is the take-off angle in transmitting antennas, and how does it relate to a good DX antenna system design? How does antenna height tie in to all of this?

The answers can be found, and a lot of insight gained, by turning the problem around from transmit mode to receive mode, and to look at the *arrival angle*, the receiving analog to transmit take-off angle as a DX parameter rather than an antenna characteristic. We are justified in looking at the receive mode performance because the *Theorem of Reciprocity* states that the antenna system performance is identical in transmit or receive. If we do that, we see that before even considering anything about an antenna, the field strength from a DX station at our receiving location varies with height. There are peaks and nulls versus height, so the proper height for placing an antenna must be one at which the field strength is at a maximum, or at the very least, is not in a field strength null.

We begin with a picture of how waves propagate to our station, and how the earth-reflected wave combines in constructive and destructive interference with the direct wave at the tower location of our antenna, just as with waves in the sea. Next we find optimum heights in different HF bands and combinations of bands for the range of arrival angles needed to accommodate DX signals. We will also see that for optimum performance, antenna systems must accommodate a range of arrival angles (which correspond to take-off angles in transmit mode). By looking at the problem in receive mode we'll clearly see how the optimum antenna height depends on frequency, on polarization, on the properties of the earth at the wave reflection point and on the arrival angle from the ionosphere.

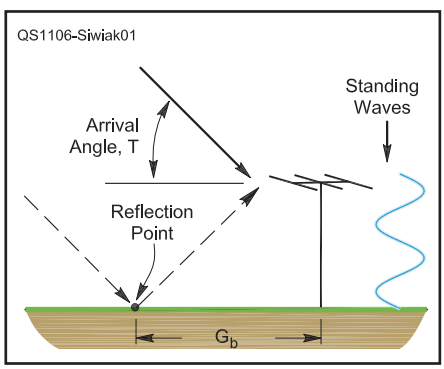


Figure 1 — Waves arrive directly and via an earth reflection forming a local vertical standing wave pattern.

Waves from the Ionosphere Take at Least Two Paths

DX signals from the distant ionosphere reach our station by at least two paths. One is the direct path and a second path reflects from the earth at the distance G_B before reaching our station location, as shown in Figure 1. The solution for distance G_B involves a very messy cubic equation, with the details in the *QEX* version of this article and in the *DUBUS* article.[1,2] The angle T is also called the take-off angle and the local elevation angle.

Expected Angles of Arrival from DX Stations

The arrival angle is not an antenna characteristic, but a result of the geometry between

[1]Notes appear on page 35.

Figure 2 — Transmit mode take-off angles for a dipole 15 meters above earth ground with 3 meters of surface roughness.

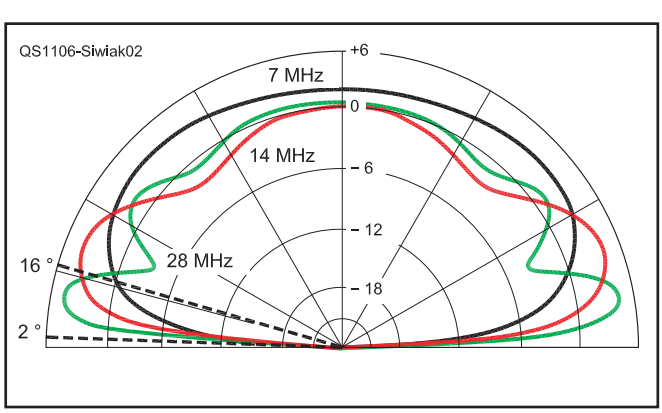
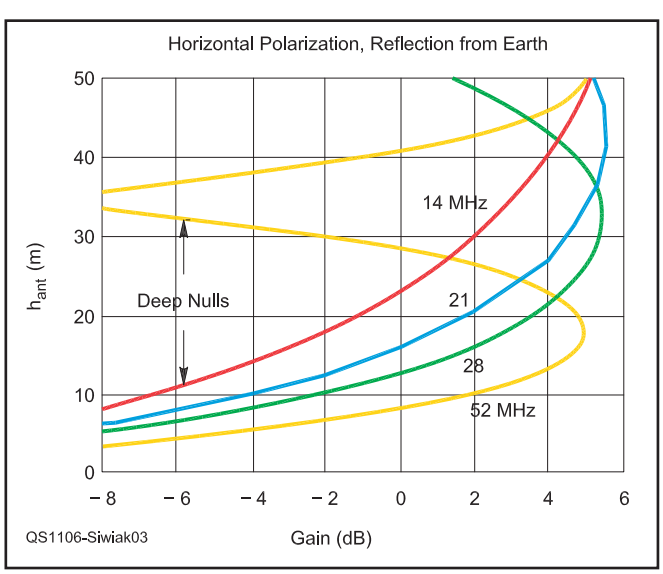


Figure 3 — Receive mode view for horizontal polarization, earth ground, T = 5°, surface roughness of 3 meters.



the ionospheric height and the distance between the DX station and our location. Since we will want to find the best height solution over a range of arrival angles, it would help to estimate that range. Data files in *The ARRL Antenna Book* help in this regard.[3] For example, using the combined arrival angle statistics between several regions of the USA and all other regions of the world, we can show that 90% of the arrival angles are smaller than 16°. So we will confine our interest to arrival angles between 2 and 16°. Viewed in transmit mode, this is the range of take-off angles that must be accommodated. A similar range of arrival angles also exists for 6 meter band sporadic-E operations.[2] As seen in *The ARRL Antenna Book*'s take-off angle files, the lower arrival angles become more important as frequency is increased.

Height Gain

Next we need to know the reflection coefficients, or reflection loss, for the wave component that is reflected from the earth ground or sea. The formulas, which include surface roughness and spherical earth effects, are in the companion *QEX* article. Reflections from either the sea or the ground will add a phase and amplitude change to the reflected wave. The result depends on frequency as well as the on the wave's polarization. As the direct wave and the earth-reflected wave meet at our tower location, their constructive and destructive interference will form a vertical standing wave with peaks and nulls. This suggests placing the antenna at the signal peak, which is one definition of the optimum antenna height. Note that we are not taking into account terrain variations here. Details of the terrain are handled by Dean Straw's terrain analysis program *HFTA*, supplied with *The ARRL Antenna Book*.

Figure 1 additionally shows the vertical standing wave pattern depicted against local tower height. Figure 2 shows the traditional transmitter point of view for take-off angle patterns of a dipole 15 meters above earth ground at 7, 14 and 28 MHz. Terrain effects are rarely, if ever, taken into account in transmit mode take-off angle patterns such as in Figure 2. The reflection distance G_B is typically between 100s and 1000s of meters distant from the tower. In contrast, Figure 3 shows the receiver mode view of signal strength standing wave patterns versus height, revealing detail useful for antenna placement. Those standing waves depend on frequency, as seen in Figure 3, and also on the value of the arrival angle. Vertically polarized results differ markedly from horizontal polarization results as shown in Figure 4. The results for horizontally polarized waves reflected from the sea differ primarily in the depth of nulls compared with earth ground reflected results of Figure 3.

The sea reflected vertically polarized wave has an optimum at sea level that adds as much as 5 dB *height gain* to the actual antenna gain. This is why vertically polarized antennas on the beach are so effective on some DXpeditions. such as during the VP6DX operation. Note that the optimum heights for vertically polarized height gains with the reflection from earth ground are not the same as for horizontal polarization. Ground mounted vertical antennas with reflection from earth ground will have negative height gains of –1 to –5 dB. The gains shown in Figures 4 through 6 are in addition to any directive gain provided by the antenna system.

Concentrating now on the 20 meter band, Figure 5 shows field strength signal levels, or height gains, relative to the free space value including ground reflections. These are not antenna patterns but rather signal field strength levels that are then sampled by an antenna. The axes have been flipped compared with those of the previous Figures. The upper dashed asymptote is the maximum constructive interference for the continuum of all arrival angles between 2 and 16°.

Specific results for 2, 5, 10 and 15° are shown by curves. The lower dashed asymptote is defined by the destructive interference for the continuum of arrival angles. The lower asymptote intersects the 2° arrival angle curve at a cusp which defines the optimum antenna height for that frequency band. At that elevation the height gain G_W has the smallest variation over the range of arrival angles, and its minimum gain value is the highest.

If an antenna is placed there, the actual free space antenna gain, at the antenna pattern elevation angle T, adds to this field strength height gain. Depending on the arrival angle of the signal from the DX station the height gain will be anywhere from about –5 to +4.5 dB, added to the antenna

Hamspeak

DX — Long distance communication — generally with stations in other countries. Often used to refer to desired countries and prefixes needed for various operating awards.

Field strength — A measure of the strength of electromagnetic radiation. In a calibrated system, generally expressed in µV/m, but more often used as a relative measure of signal strength for comparison purposes.

HF (High frequency) — The radio frequencies from 3 to 30 MHz.

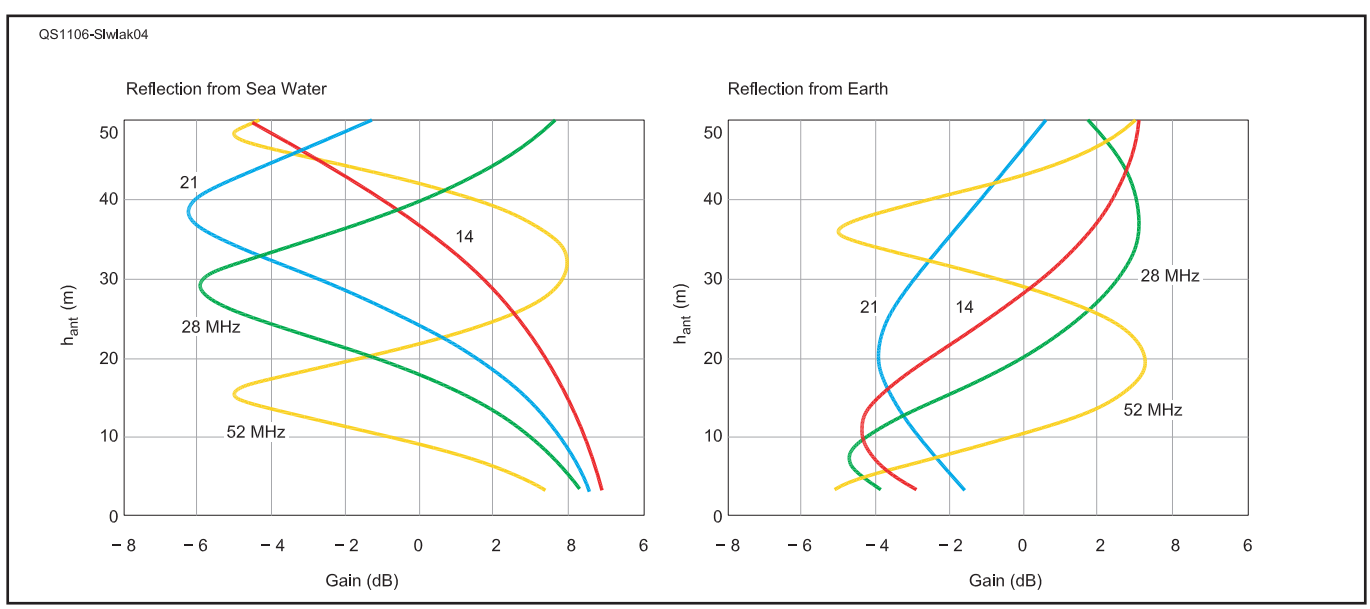


Figure 4 — Vertical polarization, T = 5°, surface roughness of 3 meters, reflections from (left) sea water and from (right) earth ground.

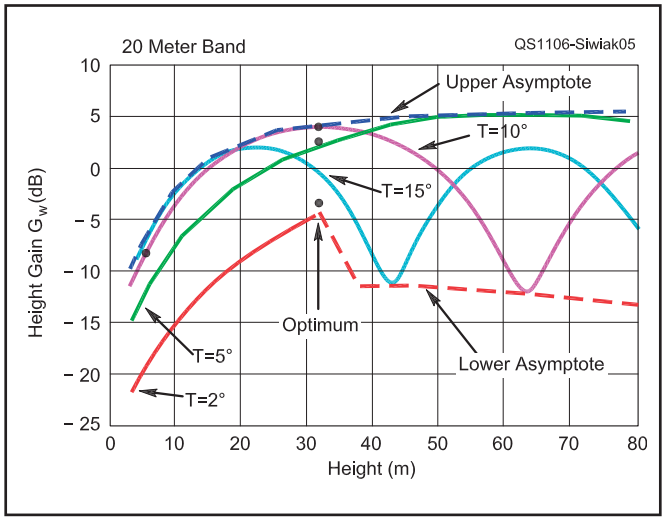


Figure 5 — Height gain for horizontal polarization in the 20 meter band.

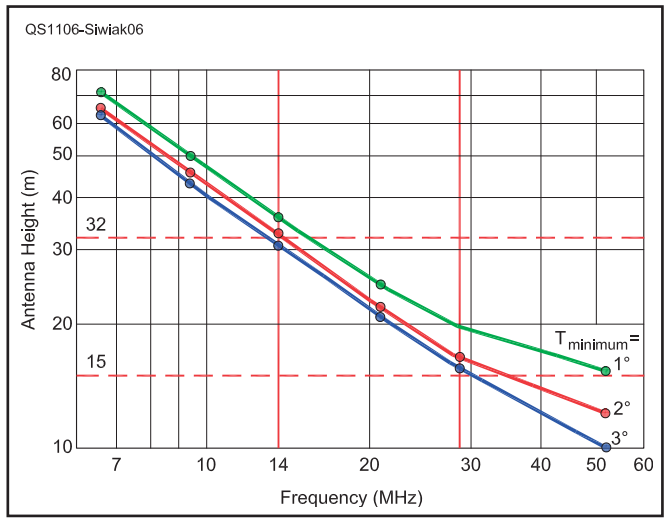


Figure 6 — Optimum antenna heights over even terrain for various frequencies.

free space gain at the same elevation angle. Antennas that are higher than the optimum height will encounter degraded performance at the higher angles of arrival because the nulls defining the lower asymptote to the right of the cusp are likely to be a factor. This is why in some cases a lower antenna can significantly outperform a higher antenna.[4] If we had chosen a higher minimum required arrival angle, the optimum height would decrease. Similar curves can be drawn for other HF bands or combinations of bands, and corresponding optimum heights can be found.

Finding an Optimum Antenna Height

Some multiband Yagis can cover the 40 to 6 meter bands in a single structure. Raising and lowering such an antenna is not usually desirable, so knowing an overall optimum height could be very useful. A family of curves such as the 20 meter band curves in Figure 5 can be calculated for any frequency band or any combination of frequency bands. One effective strategy for finding an overall optimum over multiple bands is to choose the best height for the highest frequency band of interest. That somewhat sacrifices the performance for the lowest arrival angles at the lower frequency bands, but more gently than the destructive interference loss of height gain for higher arrival angles if a higher antenna were chosen. The optimum heights for various frequency bands between 7 and 54 MHz are shown in Figure 6. The three curves are for three different minimum angles. The upper curve shows optima for a 1 to 16°arrival angle range, the middle curve for 2 to 16°, and the lower curve for 3 to 16°. The middle curve slopes from about 1.5 to 1.6 wavelengths in height between the 7 and 28 MHz bands.

If operation anywhere in the 10 to 40 meter bands is of equal interest, the best height works out to be 19.9 meters. That height is suitable for arrival angles as low as 1° in the 10 meter band, and is also suitable for angles above about 4° in the 20 meter band. In the 40 and 30 meter bands the results are a best effort. If the 20 meter band is to be optimized then the best height is about 32 meters. If 6 meter band operation is important then the optimum height is about 15.3 meters. The heights between about 15 and 32 meters (50 to 105 ft) emerge as a good range of compromise choices for multiband HF and 6 meter band operations.

Summary and Conclusions

By introducing a receive mode view we see that constructive and destructive wave interference from a direct path and an earth-reflected path causes a vertical standing wave at the antenna location. The details depend on the wave angle of arrival, polarization, on whether the reflection point was ground or sea water as well as on terrain (not considered here). Optimum antenna heights are largely governed by the lowest arrival angle at the highest frequency deemed important and by the range of expected arrival angles. Antennas that are placed too high can suffer from significant wave destructive interference at the higher arrival angles. Optimum height is 1.5 to 1.6 wavelengths for any one band, or a compromise height can be found for a multiband antenna operating over several bands by using the optimum for the highest frequency. Keeping in mind that this analysis was limited to rough but not locally mountainous earth or a dense urban region, antenna heights in the range of 15 to 32 meters (50 to 105 ft) are found to be reasonable compromise choices for multiband antennas operating from a fixed height.

Notes

[1]K. Siwiak, "Optimum Height for an Elevated HF Antenna," *QEX*, May/Jun 2011. Available on the ARRL website at **www.arrl.org/qex**, "This Month in *QEX*."

[2]K. Siwiak, "Optimum Height for an Elevated Communications Antenna," *DUBUS* Magazine, Vol. 39, 3rd Quarter 2010, pp 86-99.

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

[4]K. Siwiak, KE4PT, "You Can Enjoy DXing with a Modest Station," *CQ Amateur Radio*, Nov 2010, pp 46-48.

Kazimierz (Kai) Siwiak, KE4PT, earned a PhD from Florida Atlantic University, Boca Raton, Florida and his BSEE and MSEE from the Polytechnic Institute of Brooklyn, New York, specializing in antennas and propagation. He founded TimeDerivative, a wireless technology consultancy in 2003. He is a registered Professional Engineer and Senior Member of IEEE. Kai holds 38 US patents, has authored many peer reviewed papers and four textbooks, and has contributed chapters to other books. His work appears in ARRL publications including QST and *QEX. He holds an Amateur Extra class operator license and is a life member of AMSAT and a member of ARRL. Kai serves on the ARRL RF Safety Committee and is a Technical Advisor. He is an avid DXer, and was involved with Space Amateur Radio Experiment as a team member, including many SAREX operations and school contacts. His interests include flying (instrument and multiengine commercial pilot), hiking and camping.*

You can reach Kai at 10988 NW 14 St, Coral Springs, FL 33071 or at **ke4pt@amsat.org**.

SWR, Reflected Power — What Do They Mean?

Some transmission line measuring instruments talk about power, some about SWR — here's how to bring them together.

Joel R. Hallas, W1ZR

So you're at your ARRL Field Day site ready to trim antennas. Of course the test equipment you're familiar with is at home — so you grab a wattmeter from the pile. You want to adjust for minimum SWR, but this Bird just gives you forward or reflected power readings — what to do?

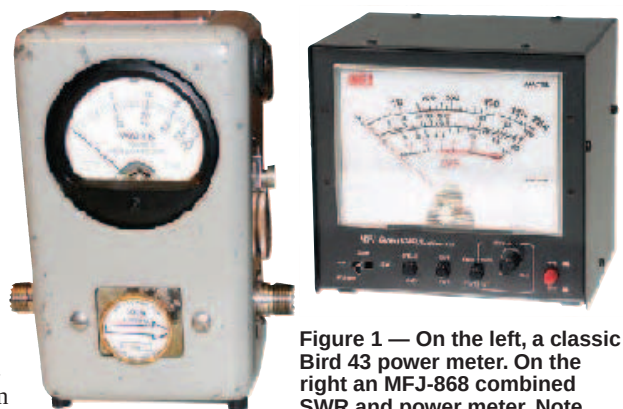


Figure 1 — On the left, a classic Bird 43 power meter. On the right an MFJ-868 combined SWR and power meter. Note that the SWR meter's midscale is at an SWR of 3:1 — making it somewhat easier to see the most useful part of the range.

Matched Impedances

SWR and the ratio of reflected to forward power are closely related. If the load is matched to the design impedance, the SWR is a perfect 1:1 and the reflected power is exactly 0. The power meter does provide one more piece of information — for the matched case, in the FORWARD POWER position, the meter indicates just how much power is headed toward the load — sometimes nice to know.

It is thus pretty easy to use either device to confirm or verify that you have a properly matched system. It can get a bit more complicated to compare results if the match isn't perfect.

Measuring Standing Wave Ratio

A matched lossless transmission line has the same voltage and current anywhere on the line — well, a real matched line has some attenuation, so voltage and current actually get somewhat lower as the signal goes toward the load. If the load isn't matched to the line, the impedance is transformed to different values along the line, resulting in a variation of voltage over distance. This also can be viewed as the result of two waves — one going toward the load and one reflected and returning to the source. The ratio of the maximum voltage to the minimum voltage is the voltage standing wave ratio — VSWR, or just SWR to its friends.

At high VHF frequencies, into the microwave region, it is possible to measure the voltage along the length of the line directly with a device called a *slotted line*.

For lower frequencies, the usual SWR meter uses two directional couplers to separate the forward and reflected waves on the transmission line. A measure of the amplitude of each is taken. The meter is set to full scale in the forward wave direction and the meter is calibrated to read SWR directly while switched to the reverse direction. In most such meters, the level detected is higher with higher frequencies, so an absolute reading of power isn't possible. Some actually also measure power in each direction and can provide either power or SWR measurements. Figure 1 shows a classic Bird 43 power meter and an MFJ-868 SWR and power meter, which can measure either SWR or power.

Table 1

Relationship Between Power Ratio, Reflection Coefficient (ρ), SWR and Return Loss

P_R/P_F	ρ	*SWR*	*Return Loss (dB)*
0.05	0.22	1.6	13.01
0.1	0.32	1.9	10.00
0.2	0.45	2.6	6.99
0.3	0.55	3.4	5.23
0.4	0.63	4.4	3.98
0.5	0.71	5.8	3.01
0.6	0.77	7.9	2.22
0.7	0.84	11.2	1.55
0.8	0.89	17.9	0.97
0.9	0.95	38.0	0.46

Measuring Forward and Reflected Power

Most power meters use a transformer coupled arrangement in which the current in each direction on the line itself is measured using a transformer. Since the current is independent of frequency, an absolute power calibration can be established.

If there is a mismatch, the power meter will indicate a value for both forward and reflected power. The actual power being delivered to the load is thus the forward power (P_F) less the reflected power (P_R), or the net power output, $P_N = P_F - P_R$.

Return Loss

While not often encountered in Amateur Radio circles, some test equipment expresses the reflected power in a slightly different form. Rather than indicating the magnitude of the reflected power, they specify the fraction returned as if it were a loss — usually in decibels. Thus a high return loss means little is reflected — a low SWR.

Converting Back and Forth

It is relatively easy to convert between SWR and forward and reflected power. The key is to take an intermediate step — find the power reflection coefficient, ρ (the Greek letter rho).

$\rho = \sqrt{P_R / P_F}$

Then the SWR equals $(1 + \rho) / (1 - \rho)$

To go the other way, $\rho = (SWR - 1) / (SWR + 1)$

The relationship between the two, and with return loss in dB, is shown in Table 1. It is pretty easy to set up the relationships on a programmable calculator or with spreadsheet formulae. If you are Internet connected, there are also real time conversion websites such as **www.microwaves101.com/encyclopedia/calvswr.cfm**.

Joel R. Hallas, W1ZR, is QST *Technical Editor. You can reach Joel at* **w1zr@arrl.org**.

Direct Digital Synthesis for Those Classic Rigs

Bring that old favorite back from the display shelf with a stable and accurate frequency source.

Joe Lunsford, N4YG

How many older transceivers and transmitters are collecting dust just because the old VFO drifts badly and is so unstable that transmitting would be an embarrassment? Some of these old boat anchors were never particularly stable, but were acceptable 30 or 40 years ago. But now, with new digital modes such as PSK31, stability requirements are higher and so are expectations.

Many amateurs are continually repairing their PTOs and VFOs while others are overwhelmed with the thoughts of attempting repair. Direct digital synthesis (DDS) provides a solution that is within reach of the average amateur and provides just what is needed for a majority of transceivers that were popular from 1960 through the 1980s.

A Solution is Within Reach

This particular system was originally designed for the Heathkit HW-101 but has found wider applicability to other transceivers. It is even easier to install in some other transceivers, such as the Ten-Tec Corsair series and Drake TR-7. The design is also applicable to the construction of a VFO that can make those old boat anchor AM-CW transmitters of the 1950s sound as good as the highly stable rigs of today See Figure 1.

Why DDS?

There are many advantages to the DDS system, including that it provides stability equivalent to that of a fixed crystal oscillator. In addition, it offers exceptional flexibility and adaptability under software control. A digital frequency display is optional, but if selected allows calibration, as well as tuning, to an accuracy of a few hertz.

This design includes an optional liquid crystal display (LCD) for frequency and other status information. In addition, it offers receiver incremental tuning (RIT) and capability for dual VFOs to support split receiver and transmitter operation — big plusses to support the usual DX operating environment. The VFO also includes calibration routines with on-display prompts. The HW-101 version also provides a band sensor.

This article shows how to construct a stand-alone VFO. Separate descriptions of how the DDS system can be integrated into the Ten-Tec Corsair II, the Drake TR-7 and the Heathkit HW-101 are available and firmware versions for these applications on the QST-in-Depth website.[1] A big plus is that the integration of the new DDS system can be accomplished without permanent modification — important if these transceivers achieve collector status.

The HW-101 Saga

My HW-101 served me well during the 1970s and ’80s. Then it served my brother for 10 more years, after which it found its way back to me. It still worked, but it sounded awful. The one time I put it on the air I was embarrassed. Being a person who despises things that do not perform well, the choices were to either fix up the old thing or throw it away, the latter being a serious consideration. [I had one as well, until my usual weekly CW sked contact refused to tolerate my drifting — mine went to a flea market! — *Ed.*] Fortunately, the former was chosen and I was committed to fixing the old VFO. Repairing the VFO turned out to be practically impossible because the parts were not to be found. That set me on a new path — direct digital synthesis. The resulting modified HW-101 is now a pleasure to operate. I use it more than I do my modern transceiver. It sounds as good as any modern rig.

System Design

The DDS system was designed to be integrated into transceivers, initially into the HW-101. The firmware in the controlling processor supports all the functions required for integration into the HW-101 — features such as a band sensor and an LCD for displaying frequency and status information. These features are not required for installations in rigs from the 1970s and 1980s with digital frequency displays. Much of the firmware was applicable to these transceivers while some was simply disabled. Installation in this class of transceiver was much simpler, however.

Paul Reams, AD3G, was the first to incorporate the same design into his RV-7 (remote VFO for the Drake TR-7) and later directly into his TR-7. He was successful and quite pleased with the result. Cap Allen, WØCCA, was the first to replace a Ten-Tec PTO with the DDS system. Cap accomplished the installation in his Corsair II without a hitch. I am sincerely thankful for the help provided by Paul and Cap and also by Joe Basham, N5CQK.

It has been gratifying to observe the excitement as these and others first turned on their transceiver after installing the DDS. The things that seem to be most evident are the exceptionally smooth and effortless feel (and sound) of the main tuning knob, the rock solid stability and the convenience of dual VFOs.

Figure 1 — The stand-alone DDS VFO, suitable for frequency control of ’50s transmitters such as Johnson Ranger, Adventurer, Navigator or Viking; Heathkit AT-1, DX-20, 35, 40, 60 or 100.

[1]Notes appear on page 41.

The DDS Module Design

Direct digital synthesis is, as the name implies, a digital technique except for the final step in which the digital sine wave is converted to analog segments. A stable oscillator or clock is required whose frequency is at least three times that of the highest desired output frequency. The DDS that was designed for the author's HW-101 uses a 50 MHz crystal oscillator for its timing reference.

Every cycle of the timing reference causes three things to occur: 1) a phase increment is added to a modulo 2 π phase accumulator or adder, 2) the sine of the value in the phase accumulator is looked up in a table, and 3) the digital sine value is converted to an analog voltage. This analog voltage is the output of the DDS system.

All this occurs every 20 ns or 50 million times a second. The stability of the resulting signal is the same as that of the 50 MHz crystal oscillator. The above is a very brief explanation of DDS. *The ARRL Radio Amateur's Handbook* should be consulted for a more complete explanation.[2]

The exceptional flexibility of the DDS system is a significant advantage over the old analog VFO. Under software control, the operating frequency can be changed by several megahertz in less than a microsecond and the operating frequency can be controlled to within a small fraction of a Hertz. The output frequency can be readily displayed digitally. There are no moving parts except for an incremental encoder typically used for tuning the DDS system in an Amateur Radio application. There is only one disadvantage of the DDS system: its spurious output. While there are numerous spurs in the output from any DDS system, these are at least 60 dB below the main spectral line.

A DDS system would be very difficult to construct from common components, particularly for an amateur. Fortunately, Analog Devices has designed a family of devices particularly for DDS. The one chosen for this design is the AD9835 that features a fully DDS capable cosine table lookup and a 10 bit D/A converter. It can operate up to a maximum clock speed of 50 MHz. It comes in a 16-pin TSSOP (thin-shrink small outline) package that includes built-in serial communication with the processor. The peak output is 0.3 V_{P-P}.

Since I decided to design and build a DDS system for the HW-101 and since I selected the AD9835 DDS chip, I had to address two questions before proceeding. What were the reasonable expectations for what might be achieved in the design and what hardware and firmware would be required? Notice that the requirements were specific to the HW-101, but are sufficient for any transceiver. These are the general design goals that were established:

- Minimal modification to the transceiver.
- Alphanumeric display of DDS frequency and status.
- Integrated receiver incremental tuning (RIT), dual VFOs and receiver/transmitter frequency split capability.
- Variable tuning rate with frequency readout to 1 Hz and integrated digital calibration to less than 100 Hz.

The circuit diagram, Figure 2, results in a system that meets these requirements. The circuit diagram only includes components mounted on the PC board. A separate circuit diagram for the interconnections between the PC board and off-board components is shown in the Qst-in-Depth version.

Cables connect to points within the transceiver to inform the DDS processor of status information, such as transmit or receive mode. In Ten-Tec and Drake rigs, there are only one or two of these status lines to be connected. In the HW-101 there are several, BAND, RECEIVE or TRANSMIT mode and USB, LSB or CW mode.

There are only three means for the operator to interact with the DDS system, the MAIN TUNING knob that is connected to the incremental encoder, the DDS CONTROL button and the RIT potentiometer. The former is simply mounted where the old VFO or PTO shaft was removed. The existing pushbutton switch and potentiometer should be used if possible for the DDS CONTROL button and the RIT control so that the external appearance of the transceiver is preserved.

With this button the operator selects VFO A or VFO B, selects split operation and gains entry into the calibration routines (HW-101 only). While monitoring all these and other inputs, the 16F877A calculates the frequency desired and provides necessary data (phase increment) to the AD9835 DDS

Figure 2 — Schematic diagram and parts list of the main board of the DDS system. Mouser parts are available from www.mouser.com.

C1, C2 — 20 pF, 50 V, ±5% disc capacitor (Mouser 140-50N5-200J).
C3-C12, C15, C16, C19, C20, C28 — 0.01 µF, 50 V, –20%, +80% disc capacitor (Mouser 140-50V5-103Z).
C13, C17 — 10 µF, 20% tantalum capacitor (Mouser 80-T354E106M20AT).
C14, C18, C22-C24, C26, C27 — 0.22 µF, 20% axial lead capacitor (Mouser 581-SA-105E224MAR).
C21 — 470 µF radial lead capacitor (Mouser 140-HTRL25V470-RC).
C25 — 47 µF radial lead capacitor (Mouser 140-HTRL25V47-RC).
D1-D5 — 400 PIV rectifier diode (Mouser 512-1N4004).
J1 — Connector housing, 9 pin (Mouser 538-50-57-9009).
J2 — Connector housing, 7 pin (Mouser 538-50-57-9007).
J3 — Connector housing, 5 pin (Mouser 538-50-57-9005).
J4, J6, J7 — Connector housing, 4 pin (Mouser 538-50-57-9004).
J5 — IDC ribbon connector (Mouser 653-XG4M-1630-T).
JP1-JP4, JP6, JP7 — Single row header pins (Mouser 517-6211TG).
JP5 — Dual row header pins (Mouser 517-2340-6221TG).
OS1-OS3 — Photo interrupter (Mouser 512-QVE00118).
R1 — 39 kΩ, ¼ W carbon film resistor (Mouser 291-39K-RC).
R2, R11 — 1 kΩ, ¼ W carbon film resistor (Mouser 291-1K-RC).
R3, R4 — 47 kΩ, ¼ W carbon film resistor (Mouser 291-47K-RC).
R5 — 100 Ω, ¼ W carbon film resistor (Mouser 291-100-RC).
R6 — 3.9 kΩ, ¼ W carbon film resistor (Mouser 291-330-RC).
R8 — 5 kΩ, ¼ W trimmer potentiometer (Mouser 652-3306F-1-502).
R9 — 10 kΩ, ¼ W carbon film resistor (Mouser 291-10K-RC).
R12 — 470 Ω, ¼ W carbon film resistor (Mouser 291-470-RC).
R13 — 33 kΩ, ¼ W carbon film resistor (Mouser 291-33K-RC).
R15, R16 — 6.8 Ω, ¼ W carbon film resistor (Mouser 291-6.8-RC).
R17 — 20 kΩ, ¼ W trimmer potentiometer (Mouser 652-3306F-1-203).
U1 — Microcontroller, 40 pin (Mouser 579-PIC16F877A-I/P).
U2 — 50 MHz crystal clock (Mouser 815-ACH-50-EK).
U3 — DDS surface mount chip, 16 lead (Analog Devices AD9835BRU).
U4 — Voltage regulator, +12 V, 100 mA (Mouser 512-KA78L12AZTA).
U5 — Voltage regulator, +5 V, 3 A (Mouser 512-LM7805ACT).
U6 — Voltage regulator, –12 V, 100 mA (Mouser 512-KA79L12AZTA).
U7 — Video amplifier chip (Linear Technology LTC1253).
U8 — Liquid crystal display, 16 character × 2 line.
U9 — Incremental encoder, 128 pulses per revolution (Ten Tec Oak Grigsby 90Q064-02-00).
X1 — Parallel cut crystal, 20 MHz (Mouser 815-AB-20-B2).
PC board from author at n4yg@comcast.net.
Perfboard (Veroboard from Ocean State Electronics, www.oselectronics.com).

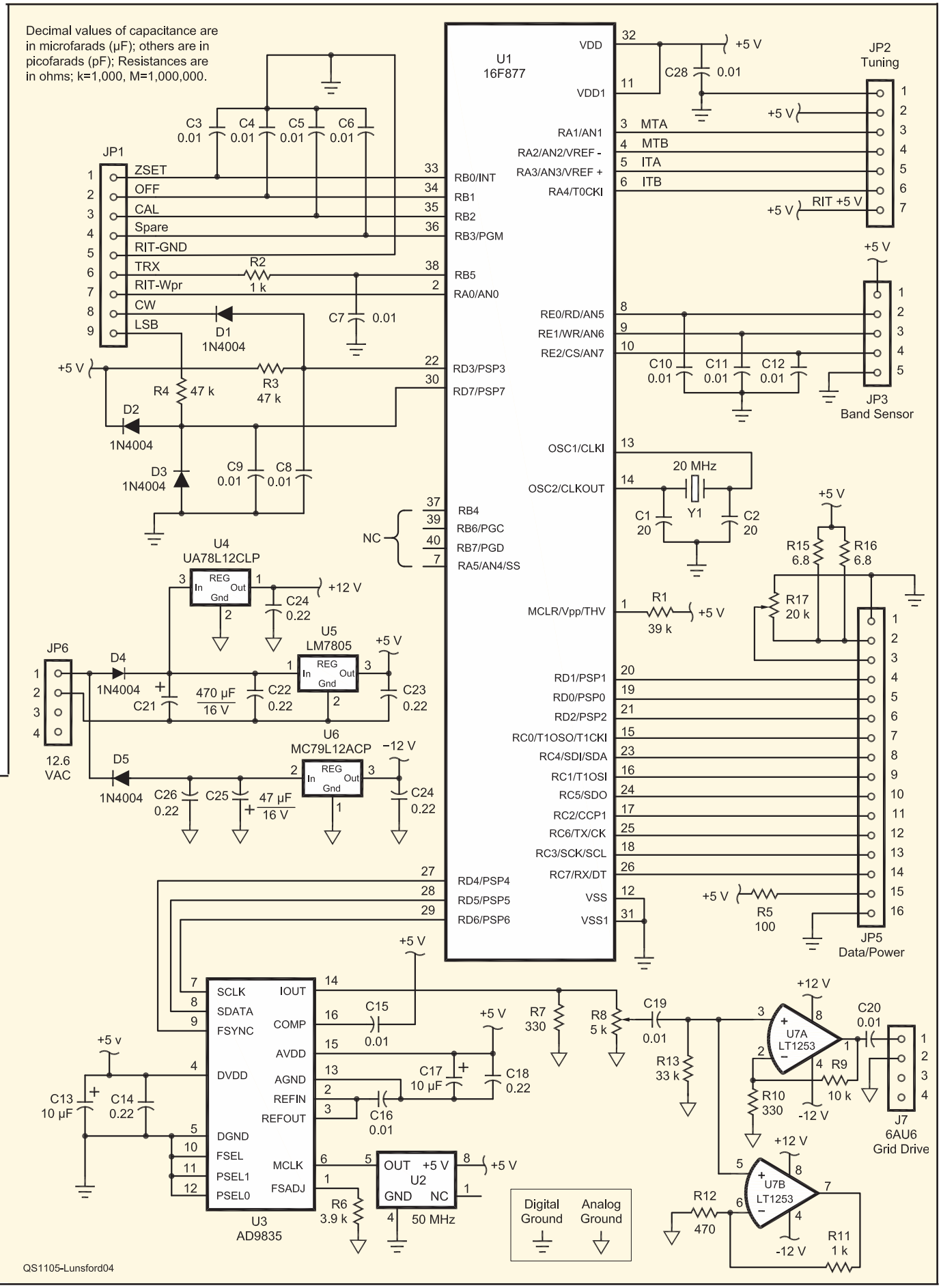

Decimal values of capacitance are in microfarads (µF); others are in picofarads (pF); Resistances are in ohms; k=1,000, M=1,000,000.
U1
16F877
JP1
ZSET
OFF
CAL
Spare
RIT-GND
TRX
RIT-Wpr
CW
LSB
JP2
Tuning
MTA
MTB
ITA
ITB
RIT +5 V
JP3
Band Sensor
JP5
Data/Power
JP6
12.6 VAC
U2
OUT +5 V
GND NC
50 MHz
U3
AD9835
SCLK
SDATA
FSYNC
DVDD
DGND
FSEL
PSEL1
PSEL0
IOUT
COMP
AVDD
AGND
REFIN
REFOUT
MCLK
FSADJ
U4
UA78L12CLP
U5
LM7805
U6
MC79L12ACP
U7A
LT1253
U7B
LT1253
20 MHz
Y1
Digital Ground
Analog Ground
QS1105-Lunsford04

Table 1

DDS CONTROL Actions and Results

Button Action	*DDS System Action*	*Result*
Click	Complement RX and TX VFOs	Swap RX and TX VFOs, A and B saved to memory
Double click	Complement TX VFO	Split or Unsplit, A and B saved to memory
Long click	Equate A and B to the RX VFO	A = B or B = A, A and B saved to memory
Very long click	Save A and B, Enter Calibration Mode (HW-101)	A and B saved to memory

chip, which changes the output frequency as desired. Unlike many DDS systems on the market that provide a low voltage output, the output of this VFO can be adjusted from 0 to 20 V_{P-P}. At the same time the 16F877A provides data to the LCD to display the desired frequency and other information. The 16F877A, clocked at 20 MHz, has ample speed to complete all these tasks within a fraction of a millisecond.

Implementation Approach

Power is taken from an 8 to 12 V dc or 12.6 V ac source within the transceiver. In Ten-Tec rigs, the 8 V source that powered the old PTO is the best source.

Extensive code is incorporated into the firmware of the 16F877A. Required tasks include the need to control and communicate data to the AD9835 and the LCD. It also must interpret the MAIN TUNING and RIT control inputs and set the frequency display accordingly. It must also accept and apply calibration for all band segments and modes (USB, LSB and CW).

The Main Board

You could decide to construct the main board as I did the first prototype using perforated prototype board and a surface mount adapter. The surface mount chip presents a difficulty, however. A printed circuit board makes the task much easier. The assembled PC board is shown in Figure 3.

Liquid Crystal Display (Optional)

Support for an LCD display is included in all firmware versions. If the transceiver already has an operational digital display, then it is recommended that it continue to be used with modification. Since the HW-101 has only an analog dial in its original configuration, a digital display is suggested.

Although several LCD modules will work, the one in the parts list is preferred. The line width of the 16 character display lines should be approximately 55 mm and the width of the module should be about 80 mm. The display module is mounted with two L shaped pieces of aluminum about 1¼ inches long and ⅜ inches wide, bent into an L shape with one flange ⅞ inches wide. The short flanges are attached to the display module with 2-56 hardware and the ⅞ inch flanges attach underneath the flange at the top of the front panel of the HW-101 with 4-40 hardware. Counter sink the heads of the 4-40 screws.

Getting To Know the DDS System

Controls

Operation may vary somewhat depending on the type of transceiver. These differences are generally only related to the display, which may be the original display. The original display will very likely be used in the TR-7 and the Corsair II, for example. The use of the DDS is very simple because there are only three controls, the MAIN TUNING knob, the DDS CONTROL button and the RIT control.

The MAIN TUNING control is simple, yet designed to make it easy to make small or large changes in operating frequency. This is accomplished with a variable tuning rate, measured in kHz per knob revolution. If rotated slowly, the tuning rate is slow for fine tuning. As the rotation rate is increased, the tuning rate increases, making it easy to move from one end of the band to the other.

The DDS CONTROL button, SPOT button in the Corsair II and ZERO SET in the HW-101, controls the two VFOs, A and B.

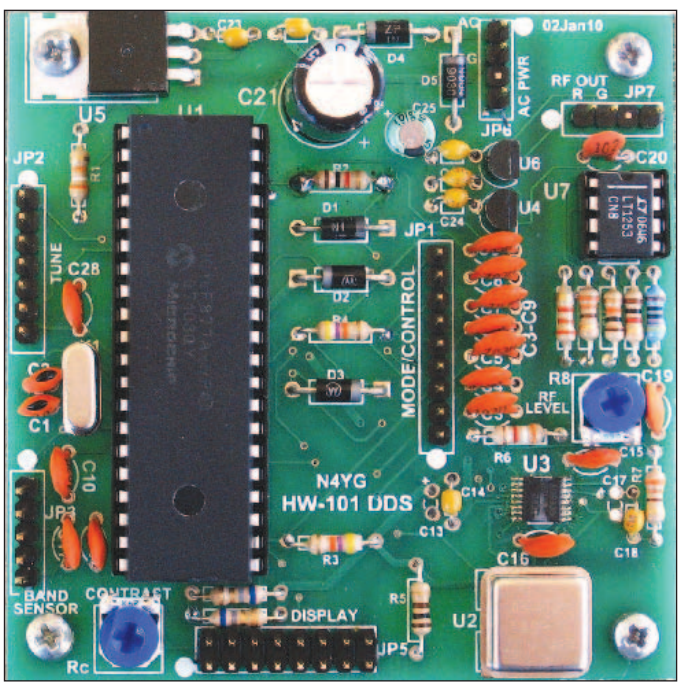


Figure 3 — Printed circuit implementation of DDS main board.

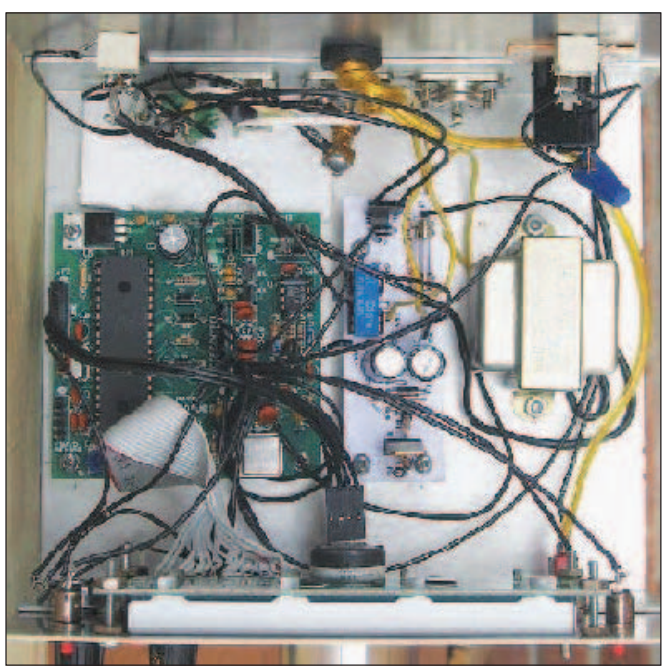


Figure 4 — Bottom view of assembled stand-alone version.

Hamspeak

Crystal oscillator — Circuit that generates a signal at a precise fixed frequency. The crystal is one of quartz, sliced and ground until it responds to electrical stimulation by mechanically vibrating at the desired frequency (the **piezoelectric** effect**).**

CW — Continuous wave. Term for the on-off keyed signaling associated with radiotelegraph transmission.

DIP (Dual in-line) package — Integrated circuit package characterized by two parallel rows of connecting pins.

DDS — Direct digital synthesis. A method of generating an ac signal in which a computer directly outputs the waveform by generating a series of voltage steps that add up to the desired time function.

LCD — Liquid crystal display. Structure that allows the transmission of light when energized. Multiple LCD segments are combined together to form display screens that are only visible upon application of light.

Potentiometer — Variable resistor with three terminals, two of which are attached to a fixed resistance element and the third can be mechanically moved along the element, presenting a different resistance to each of the fixed terminals.

PSK31 — Popular keyboard-to-keyboard amateur digital transmission system developed in 1999 by Peter Martinez, G3PLX.* This system is based on phase shift keying at a required bandwidth of 31 Hz, hence its name. This was the first popular "sound card mode," in which a PC sound card was used to encode and decode the data.

PTO — Permeability tuned oscillator. Variable frequency oscillator in which the frequency is changed by moving a tuning slug, often with a multi-turn screw thread, in and out of an inductor to change the inductance of the frequency determining circuit.

Transceiver — Radio transmitter and receiver combined in one unit. In many cases some circuitry is shared between the two functions.

VFO — Variable frequency oscillator. Oscillator with frequency established by resonant inductor-capacitor circuit. One or the other elements is adjustable to vary the frequency over a range, typically as wide as an amateur band.

*P. Martinez, G3PLX, "PSK31: A New Radio-Teletype Mode (reprint from *RadCom*)," *QEX*, Jul 1999, pp 3-9.

In the HW-101 it also gives access to and control of the calibration routine. The A and B values are saved to memory each time any action is taken with the DDS CONTROL button. The A and B values are retrieved each time the system is powered up so that it returns to the same frequencies. One of the VFOs must be designated for receive (RX) and one must be designated for transmit (TX). If the same VFO is designated for both transmit and receive, this is referred to as *unsplit*. If different VFOs are designated for RX and TX, then this is *split* operation.

The DDS CONTROL button has four functions that are invoked by what will be referred to as *clicks*, analogous to a click with a mouse. A click means a short tap of the button. A *double click* is two clicks in rapid succession. A *long click* means a button push and held for ½ second but less than 2 seconds. A very long click is a button pushed and held for 2 seconds or more. The functions invoked by these DDS CONTROL actions are enumerated in Table 1.

The RIT control is a potentiometer. In the center of rotation, there is a small dead band at which point the RIT value is 0. Rotating clockwise applies positive RIT up to 1.5 kHz. Counterclockwise applies negative RIT up to –1.5 kHz.

Frequency Readout Display

In transceivers with an original digital display, little difference will be noted, depending on how the DDS system is integrated with existing status displays. The DDS board has the functionality to control up to five discrete indicator LEDs. These indicate VFO A active, VFO B active and split operation. In the installation in the Corsair II by WØCCA, the original LEDs with original functions RF ATTN, OFFSET and PROCESSOR were used to indicate these new functions.

Installations in Drake gear may include five LED indicators, which, in addition to the three mentioned above, indicate LOCK and RIT status. Another existing pushbutton toggles the LOCK condition. The RIT LED is illuminated whenever there is a non-zero RIT value.

Stand-alone VFOs

An outstanding VFO for use with early crystal controlled vacuum tube transmitters can be easily constructed using the same DDS board. The author has constructed a VFO for use as a crystal replacement for the Knight T-50 transmitter. Figure 4 is a bottom view of the DDS VFO constructed with the same DDS board used for the HW-101. The only difference is the firmware load for the 16F877A.

The VFO shown in the photos has an integrated transmit/receive (TR) switch. The firmware supports the TR switch, however the TR switch may be omitted if desired. The RF output from the DDS board is a maximum of about 20 V_{p-p} into a 75 Ω load. It provides output in the 160, 80 and 40 meter bands. The display shows the output frequency on the first line and the output frequency of the transmitter on the second line (many radios of the time operated on multiples of the crystal frequency). The operator selects the multiplier, 1, 2, 3 or 4 times that of the VFO, to match the band of the transmitter. The firmware load for the stand-alone VFO and further details may be downloaded from the QST-in-Depth website.

Final Words

This has been a long term project, but one that I am glad I undertook. My HW-101 was useless, but now it is my favorite rig. It is a pleasure to operate. I never get anything but glowing reports on the air.

Notes

[1]The QST-in-Depth website at **www.arrl.org/qst-in-depth** includes firmware and installation instructions for the Corsair II, TR-7 and HW-101 versions and for the stand-alone VFO.

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

ARRL Member Joe Lunsford, N4YG, was first licensed as WN4RUF in 1969 and has held an Amateur Extra class license for 32 years. He has a Master's degree in electrical engineering. Joe is currently retired from his job of over 36 years. He is an avid CW operator who in previous years chased DX regularly, but now enjoys a nice CW QSO. He has designed a dozen or more electronic keyers. The most notable of these is the smart keyer series. He is also the designer of the smart filter. These products were produced and sold in the '80s and '90s, and several hundred remain in service. This venture was discontinued in the late '90s. Since retiring, Joe continues to work part-time, but manages to spend more time operating. Most of his additional time is spent designing electronic products for ham radio and other applications, playing golf and enjoying his seven grandchildren. You can reach Joe at 1304 Toney Dr, Huntsville, AL 35802 or at **n4yg@comcast.net**.

A Single Element Vertical "Beam"

You can make a directional antenna out of a single monopole — here's how.

David Robbins, K7BKI

We are all familiar with the omnidirectional radiation pattern of a single vertical monopole antenna. Personally, I never thought it could be any different until I stumbled on a method that gives a single vertical element a moderate front to back ratio. How does it do it? How should I know — I only built one.

Necessity is the Mother

It all started on a dark and stormy night. It really did. It was then that my old Yagi on top of my 40 foot tower was destroyed by the storm. My wallet wasn't fat enough to purchase another Yagi so I decided to put up a quick vertical instead. I went out to my garage to rummage through 23 years of accumulated treasures. My family has a saying about my collection: "If you need something out of grandpa's garage, forget it." I'll admit it is sadly lacking in organization and trying to find something is almost impossible but I look at it as an adventure. I always find something fantastic when I'm looking for something else. Anyway, way back in the garage I found an old treasure. It was a CB base antenna that a neighbor had given me years ago, if I took it down off his roof.

Believe me, dragging a CB antenna with three stiff radials out of there was no easy task. When it was in the clear, I stopped to rest and contemplate how best to convert it for amateur band use. On the floor were remnants of my Yagi and it made me think: "Wouldn't it be great if I could make a vertical beam." I always talk to myself like that and yes, sometimes I answer.

The Plot Thickens

Once again I thought: "Why not?"With my brain in high gear I immediately concluded that if it were possible to make a vertical beam, it would have to be the radials that controlled the vertical's radiation pattern. It was obvious that the radials on the CB antenna were too short to be part of the solution, unless I wanted to work 10 meters, so I removed them. The vertical element of the half wave CB antenna was 16 feet long, but it was adjustable. I left it at that length for the time being. Next I needed to rummage for a mast. I found two of them. One was a heavy monster that extended to 25 feet and the other, a fairly light metal mast of 13 feet. I knew that while experimenting it would have to be taken down and put back up numerous times so I selected the 13 footer.

Now I needed to decide on a band. I'm an old CW operator from way back, so 40 or 20 meters were considered. Then I chose the 30 meter band for two reasons. First, it was right between 20 and 40 and secondly I had never worked 30 meters before. With the band chosen, I had to decide on dimensions. According to the usual metrics, a ¼ wave monopole should be about 23 feet long, so 16 feet of vertical element is not the ideal length. I thought I'd see if I could compensate by using longer radials.

Cut and Try

I mounted the CB's vertical element on top of the 13 foot mast using its insulated base and moved the antenna out into my front yard. I decided that two radials would be easier to tune than three, so I took some #16 AWG insulated copper wire and cut myself two 34 foot wires.

I connected the coax from my radio to the antenna — center wire to the vertical element and braid to the mast. Then after trimming one end of each radial I attached them to the same spot on the mast as the braid and secured everything with hose clamps. To make it easy on myself, I raised the antenna up and tied it to a post on the front deck. Then I spread the radials out into a V with the ends about 33 feet apart. I bent a small loop in each extended end of the radials and tied rope to them. I pulled the radials tight and tied the ropes to our pasture fence. The radials were sloped and each end was approximately 6 feet from the ground. I figured 6 feet was good because I could drive my riding mower underneath.

Tuning it Up

For testing and adjusting purposes, I temporarily used an 8 foot piece of coaxial cable with a PL-259 coax plug on the far end connected in place of the regular coax. This makes adjusting the antenna with an antenna analyzer or an SWR meter easy. I also pounded in a ground rod next to the mast and attached it to the mast to aid in lightning protection. I used a battery cable and clamps.

I tied off the ropes to anchors of opportunity, making sure the ends were at least 6 feet off the ground. I then attached the analyzer to the temporary coax and adjusted the radial lengths for lowest SWR. The lengths should be adjusted together so the radials

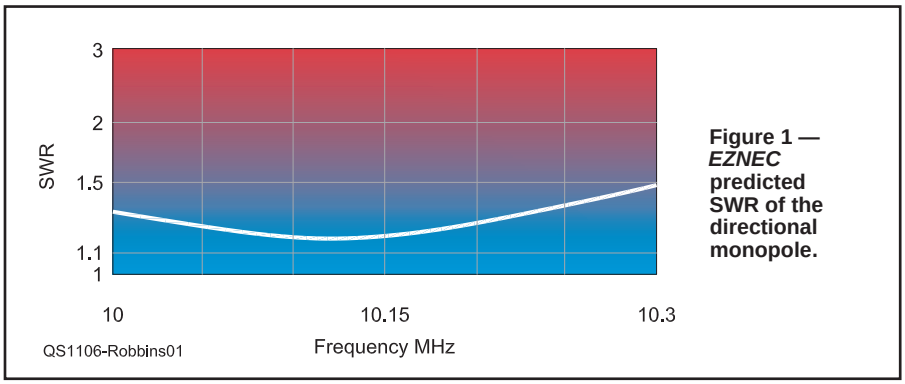


Figure 1 — *EZNEC* predicted SWR of the directional monopole.

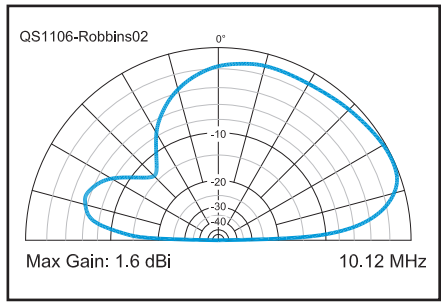


Figure 2 — *EZNEC* elevation pattern of the directional monopole.

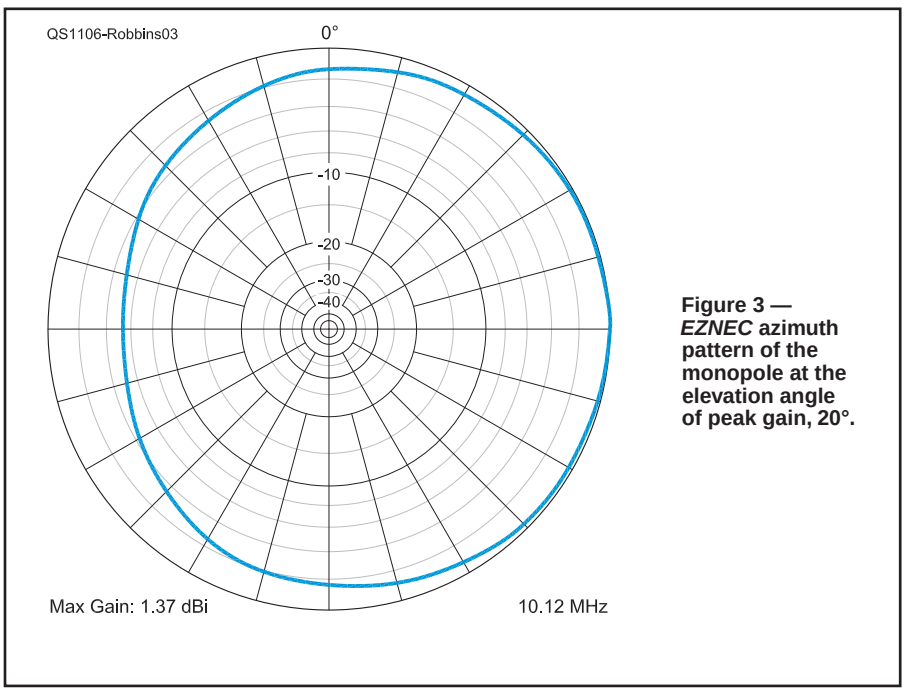


Figure 3 — *EZNEC* azimuth pattern of the monopole at the elevation angle of peak gain, 20°.

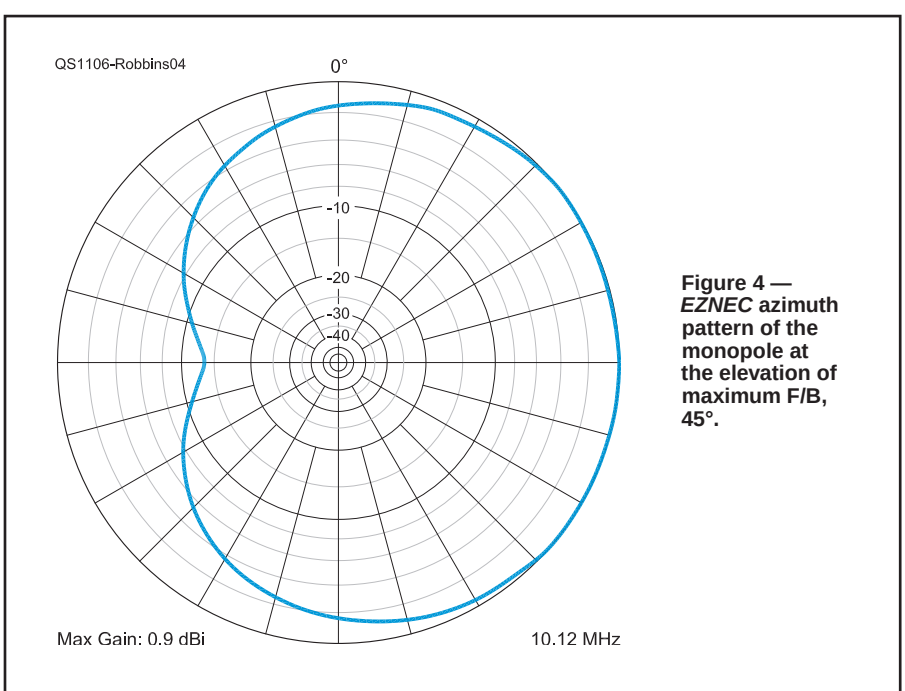


Figure 4 — *EZNEC* azimuth pattern of the monopole at the elevation of maximum F/B, 45°.

end up of equal length. Shorter lengths result in a higher matched frequency. Remember that the voltage at the end of the radials is about as high as on the tip of the monopole, so make sure people won't come in contact while you are on the air.

I discovered the antenna frequency was too low, so I trimmed the radials until the system resonant frequency was close to 10.1 MHz. Then I read the SWR using my in-line meter. A little bit more of trimming and the SWR settled at 1.3:1. Figure 1 shows the *EZNEC*-predicted SWR of the final antenna.[1]

So What Did I Get?

I went on the air and was surprised by the antenna's performance. In the first few hours I had contacted several East Coast stations as well as England, New Zealand, Norway, Russia and others. Working the East Coast is like working DX for me. It's more than a 2000 mile jump from Washington's North Olympic Peninsula to Rhode Island.

For the past year I have totaled up more DX than the combined total of my previous 38 years of hamming. I used 50 to 100 W of power. I asked an ARRL staffer about my weird antenna but no conclusions were reached about it. He suggested I get an antenna analyzer and the *EZNEC* antenna modeling program. I took his advice and also invested in a field strength meter.

When I hooked up the analyzer to the base of my antenna it told me my SWR was 1.1:1 and the impedance of the antenna was 48 Ω. Once I got all the dimensions of my antenna into *EZNEC*, its analysis agreed with the analyzer's findings. In addition it told me the antenna had a front to back (F/B) ratio as shown in the elevation pattern of Figure 2. It looked like I had my vertical beam! As seen, the F/B is a function of elevation angle. Figure 3 shows the azimuth pattern at 20° elevation, the angle of maxi-

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

mum forward gain, while Figure 4 shows it at the elevation angle of highest F/B, 45°. The improved high angle F/B should help reduce the response to signals at moderate distances — from which the strongest interfering stations are likely to arrive.

I suspect some of you are skeptical and at this point and I was too. So armed with my field strength meter I took readings at 20 W output on 30 meters. At 50 feet in front of the antenna, which is the direction the radials are pointing, the meter read the maximum of 30 at a height of 6 feet. I took another reading 50 feet behind the antenna. It read 2. While the readings are not likely linear, it did confirm that the antenna indeed had a preference in the direction of the radials.

Using *EZNEC* as a modeling program I increased the vertical element to 21 feet and shortened the radials to about 29 feet. The results were almost identical. To be sure I went outside and took my original antenna down. I extended the vertical element to 21 feet and shortened the radials to *EZNEC*'s specs. The antenna analyzer confirmed *EZNEC*'s predictions for SWR and impedance. *EZNEC* said it had a 12.3 dB F/B ratio now. My field strength meter read it as 16 to 1 with a repeat test.

This antenna is for 30 meters. I suggest you make it for 30 first and once you're familiar with its makeup and how it works, you can try to make one for the band you want. To experiment or test this antenna, an antenna analyzer and a field strength meter are invaluable.

There is a lot more experimenting to be done on this antenna. I hope you will join me.

ARRL member and General class licensee Dave Robbins, K7BKI, has previously held call signs, KN6LAF, KB7BKI and KF7CBW. He has been licensed since 1963, with 10 years off while a US Navy Radioman. Dave is a 1963 graduate of the National Radio Institute. He was employed as a journeyman color TV repairman for 30 years. You can reach him at 1012 Atterberry Rd, Sequim, WA 98382 or at **daveanjackie@netzero.net**.

Hamspeak

Antenna analyzer — Test instrument designed to measure the impedance and standing wave ratio (SWR) of an antenna or an antenna and feed line combination as a function of frequency. See **www.arrl.org/reviews-listed-by-issue** and look for May 2005.

CB — Citizens band. Range of frequencies near 27 MHz that are assigned in the US by the FCC as 43 AM channels for use by individuals or small businesses. Power is limited to 5 W dc input.

DX — Long distance communication — generally with stations in other countries. Often used to refer to desired countries and prefixes needed for various operating awards.

EZNEC — Antenna modeling software that provides a user friendly interface to the powerful *Numerical Electromagnetic Code* (NEC) calculating engine.

F/B — Front to back ratio. The ratio of the power in the main beam of a directional antenna to that to its rear. This is a key figure of merit for many applications of directional antennas, particularly if used to reject signals from undesired directions.

Monopole — Single vertical antenna element, typically a quarter or more wavelengths long. Often used as a transmit and receive antenna, singly or in combination with other similar antennas.

PL-259 — Male UHF type coax connector. Part of a coaxial cable connector family developed before WWII for the "ultrahigh frequencies" then starting at 30 megacycles (now MHz). On right and left in photo.

Radials — Portion of a usually vertical antenna, designed to provide an artificial ground or a connection to real ground. The multiple radials project radially from the antenna base in multiple directions.

SWR — Standing wave ratio. Measure of how well a load, such as an antenna, is matched to the design impedance of a transmission line. An SWR of 1:1 indicates a perfect match. Coaxial cables, depending on length, type and frequency, can often work efficiently with an SWR of 3:1, sometimes higher. Solid state transmitters frequently require an SWR of 2:1 or less for proper operation.

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.

New Products

MFJ HF/VHF/UHF SWR ANALYZER

◊The MFJ-266 SWR analyzer displays SWR, complex impedance and impedance magnitude simultaneously on a backlit LCD screen. The device can be used to measure capacitance, inductance, field strength and frequency or to generate test signals. Frequency coverage is 1.5-185 MHz plus 300-490 MHz. A 10:1 vernier drive makes fine adjustments easier. Housed in an aluminum case and powered from eight AA batteries or a 12 V ac operated power supply, the MFJ-266 can be used at home or in portable locations. Price: $349.95. To order, or for your nearest dealer, call 800-647-1800 or see **www.mfjenterprises.com**.

DB6NT 1.3 GHz HIGH POWER AMPLIFIER

◊ The MKU PA 131000 power amplifier from Kuhne Electronic uses LDMOS technology to provide high linearity and a 50% efficiency rating on the 1.3 GHz band. Typical power input is 20 to 30 W for 1000 W output from 1280 to 1300 MHz. The amplifier is intended for all analog and digital modes including SSB, CW, ATV and DATV and for high power EME operation. The amplifier features a built-in transmit-receive sequence controller and overheat protection. Power requirements are 50 V dc at 40 A. Input and output impedances are 50 Ω, and an SMA female connector (input) and 7/16 connector (output) are supplied. For more information, visit **www.db6nt.com**.

Two Small Helical Antennas for 2 Meters

With performance close to that of full sized antennas, these small helical antennas are low in profile but high in efficiency.

John E. Portune, W6NBC

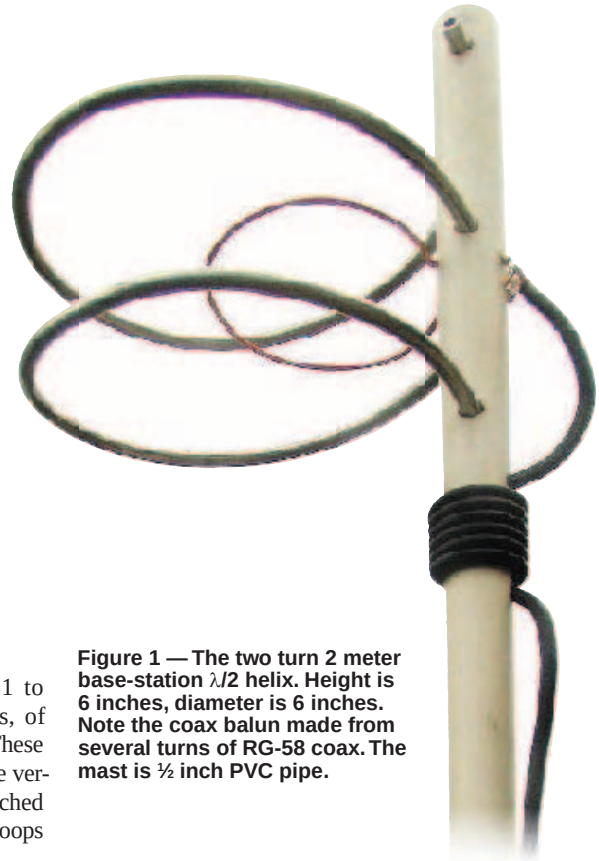


Figure 1 — The two turn 2 meter base-station λ/2 helix. Height is 6 inches, diameter is 6 inches. Note the coax balun made from several turns of RG-58 coax. The mast is ½ inch PVC pipe.

Helical antennas have long been known for their excellent properties. They have not found much favor in the ham community, however, perhaps because they are more difficult to build than straight dipoles, whips or Yagis. Fortunately a less well-known, but equally high performance version of the helical antenna, the normal mode helix, is quite practical for ham construction. Best of all, it is impressively small in size and low in profile. Figure 1 shows a 2 meter base station λ/2 normal mode helix, only 6 inches high. In Figure 2, we show a λ/4 mobile helix, only 3 inches high — both made from common hardware store materials. It is also quite feasible to apply these principles to small helical antennas for HF.

There is not just one kind of helical antenna. Helices exhibit several modes. The two most common are *normal* and *axial* mode. Many hams are familiar with axial mode helical antennas. These are big corkscrew shaped direction beams, often on long booms. They use large circumference turns, wide turn spacing and a large ground plane at the feed end. Gain is axial along the boom, as the mode's name implies.

The helical antennas shown here operate in the normal or dipole mode. Circumference and turn spacing for VHF are measured in inches instead of feet. I use one of the mobiles on the roof of my recreational vehicle. It is mounted under a *radome* made from a plastic food container (see Figure 3). Before installing it, I kept knocking full sized 2 meter antennas off of the top of my vehicle.

A Classical Ham Experiment

These antennas are the result of a series of ham level cut-and-prune experiments that began one day when I simply wondered what would happen if I were to wind a full sized 2 meter λ/2 dipole (38 inches long) into a small helix. And what about doing the same with a λ/4, 19 inch spike? I knew that they would be smaller, but would they work almost as well as their full sized straight cousins?

To find out, I made five helices (1 to 5 turns), each from roughly 38 inches, of ¼ inch aluminum tubing — a full λ/2. These helices were all self resonant. The mobile version is half of this, λ/4 of tubing. I matched all to a 1:1 SWR with small inductive loops as shown.

According to John Kraus, W8JK (SK), normal mode helices (much less than λ/2 in circumference and turn spacing) have gain perpendicular to the helix.[1] In other words, they behave like dipoles. You can visualize the pattern by imagining a full sized straight dipole lying along the center axis of the helix.

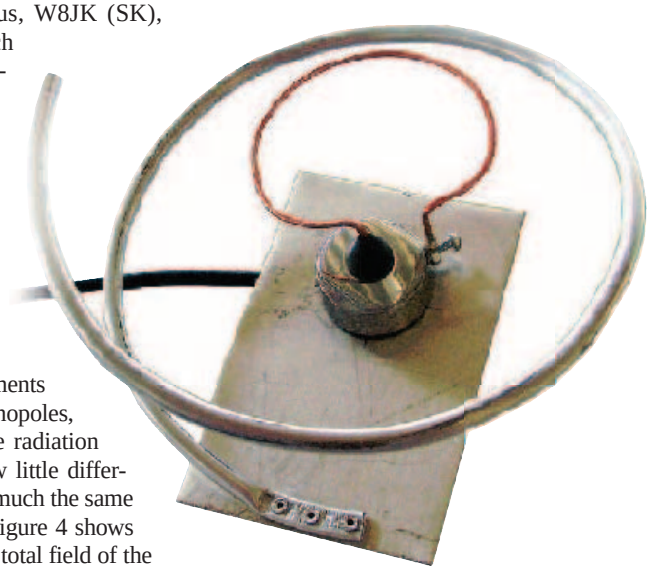


Figure 2 — The 1¼ turn low profile 2 meter grounded λ/4 mobile helix on a modified NMO mount. Height is 3 inches, diameter 6 inches.

To begin investigating their performance as replacements for full sized dipoles and monopoles, I used *EZNEC* to model the radiation patterns.[2] I was amazed how little difference there was. All five had much the same gain and radiation pattern. Figure 4 shows the elevation patterns for the total field of the 2 meter, two turn λ/2 helix compared to a full sized linear dipole. Figure 5 shows a similar comparison of the λ/4 version.

So to answer my first question, a small λ/2 helix has only minimally less gain (about 0.4 dB less) and slightly shallower nulls than a full sized dipole. The same is true for a λ/4 mobile monopole. Yet they have much the same radiation pattern. Azimuth patterns are not shown since they are essentially omnidirectional for the vertical orientation.

There is one major difference, however — polarization. The electric (E) and magnetic (H) fields in a small helix trade places compared to a dipole. The same is also true for a single turn compact transmitting loop. Polarization is rotated 90°. A helix, though, has an advantage here. It is also somewhat circularly polarized. The degree depends on the height to diameter ratio. Hence how one mounts a helix is not as critical as for a linearly polarized antenna. This is useful on bands such as our VHF, UHF and 10 meter bands, in which both horizontal polarization (for SSB) and vertical polarization (for FM) are in use.

This is a two edged sword. The good news is that it provides the flexibility to work stations using either vertically polarized (FM)

[1]Notes appear on page 49.

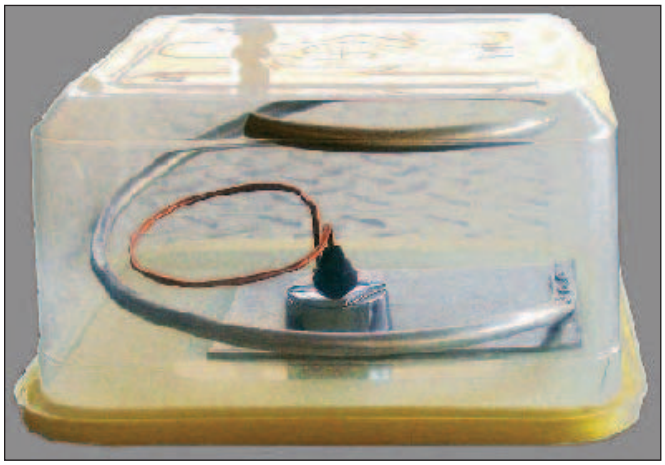


Figure 3 — Grounded mobile λ/4 helix on top of my RV, mounted under a plastic food container radome.

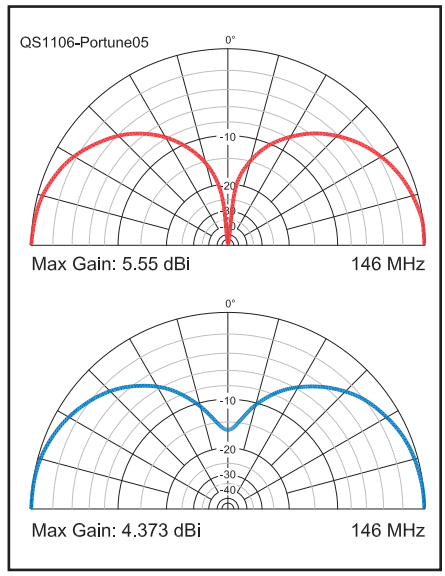


Figure 5 — Elevation patterns of a λ/4 vertical whip (blue) and the total field of the 2 meter λ/4 mobile helix above perfect ground (red) — typical of the body of a vehicle.

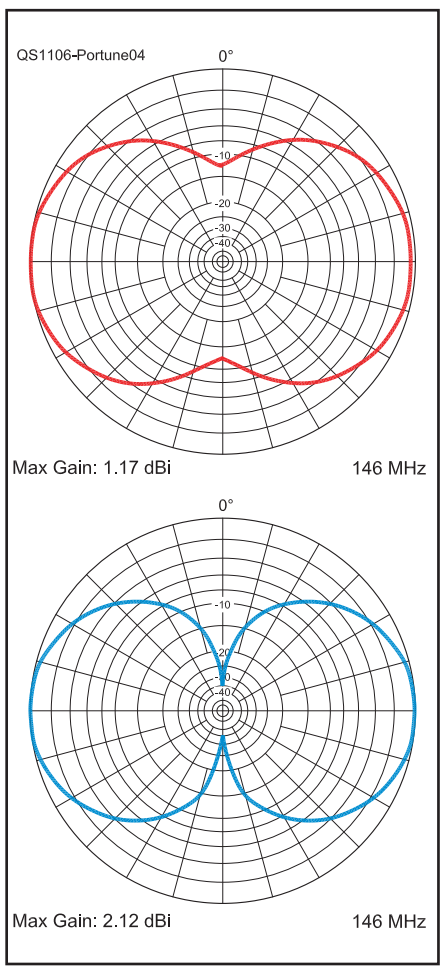


Figure 4 — Free space *EZNEC* elevation radiation patterns of a 2 meter λ/2 vertical dipole (blue) and the total field (red) of two turn λ/2 helix. Note how similar they are. The nulls are slightly shallower for the helix. Gains are normalized, but only differ by less than 0.5 dB.

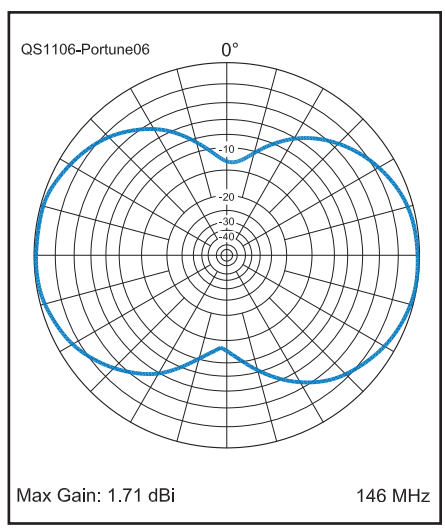


Figure 6 — Free space *EZNEC* azimuth pattern of a 2 meter, two turn λ/2 helix at the horizon. The total field is in blue, vertical component in red, horizontal green. The field of the λ/4 version is almost entirely vertical — good for mobile work.

or horizontally polarized (SSB, CW and AM) antennas equally well. The bad news is that each is down about 3 dB compared to a linearly polarized antenna of a single sense. The circularly polarized component is also suitable for the reception of satellite signals. Figure 6 shows the free space azimuth patterns of the λ/2 helix at the horizon including horizontal and vertical components as well as the total field. Interestingly, the dimensions of the mobile λ/2 version result in the field being almost entirely circular.

Losses

My second question was efficiency. Will one experience high loss with a small helix? As many hams know, small antennas often exhibit considerable lack of efficiency. This is due to low radiation resistance. For example, this shortcoming is common for HF mobile whips and shortened HF beams, in which radiation resistance may be only a fraction of an ohm. In a full sized antenna, however, where radiation resistance is closer to 50 Ω, efficiency is much higher.

Low efficiency is caused by the fact that an antenna's radiation resistance is in series with its conductor and loss resistance. The portion that goes to radiation resistance creates the radio wave. That which goes to conductor resistance is wasted as heat. There is no exception. To give some numbers, if the radiation resistance of an antenna is exactly equal to its conductor resistance, the overall efficiency is only 50%. Half of the power is wasted. In the real world of small antennas, even greater loss is very often the case. For example, a typical coil loaded 40 meter mobile whip antenna is seldom more than 5% efficient.

Fortunately, loss in small helices can be minimized by observing two precautions:

- Use large diameter conductors of low resistance metals — copper or aluminum, not steel, brass or stainless steel. These metals have too much resistance.
- Keep the turns of a helix widely spaced compared to its conductor diameter.

Kraus suggests a turn spacing of at least four times conductor diameter. Closer spacing increases skin effect loss. RF can't flow on the sides of conductors facing closely spaced adjacent turns. This makes the conductors seem smaller and more resistive. Hence, both antennas here have wide turn spacing, 12 times the conductor diameter. In contrast, notice my five turn test helix shown in Figure 7. It has minimum turn spacing.

So the answer to my second question is that small normal mode helices can compare favorably to full sized λ/2 dipoles and λ/4 mobile whips in efficiency.

Figure 7 — My five turn 2 meter test helix, illustrating minimum turn spacing. Note also the ferrite balun.

Hamspeak

Antenna analyzer — Test instrument designed to measure the impedance and standing wave ratio (SWR) of an antenna or an antenna and feed line combination as a function of frequency. See **www.arrl.org/reviews-listed-by-issue**, look for May 2005.

Azimuth pattern — Plot of antenna radiation level as a function of azimuth angle around the antenna. Generally provided at a particular elevation angle.

Bandwidth — The difference between the highest and lowest frequency component of a signal waveform or highest and lowest frequencies passed in a system. In an antenna, the term bandwidth often refers to the difference between the highest and lowest frequency for which the SWR is below an application suitable value, often 2:1.

Boom — Structural portion of many antennas. Used to support the active elements and maintain their relative spacing.

Coax — Coaxial cable. Kind of unbalanced transmission line in which one conductor is a wire in the center of a dielectric with a circular cross section. The dielectric is surrounded by a tubular conductor, often made of flexible braid. In same cable types, the outer conductor is covered by a protective insulating jacket.

Dipole — An antenna often, but not always, center fed with two halves along the same line. Often refers to an antenna with a length equal to half an electrical wavelength. Often a reference antenna and also used as an element of multielement arrays.

EZNEC — Proprietary software program that performs analysis of antenna systems based on the *Numerical Electromagnetic Code (NEC)* antenna modeling engine. There are a number of versions available from **www.eznec.com**, including a reduced size free trial version. Many of the antenna pattern plots used in *QST* articles are generated using *EZNEC*.

FM (frequency modulation) — An operating mode commonly used on ham radio repeaters.

HF — High frequency. That portion of the radio spectrum between 3 and 30 MHz. Often called *short waves*, these frequencies are characterized by long range propagation via ionospheric refraction.

Monopole — Single vertical antenna element, typically a quarter or more wavelengths long. Often used as a transmit and receive antenna, singly or in combination with other similar antennas.

Radiation resistance — Portion of antennas' input impedance that results in transfer of electrical signal into a radiated electromagnetic wave. In general, the higher the radiation resistance, the higher the efficiency will be.

RG-58/U coaxial cable — Coaxial cable type with typically 50 Ω (some variants at 52 or 53 Ω) characteristic impedance and 0.195 inch outer diameter. Compatible with a PL-259 coaxial plug with the use of a sizing adapter.

SWR — Standing wave ratio. Measure of how well a load, such as an antenna, is matched to the design impedance of a transmission line. An SWR of 1:1 indicates a perfect match. Coaxial cables, depending on length, type and frequency can often work efficiently with an SWR of 3:1, sometimes higher. Solid state transmitters frequently require an SWR of 2:1 or less for proper operation.

UHF (ultra high frequencies) — Radio frequencies from 300 to 3000 MHz.

VHF (very high frequencies) — Radio frequencies from 30 to 300 MHz.

Bandwidth

My third concern was bandwidth. My five turn helix, for example, was more efficient but was also had a narrower bandwidth than those with fewer turns. A full sized linear dipole or monopole has a greater bandwidth.

Putting all of this together — efficiency, bandwidth, number of turns and physical size — I concluded that a two turn helix is the best choice for the base station helical antenna, and one turn for the mobile. Due to the reflection of its single turn in its ground plane, the mobile acts as if it also has two turns. These helicals are much smaller than their linear counterparts, but still exhibit acceptable SWR across the band, as shown in Figure 8.

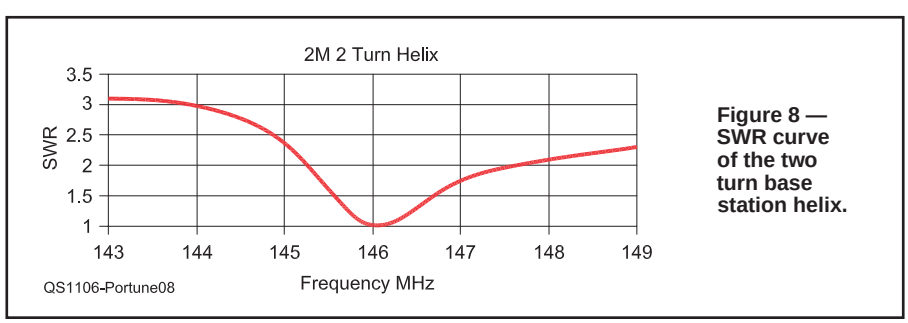


Figure 8 — SWR curve of the two turn base station helix.

Building the Antennas

If these helices are made from common soft aluminum or copper tubing they are almost self supporting. A single length of PVC pipe is sufficient for mounting. For the 2 meter helix I used ¼ inch tubing. For 6 meters use ½ inch tubing. These tubing diameters give acceptable efficiency.

No Hard Dimensions

Unlike full sized linear antennas, which can be successfully built from cookbook plans, there are too many variables in a small helix to allow the same approach. Hence, the dimensions of Figures 9 and 10 are only guidelines. One always arrives at final dimensions during tuneup and with the antenna mounted in its final operating location.

The only fixed starting point is 40 inches of tubing for the base station helix and half that for the mobile. This is close to the free space λ/2 length of a linear dipole. The final total length of my helices ended up close to this. For the mobile version, add an extra inch (21 inches total) to allow for the blind rivet attachment to the aluminum plate — it acts like part of the plate — not part of the antenna.

Constructing the λ/2 Base Station Antenna

Begin by drilling an opposing set of hole pairs, 3 inches apart down the ½ inch PVC mast. See Figures 1 and 9. These maintain the turn spacing. Make them a little larger than ¼ inch to facilitate helix insertion. Also drill the holes on one side slightly lower than on the

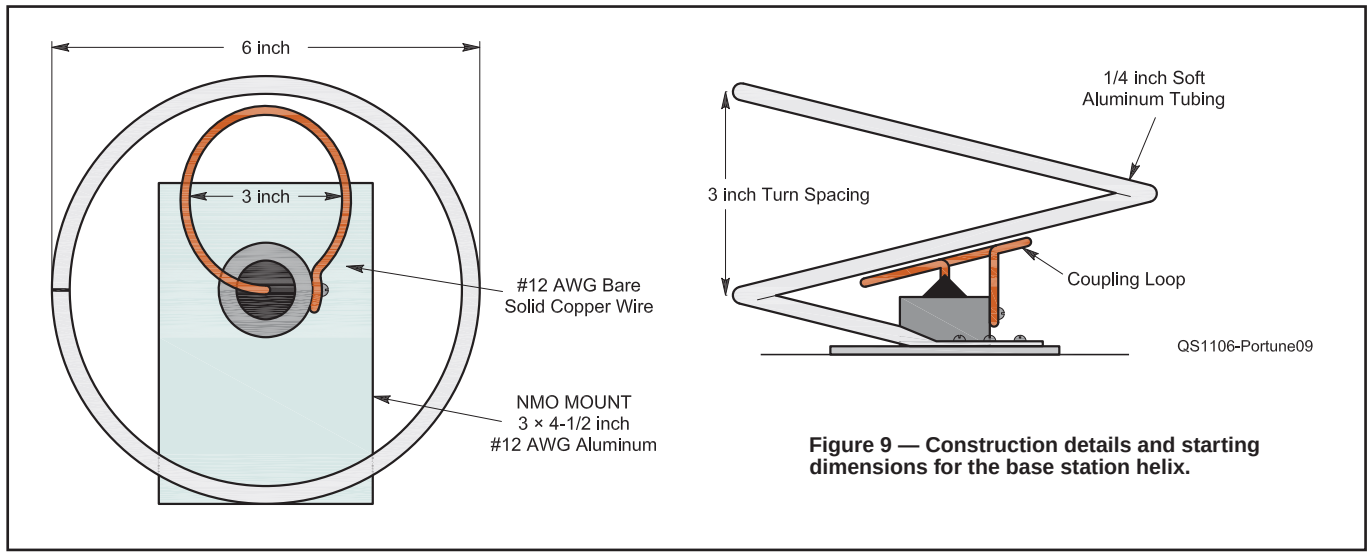


Figure 9 — Construction details and starting dimensions for the base station helix.

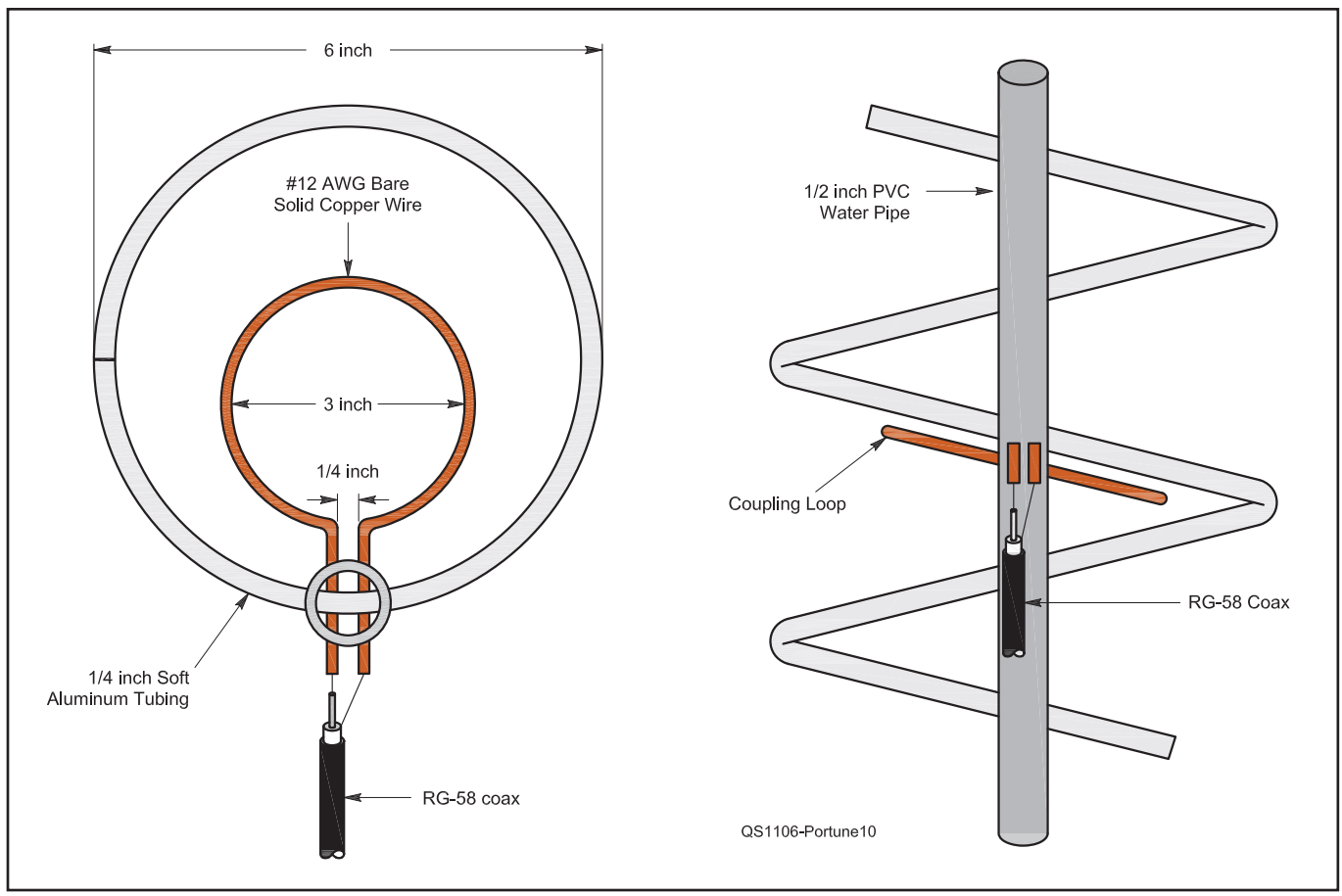


Figure 10 — Construction details and starting dimensions for the mobile helix.

other to accommodate the descending angle of the helix. For lower frequencies you might use black ABS DWV pipe, as it is less expensive and less visible than white PVC.

If you wish, you may wind the tubing around a cylindrical form. I found that I could easily just bend it into shape with my fingers. Again, cookbook precision is not required. You will be able to easily attach it with screws beginning at the top holes.

Constructing the λ/4 Mobile Helix

For the 2 meter mobile I modified an NMO mount and whip. See Figure 2. Other types will also work. Replace the stainless steel whip with solid copper wire for the coupling loop. See Figure 10. You must also ground the top end of the loop. I drilled and tapped 6-32 threads into the side of the mount for a grounding lug.

As illustrated in Figure 2, pop rivet the helix to a small 12 gauge rectangular aluminum plate (roughly 3 × 4½ inches). Make a ⅞ inch hole in it as shown. This permits you to

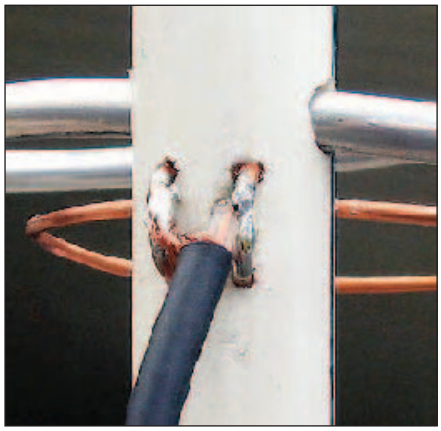


Figure 11 — Base station antenna connection from RG-58 coax to coupling loop. Weatherproof the connection.

slip the entire helix assembly over the threads of the NMO mount and secure it under the screw-on top portion. You might also put sealant under the aluminum plate. Tuneup and matching is the same as for the base station antenna.

It is not necessary to make an electrical connection between the base plate and the body of the vehicle. The plate and the car body form a capacitor through which the RF readily flows. Though if you are conveniently able, use as large a plate as you can. The bigger the better is true here.

Feeding and Matching

The easiest way I've found to match a helix (or a compact loop) to coax is a separate magnetically coupled feed loop as shown in Figure 10. Make it from solid bare copper wire (roughly #12 AWG) or small diameter soft copper tubing. A delta match or gamma match is also practical, but more difficult to build and adjust.

Notice that there is also no electrical connection to the helix. The coax attaches to the ends of the coupling loop only, via a couple of extra inches of the same piece of wire that forms the loop. Pass the ends through holes in the support pipe and secure them in two additional holes. See Figure 11. Weatherproof the connection and the open coax end.

In case you are wondering how loop coupling works, visualize the main helix as a parallel L/C tuned circuit, with link coupling, in a receiver's IF or RF stage. The field around the link excites the tuned circuit, creating a single tuned RF transformer. The same principle is at work with the coupling loop and resonant helix.

Tuning and Matching

The first step is to put the helix on frequency. Only after that will you adjust the coupling loop for a good SWR match. Connect an MFJ-259 or similar antenna analyzer to the coax and first measure the helix's initial resonance, by sweeping the frequency on the analyzer. It is tuned to the frequency giving the lowest SWR. Do not be concerned that is not even close to 1:1 at first.

If the initial resonant frequency of the helix is low, move its turns farther apart on the side opposite the support pipe. Conversely, if it is too high, bring the turns closer together. If after you have tuned the helix to the desired operating frequency, say 146 MHz, and it has become too distorted, make a new longer helix or shorten the existing one.

Now, with the helix on frequency, you may adjust the match. You will discover that the area of the loop, its angle to the helix and the loop's location within the helix all influence the SWR. So again there are no cookbook dimensions. Merely begin with a round loop roughly ½ the diameter of the helix, mounted close to and parallel to the helix. See Figure 9. Adjust loop size and shape, or change its position and angle compared to the helix until you reach a good SWR. In any case always recheck the helix's resonant frequency after making any adjustment to the match. Keep it on frequency at all times.

Finally, a common mode choke or balun is highly recommended for the base station antenna. You can create a choke using a few turns of the RG-58 feed coax wrapped around the support mast. See Figure 1. Secure it through four holes in the mast. Or you can use ferrite beads just below the antenna. See Figure 7. Note also that the coax loops away perpendicular to the helix. This helps keep the radiation pattern symmetrical.

My final conclusions, therefore, for small normal mode helical antennas are these. Except for a slightly smaller bandwidth and a minor reduction in gain, I have found their small size, low profile, stealth properties and circular polarization well worth the minor compromises, so I have several in service.

Notes

[1]J. Kraus, W8JK (SK), *Antennas*, 3rd edition, McGraw-Hill Education.

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

ARRL Member John Portune, W6NBC, received a BSc in physics from Oregon State University in 1960, his FCC Commercial General Radiotelephone license in 1961 and his Advanced class amateur license in 1965. He spent five years in England as G5AJH and upgraded to Amateur Extra class in 1985. John retired as a broadcast television engineer and technical instructor at KNBC in Burbank and then from Sony Electronics in San Jose, California.

John is active on many bands and modes, predominantly from his HF equipped RV mobile station. He has written various articles in ham radio and popular electronics magazines and remains active as a VE team leader, ham license teacher and website designer. You can reach John at 1095 W McCoy Ln #99, Santa Maria, CA 93455, or at **jportune@aol.com**.

Strays

ANNOUNCING THE WINNERS OF THE ARRL VIDEO CONTEST

◊The first prize winner of the ARRL video contest was the father/daughter team of Frank Callaghan, AC2EE, and Becky Callaghan, KC2YZI, of Cresskill, New Jersey for their video *No Communication, No Problem!* Becky Callaghan — who wrote and edited the video — received $250.

Second prize was awarded to Stefan Hein, DL7AOS, of Pliezhausen, Germany. In his video, Hein and his friends erect a 20 meter homebrew Moxon beam antenna in his backyard. He received $100 for his second place video.

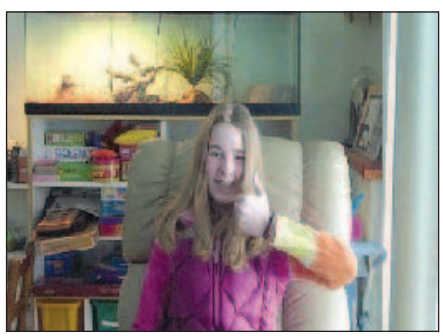
Stan Leschinsky, VE3TW, and Bert Almemo, VE3OUB — both of Scarborough, Ontario, Canada — submitted *CQ WW 160 Contest*. This video won third place and $100.

Fourth place goes to Yogeswaran Umasankar, NY3W, of Taipei, Taiwan, who showed how much fun operating outdoors can be in his video *BVØPC Outdoor QSO*.

For his fourth place finish, Umasankar received $100.

The winning entries were selected by a group of ARRL HQ production and editorial staff members.

All the winning videos can be viewed on the ARRL website at **www.arrl.org/winners**.



The winner of the ARRL video contest was the father/daughter team of Frank Callaghan, AC2EE, and Becky Callaghan, KC2YZI, of Cresskill, New Jersey for their humorous video "No Communication, No Problem!"

Goal Ø Sherpa 50 Solar Battery and Portable Panel

By Sean Kutzko, KX9X
ARRL Contest Branch Manager

Reliable power in the field is a commodity. Whether you're in an emergency situation and need your go-kit up and running or you're a backpack QRPer, you need a rechargeable power source independent of the commercial mains. You need a power source that's potent, rugged, lightweight and reliable.

Goal Ø has developed a line of products with these specifications in mind. Designed to power high-consumption devices used in rugged environments such as on National Geographic expeditions, their line of rechargeable batteries and foldable solar panels seemed ideal for emergency go-kits and for my QRP adventures for the US Islands (**www.usilands.org**) and Summits On The Air (**www.sota.org.uk/**) awards programs.

Pick a Package

While several packages are available, the entry-level "power-in-a-box" kit is the Sherpa 50 Adventure. It includes a Sherpa 50 power pack and the Nomad 13.5 foldable solar panel. The Sherpa 50 Lithium-Iron Phosphate (LiFe) battery is as ruggedly built as any battery I've ever seen; the case feels solid in your hands. It is 8.5 × 6.5 inches and it weighs only 2.2 pounds. It's designed to be recharged between 2000-3000 cycles and is rated at 12V at 4.2 Ah

The compact Nomad 13.5 solar panel is pretty amazing. Weighing in at only 1.5 pounds, the Nomad 13.5 expands to 35 × 10.5 inches and folds up into a 10.5 × 7 × 1 inch package. The Goal Ø website says the Nomad 13.5 can recharge a Sherpa 50 in 6-10 hours, depending on weather conditions.

The battery can be charged with an ac adapter, via the optional solar panel, or by using a dc "cigarette lighter" socket in your car. The Sherpa 50 also comes with a 5 V, 0.5 A USB port for charging compact devices like a smart phone. Adding to the ease of use is that additional batteries or solar panels can be linked together to provide more power or charging capability. Other options include two different types of 3 W LED lamps powered directly from the battery. One lamp is designed for close-in use with a short, flexible cable you can aim in the direction you need, while the other is more of an overhead lamp with a long cord and a custom-designed carabiner that you can hang practically anywhere. All of the lights come with a power-out port, so you can connect several of them in series. Goal Ø offers numerous cable options to power your favorite rig if you don't want to homebrew your own.

Out in the Field

I used the Sherpa 50 Adventure Kit and the overhead light during the January 2011 Winter Field Day. Operating QRP from New Hampshire, I was able to run both my Yaesu FT-817 and my Ten-Tec R4020 *and* the overhead light from a portable location for well over 4 hours while operating "contest style," which involves calling CQ a lot. The solar cell did provide a trickle-charge during my operations, but the conditions weren't very sunny in January, so I imagine I didn't get much power back into the battery. I was able to fully recharge the battery via the Nomad 13.5 solar panel a couple of days later in much better sunlight, but it did take all day (keep in mind that in January sunlight in New Hampshire is in fairly short supply). While the battery does provide an LED status indicator showing how much life is left (in increments of 20%), it would be nice if they offered an optional meter that showed ampere-hour consumption.

The weight of the package was minimal, raising the weight of my backpack QRP station from 5 pounds to 8.5. The average sealed lead-acid (SLA) battery used by a QRPer weighs more than 3.5 pounds and isn't nearly as flexible as the Goal Ø products. Setup is a breeze, thanks to their well-thought-out design. I unpacked my station, connected my rig and the overhead lamp to the battery, connected the battery to the solar panel, threw my dipole in a nearby tree and was making QSOs in less than 10 minutes.

Drawing 1.2 A of current from an ICOM 7000 in receive mode (no transmitting) in the ARRL Lab, the Sherpa 50 lasted just under 5 hours. At home, a fully charged Sherpa 50 battery powered my Yaesu FT-817 for several casual CW QSOs, charged my smart phone and powered their 3W LED overhead light for just under 5 hours before the 817's internal meter noted a drop in voltage.

If you're looking for reliable power in a rugged design, the Goal Ø line is a solid contender. They're not cheap; the suggested list price of the Sherpa 50 Adventure kit is $449.95, plus $49.95 for the overhead LED lamp. However, this is definitely a case in which you get what you pay for. Their products are built like tanks, can withstand some serious operating conditions and will last for a very long time if cared for. I love this power kit and plan on using one in my QRP backpack trips regularly. Visit Goal Ø online at **www.goal0.com**.

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

PRODUCT REVIEW

Alinco DX-SR8T HF Transceiver

Reviewed by Mike Corey, W5MPC
ARRL Emergency Preparedness Manager

For decades Amateur Radio equipment manufacturers have had HF transceivers in their line ups that are designed for operators who are new to the HF bands or have a limited budget for new radios. Alinco's new offering, the DX-SR8T, is their current product designed for this market segment.

The DX-SR8T is a basic, HF only, transceiver that covers the 160 through 10 meter bands (6 meters is not included) and has a general coverage receiver. It is advertised as a "desktop transceiver" but it has a detachable faceplate that makes it suited for mobile operation as well.

The DX-SR8T measures, roughly, 4 × 10 × 10 inches and weighs about 9 pounds. While it does not have the rugged military look and feel of some other radios in this price class it does seem sturdy. The front panel features a large display that measures approximately 3 × 2 inches and is not quite rectangular in shape. There are four knobs on the lower left that control VOLUME, SQUELCH, IF SHIFT and RIT. There are three jacks for MICROPHONE (8-pin round), SPEAKER (⅛ inch) and HEADPHONES (⅛ inch). A cluster of buttons on the right side of the face plate are the multifunction buttons that control most of the rig's other features. It should be noted that the large VFO TUNING knob, although it seems sturdy, is on a plastic shaft and is not secured by a setscrew. This may cause problems if the radio is used in cold conditions or takes any kind of physical abuse.

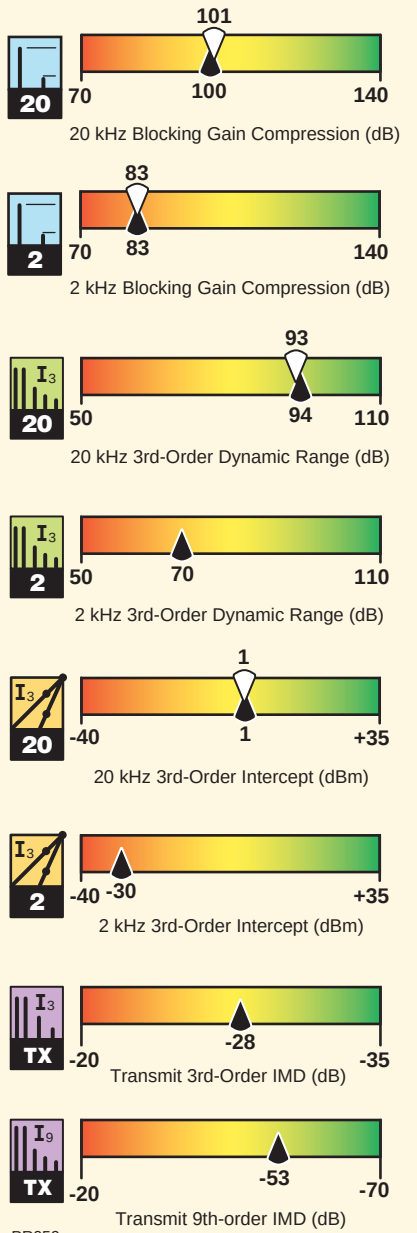
The rear panel is noticeably sparse. There are seven jacks on the back of the radio for ANTENNA, EXTERNAL AMPLIFIER RELAY, ALC, CW KEY, ACC (for the EDX-2 antenna tuner), POWER and GROUND. There are six places on the back that look like they were intended to be jacks, but are covered up. What is unusual compared to other current HF transceivers is that there is no connection for computer control and no accessory jack for a digital mode interface.

The DX-SR8T provides 100 W output on SSB, CW and FM and 40 W output on AM. The power output is not continuously adjustable as it is in most other HF rigs. There are three different power levels that you may choose from. More on this in a bit.

Out of the Box

As with any new radio, the main goal is to get it out of the box and on the air. I borrowed a test devised by another HQ staffer, the "no-manual test." Setting up the radio up was fairly straightforward. I plugged the power cord into the power supply, connected the microphone and key, and hit the

Key Measurements Summary



PR059

Key: * Off Scale
80 M
20 M
Dynamic range and intercept values with preamp off.
Intercept values were determined using -97 dBm reference

Bottom Line

The Alinco DX-SR8T is a low cost HF transceiver that includes a good selection of basic features for the casual operator. There are a few issues to consider, though, if your interests run to digital modes or competitive activities.

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

large orange button marked POWER. The large display lit up and showed a frequency on 20 meters. This test was done on the weekend of the ARRL 10 Meter Contest so the first thing to do was change bands… but how? There were no buttons marked for individual bands or UP/DOWN band buttons. Less than 30 seconds into the "no-manual test" I was going to the manual to find out how to simply change bands.

I initially found that the number pad on the upper right of the face plate is used to select the operating band. Each number corresponded to a band, but they are not marked on the radio. I found on the last page of the manual a diagram of the key pad showing the band assignments. It can be copied and kept with the radio. This seemed a bit awkward.

The next issue encountered was the keyer delay on CW. After I had changed bands to 10 meters I tried sending a quick test on CW. The delay was unusually long, about 2 seconds before the radio switched back to receive. Again going to the manual to find out how to go to the appropriate menu setting I found that the default setting is AUTO. The AUTO setting sets the delay automatically, based on what the radio thinks is appropriate for the code speed being transmitted, but 2 seconds is way too long for my on-air use. A quick adjustment changed this to full break-in. You can also manually set the delay in seven steps for semi break-in operation

Okay, so now up to the phone portion of the band. After just adjusting the CW settings I thought I should double check the SSB settings. First the mic gain…but where is the mic gain adjustment? Nothing on the front or rear panels indicated mic gain. I checked the menu settings, nothing there. Okay, back to the manual. The answer was found on page 85. The mic gain is an internal adjustment. To make the adjustment requires the user to remove the cover from the radio and adjust a variable resistor, VR117. Of course the manual clearly states that this is done at the user's risk and any damage due to the adjustment will void the warranty. It is recommended that the user take the radio to an authorized Alinco dealer for assistance unless you are familiar with radio maintenance.

For routine phone operation it isn't likely that you'll need to make regular adjustments to the mic gain, but digital modes are another story. Making the mic gain adjustment this difficult seems completely unnecessary. Mic gain is not the only adjustment that must be made by opening up the radio; beep volume, sidetone volume and power output in the SUPER LOW setting (0.1 to 2 W) are all adjusted internally. It would be nice if there were a hatch on the top of the case that could be quickly opened to make the adjustments or better still, make these adjustments in a menu setting.

Table 1

Alinco DX-SR8T, serial number M000529

Manufacturer's Specifications	*Measured in the ARRL Lab*
Frequency coverage: Receive, 0.135-30 MHz; transmit, 1.8-2, 3.5-4, 5.3305, 5.3465, 5.3665, 5.3715, 5.4035, 7-7.3, 10.1-10.15, 14-14.35, 18.068-18.168, 21-21.45, 21-21.44, 24.89-24.99, 28-29.7 MHz.	Receive and transmit, as specified.
Power consumption at 13.8 V dc: receive, 1 A (max); transmit, 20 A.	Receive, no signal, default lights, 0.69 A, receive, max volume, max lights, 0.71 A, receive, no signal, no lights, 0.64 A; transmit: 14 A (high), 4.75 A (low), 2.7 A (s-low).
Modes of operation: SSB, CW, AM, FM.	As specified.
Receiver	**Receiver Dynamic Testing**
SSB/CW sensitivity: 10 dB S+N/N, 0.15-1.8 MHz, 1 µV; 1.8-30 MHz, 0.25 µV.	Noise floor (MDS), 500 Hz bandwidth: *Preamp Off* / *Preamp On* 0.137 MHz –112 dBm / –113 dBm 0.505 MHz –126 dBm / –130 dBm 1.0 MHz –126 dBm / –131 dBm 3.5 MHz –132 dBm / –138 dBm 14 MHz –132 dBm / –135 dBm
Noise figure: Not specified.	14 MHz, preamp off/on: 13/10 dB.
AM sensitivity: 10 dB S+N/N: 0.15-1.8 MHz, 10 µV; 1.8-30 MHz, 2 µV.	10 dB (S+N)/N, 1-kHz, 30% modulation, 6 kHz filter: *Preamp Off* / *Preamp On* 1.0 MHz 2.0 µV / 0.98 µV 3.8 MHz 1.0 µV / 0.47 µV 29 MHz 1.0 µV / 0.59 µV
FM sensitivity: 12 dB SINAD: 28-30 MHz, 0.5 µV.	For 12 dB SINAD, preamp on: 29 MHz, 0.28 µV
Blocking gain compression: Not specified.	Gain compression, 500 Hz bandwidth *20 kHz offset Preamp off/on* / *5/2 kHz offset Preamp off* 3.5 MHz 101/92 dB / 85/83 dB 14 MHz 100/91 dB / 87/83 dB
Reciprocal mixing (500 Hz BW): Not specified.	20/5/2 kHz offset: –86/–65/–60 dBc.

ARRL Lab Two-Tone IMD Testing (500 Hz bandwidth)*

Band/Preamp	*Spacing*	*Input Level*	*Measured IMD Level*	*Measured IMD DR*	*Calculated IP3*
3.5 MHz/Off	20 kHz	–39 dBm	–132 dBm	93 dB	+8 dBm
		–32 dBm	–97 dBm		+1 dBm
14 MHz/Off	20 kHz	–38 dBm	–132 dBm	94 dB	+9 dBm
		–32 dBm	–97 dBm		+1 dBm
		0 dBm	–27 dBm		+14 dBm
14 MHz/On	20 kHz	–45 dBm	–135 dBm	90 dB	0 dBm
		–39 dBm	–97 dBm		–10 dBm
14 MHz/Off	5 kHz	–62 dBm	–132 dBm	70 dB	–30 dBm
		–51 dBm	–97 dBm		–28 dBm
		0 dBm	–10 dBm		+5 dBm
14 MHz/Off	2 kHz	–62 dBm	–132 dBm	70 dB	–30 dBm
		–52 dBm	–97 dBm		–30 dBm
		0 dBm	–8 dBm		+4 dBm

Getting Around the Bands

As mentioned earlier, right out of the box changing bands is not intuitive. There is nothing on the front panel that would appear to be a band selection button. In addition to pressing a digit on the numbered keypad as described earlier, there are a couple other ways the operator can change bands.

By pressing the M/KHz button you can change frequency either in band steps, 1 MHz increments, 100 kHz increments or 2.5 kHz increments. This can be particularly handy if changing frequencies within a band, especially large bands such as 10 meters.

The frequency can also be changed by direct keypad entry. Pressing the ENT button, then enter the frequency with no decimals,

Manufacturer's Specifications	Measured in the ARRL Lab
Second-order intercept point: Not specified.	14 MHz, preamp off/on: +61/+59 dBm.
FM two-tone, third-order IMD dynamic range: Not specified.	20 kHz offset, Preamp 2: 29 MHz, 61 dB†
S-meter sensitivity: Not specified.	S9 signal at 14.2 MHz, preamp off/on, 54.3/20.9 µV.
Squelch sensitivity: Not specified.	At threshold: 14 MHz SSB, 0.14 µV; FM, 29 MHz (preamp on), 0.13 µV.
Receiver audio output: 2 W into 8 Ω at 10% THD.	As specified. THD at 1 V RMS: 0.55%.
IF/audio response: Not specified.	Range at –6 dB points, (bandwidth): CW (500 Hz): 474-1154 Hz (680 Hz); Equivalent rectangular bandwidth, 733 Hz; USB: (2.4 kHz): 175-3082 Hz (2907 Hz); LSB: (2.4 kHz): 175-3082 Hz (2907 Hz); AM: (6 kHz): 157-1441 Hz (2568 Hz).
IF rejection, >70 dB.	First IF rejection, 14 MHz, 119 dB.
Image rejection: >70 dB.	Image rejection, 14 MHz, 105 dB.
Transmitter	**Transmitter Dynamic Testing**
Power output: SSB, CW, FM, 1 W (s-low), 10 W (low), 100 W (high): AM, 0.4 W (s-low), 4 W (low), 40 W (high).	SSB, CW, FM, typ 0.6 (s-low), 7.0 W (low), 96 W (high); AM, 0.5 W (s-low), 5.9 W (low), 46 W (high).
Spurious-signal and harmonic suppression: Meets FCC requirements.	Worst case: 57 dBc, 28 MHz, second harmonic, >50 dB.
SSB carrier suppression: >40 dB.	64 dB.
Undesired sideband suppression: >50 dB.	61 dB.
Third-order intermodulation distortion (IMD) products: Not specified.	3rd/5th/7th/9th order (worst case band): HF, 100 W PEP, –28/–35/–40/–53 dB (10 m)
CW keyer speed range: Not specified.	6 to 40 WPM.
CW keying characteristics: Not specified.	See Figures 1 and 2.
Iambic keying mode: Not specified.	Mode B only.
Transmit-receive turnaround time (PTT release to 50% audio output): Not specified.	S9 signal, AGC fast, 102 ms.
Receive-transmit turnaround time (tx delay): Not specified.	SSB, 50 ms; FM, 60 ms.
Composite transmitted noise: Not specified.	Test not performed.‡

Size (height, width, depth): 3.7 × 9.5 × 11.40 inches (including protrusions); weight, 9 lbs;

Price: $650.

*ARRL Product Review testing now includes Two-Tone IMD results at several signal levels. Two-Tone, 3rd-Order Dynamic Range figures comparable to previous reviews are shown on the first line in each group. The "IP3" column is the calculated Third-Order Intercept Point. Second-Order Intercept Points were determined using –97 dBm reference.
†Measurement was noise-limited at the value indicated.
‡Composite noise test equipment would not lock onto transmitted signal.

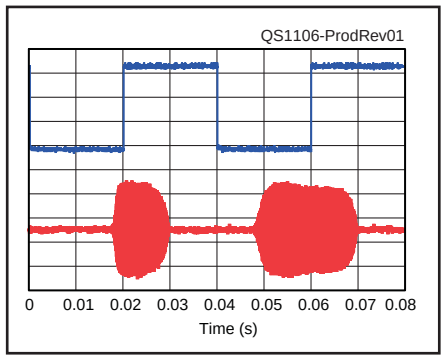


Figure 1 — CW keying waveform for the DX-SR8T showing the first two dits in full-break-in (QSK) mode using external keying and default settings. Equivalent keying speed is 60 WPM. The upper trace is the actual key closure; the lower trace is the RF envelope. (Note that the first key closure starts at the left edge of the figure.) Horizontal divisions are 10 ms. The transceiver was being operated at 100 W output on the 14 MHz band.

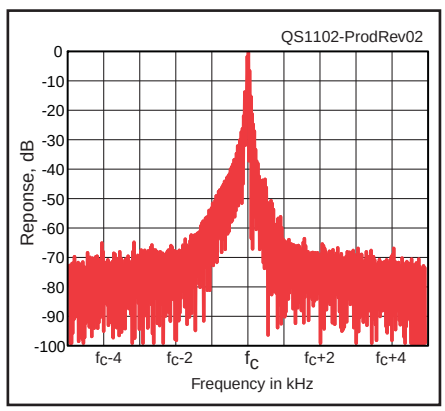


Figure 2 — Spectral display of the DX-SR8T transmitter during keying sideband testing. Equivalent keying speed is 60 WPM using external keying. Spectrum analyzer resolution bandwidth is 10 Hz, and the sweep time is 30 seconds. The transmitter was being operated at 100 W PEP output on the 14 MHz band, and this plot shows the transmitter output ±5 kHz from the carrier. The reference level is 0 dBc, and the vertical scale is in dB.

then press ENT again. The frequency will change but not the mode.

Another way to change bands quickly is by loading frequencies into the memory bank. The DX-SR8T has a very large memory capability — it can store 600 channels in three memory banks. The user can store 10 meter CW in memory 1, 10 meter phone in memory 2, 12 meters in memory 3, 15 meter CW in memory 4, and so on. Doing this will allow the user to change bands and modes quickly (memories can store mode as well as other data) simply by going into memory mode. Once on a memory channel, tuning can still be accomplished by the main tuning knob.

The DX-SR8T also allows split frequency operation. To set up split mode requires a bit more work than on most radios. You must first set up the receive frequency in one VFO and the transmit frequency in the second VFO. There is no A=B feature that will automatically set both VFOs to the same frequency. Once the two VFOs are set you leave the radio on the receive VFO. Then you activate split by pressing FUNC and then 5 on the keypad. While this takes a little bit more time than it does in other radios it can still be set up fairly quickly.

As mentioned before the DX-SR8T has a very large memory system. There are also several features that an operator may find useful. Each memory channel can be programmed with several parameters such as frequency, mode, filter, preamp, AGC, tone and noise blanker setting. The memory

system can also be set up to protect memory channels so a channel does not get accidentally overwritten. Split frequency operation can also be stored into a memory channel. This may be handy for using 10 meter repeaters and for common DX calling frequencies. A seven digit alphanumeric tag may be assigned to a memory channel.

Unlike other radios in this price class the DX-SR8T offers more options when it comes to scanning modes. There are five different scanning modes: band, programmed, search, memory and priority. The scanning modes allow the user to monitor activity on memory channels, frequency bands or a range of frequencies.

Power Output

A rather unusual feature on the DX-SR8T is the RF power output control. The RF power is not fully adjustable. This is fairly common on VHF/UHF transceivers but unusual for an HF transceiver. On SSB, CW and FM you can set the power out to HI (100 W), LOW (10 W), or S-LOW (1 W) and for AM HI (40 W), LOW (4 W), and S-LOW (0.4 W). On the 60 meter channels, HI is 50 W.

Lack of adjustable transmit power could present some challenges to the operator. If you want to operate QRP for instance, which is generally considered to be 5 W out, then your only QRP option with this radio is S-LOW, which is nominally 1 W out but can be adjusted from 0.1 to 2 W with an internal control. You would need an external amplifier to get to 5 W.

The power output options will also be a factor when using an external RF power amplifier. Most modern amplifiers that use ceramic tubes typically need 50 to 60 W drive and cannot be driven at 100 W. Driving them with 10 W will produce much less than advertised power out. It is possible to permanently change the HI power output from 100 W to 50 W by soldering an internal jumper.

The DX-SR8T provides relay and ALC connections for use with a linear amplifier but the manual does not give many details on using an external amplifier. If you do intend to use an amplifier with this radio make sure you know how much drive power your amplifier can handle.

This power output scheme will also have to be taken into consideration for digital mode operation, as discussed later.

CW Operation

The DX-SR8T has several features that CW operators will find useful. There is a built in electronic keyer that can be set from 6 WPM to 40 WPM. It can be set to semi or full break-in mode with delay selectable as described previously. During full break-in operation, the TR relay is quite noisy, but the noise can be minimized by using headphones. Weighting is adjustable.

In the ARRL Lab, Test Engineer Bob Allison, WB1GCM, found that the keying characteristics vary with keying speed. At a speed of 40 WPM, the first dit is slightly shortened and the leading edge of the waveform is nicely rounded. When you lower the code speed, the leading edge of the waveform loses roundness and develops a spike. Below 20 WPM, the power spike becomes more apparent and appears on all dits. This occurs with full or semi break-in with external or internal keying.

The included IF filter seemed to work well during crowded band conditions such as those I encountered during the January North American QSO Party CW contest. I found that the filter was most effective when used with the IF shift. There are also two CW modes to select from, CWU and CWL. These two modes utilize the upper or lower part of the sideband respectively. The DX-SR8T also has an adjustable sidetone and sidetone monitoring feature for CW. The sidetone and CW offset can be adjusted between 400 and 1000 Hz in five steps. The sidetone monitor can be used to properly tune ("zero beat") a received CW signal.

Digital Modes

The manual clearly states that there are no dedicated connections for RTTY. However, if you do want to use the DX-SR8T for digital mode operation you can connect a sound card interface to the radio's microphone and speaker connection on the front of the radio, making AFSK RTTY, SSTV and other digital modes possible. The manual provides microphone pin configuration information and basic instructions on how to set the radio up for use with a sound card interface.

During the review I tried the radio out on RTTY using a homebrewed sound card interface during the 2011 ARRL RTTY Round Up. Setting up the radio, interface, computer and software was pretty straightforward. On receive the built-in IF filter and IF shift seemed to help with the crowded band conditions. There was one problem encountered though. With the speaker jack being used to get audio out from the radio and into the computer it made monitoring receive audio impossible. When headphones were plugged into the headphone jack it shorted the speaker jack and the computer received no audio. This problem can be fixed by using a Y adapter on the speaker jack, using computer speakers, or taking the audio out from the headphone jack and using a Y adapter and headphones.

Another factor the operator must be kept in mind when using the digital modes is that the RF power out on the DX-SR8T is not continuously adjustable, as discussed earlier. The two digital modes you will likely try when new to HF operation are RTTY and PSK31. On RTTY, where a strong signal is needed for reliable communication, you would most likely select 100 W and for casual operating this would likely be okay. RTTY is a full duty cycle mode, though, so continuous operation at full power might cause the radio to overheat. (The manual does not discuss time limits for high duty cycle modes.)

PSK31 generally works well with lower power levels, so it is common to adjust the RF out to about 35 to 50 W, sometimes less. Using 100 W would be too much and possibly interfere with nearby stations. Using 10 W could work but may not be enough. A 50 W choice would be useful. It may be possible to compensate with the sound card's adjustable output level, depending on the configuration used. Another potential snag for PSK31 operation is that the DX-SR8T has no provision for ALC metering to help you set the drive level for a clean signal.

The PLL Circuit

During lab testing of the radio, Test Engineer Bob Allison, WB1GCM, discovered that the PLL circuit in the DX-SR8T is heat sensitive. While attempting to do the composite noise test on the radio, he observed that after 25-30 seconds of continuous key down in CW mode, a noise appeared on the waveform, making the test impossible to complete. Received signals were also affected with a noticeable warble similar to aurora. This issue, although noticed in CW mode, could cause problems for digital modes such as RTTY and PSK31.

Alinco engineers investigated and informed us that the cause of the problem that air blowing from the fan hits the PLL chip causing a "delicate vibration" and thereby oscillation in the CW carrier. Bob Allison confirmed that the warble is caused by warm air turbulence generated by the fan, which kicks on when the radio warms up. With the fan stopped, Bob could blow air past the fan blades and cause the transmitted signal to warble.

Alinco's suggested fix was to place a small piece of vinyl tape over the PLL chip. To do this though requires not only opening up the radio but removing even more small screws to get to the chip. Bob followed Alinco's instruction and noticed that the observed warble was lessened but not entirely eliminated. According to Alinco, radios currently shipping will have the tape applied.

Other Noteworthy Points

The manual is well written and easily understood. It is definitely written with the new

operator in mind. Throughout the manual it gives exercises for the user to try, practical tips and clear step by step instructions. The last page of the manual has two cut out cheat sheets that provide information on the key pad assignments and the Parameter Setting Mode (Menu).

The radio does have several other features that are found in other radios in the price class and above, including a noise blanker, CTCSS tone encoding/decoding and speech processor. The radio's built-in IF filter, IF shift, BFO reverse and RF attenuator offer the user several ways to tackle bad band conditions and interference. It also has FM capability and a quick offset feature for using 10 meter repeaters.

There are noticeably few optional accessories for the DX-SR8T. Alinco offers the EDX-2 automatic antenna tuner, the EDS-17 extension kit for the detachable faceplate, two optional microphones, and a power cord. Options that are available for other radios in this price class such as programming software, high stability oscillator (TCXO) or DSP noise reduction are not available for the DX-SR8T.

Conclusions

There are several things about the DX-SR8T that could be improved. It would be nice to have the RF power output fully adjustable. This would give the operator more options on QRP, make it easier to use an external amplifier and improve digital mode operation. It doesn't make any sense to have only three power output settings. Likewise it does not make sense to have the user make internal adjustments. These should be made in the menu or there should be easier access to them. The lack of computer control and an accessory jack for digital mode interface connections seems unusual, although not all operators want or need these features. And the bands should be marked on the keypad, but this is a minor point.

That being said there are many features the user will enjoy. Inclusion of IF filters, a redesigned hand mic, and a simplified, straightforward front and rear panel are nice.

A firmware change is available from Alinco's website that adds a menu parameter to swap the functions of the SQL/IF and RIT knobs, moving the RIT knob farther from the TUNING dial. Read the instructions carefully, as this change is not reversible.

If your main interest is listening on the bands and casual SSB and CW operation without spending a lot of money, then the DX-SR8T deserves consideration. Overall it is easy to see that if you are even marginally serious about contesting, DXing or digital modes this is not the radio for you. Features for those activities and much better receiver performance are available in radios a step or two up in price. Radios in the DX-SR8T's price class are often desirable for emergency communications because of their affordability and ease of use, but this radio is not that easy to use until you have read the manual and gained some experience with it. This radio is functional as an HF transceiver and will get you going on all the popular modes, but it has some quirks and shortcomings that may leave the operator frustrated and wanting more for the money spent.

Manufacturer: Alinco Inc, Yodoyabashi Dai-Bldg 13F, 4-4-9 Koraibashi, Chuo-ku, Osaka 541-0043 Japan; **www.alinco.com**. *US Distributor:* GRE America Inc, 425 Harbor Blvd, Belmont, CA 94002; tel 650-591-1400; fax 650-591-2001; **www.greamerica.com**.

TYT TH-UVF1 Dual Band Handheld Transceiver

Reviewed by Dewey Rykard II, KI4RGD
ARRL Educational Correspondent
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We've all seen the new Chinese handheld radios on the market. Most of them are priced lower than their competitors and offer great features. I have been very tempted to buy one, but was not sure how they would perform. Luckily, I was asked to review one of these neat little radios, the TYT H-UVF1, a dual band VHF/UHF handheld.

The TH-UVF1 has a good set of basic features. The dual band handheld works on one band at a time and offers 128 memory channels. Its extended receive coverage includes an FM broadcast band receiver covering the frequency range 70 to 108 MHz, the FM broadcast band in China. The radio also offers scan and priority scan functions, VOX and a voice prompt. To see the complete list of features for the TH-UVF1, visit the manufacturer's website, **www.tyt888.com**.

Early versions of the TH-UVF1, including the review radio, included a scrambler function that is not legal for use by Amateur Radio operators. We understand that this feature has been disabled in current units.

What's in the Box

The box contains several items: the transceiver, a flexible rubber antenna (about 7 inches long) with SMA connector, an owner's manual, a belt clip with strap and a drop-in charger base. The dealer included a car cigarette adapter for the charger base as a special promotion. TYT offers a few accessories, including a speaker/mic, programming cable/software and mobile battery eliminator. The battery eliminator plugs into the auto's cigarette lighter socket and has an adapter on the other end that replaces the transceiver's battery pack. This is the only provision for using an external power source.

The TYT TH-UVF1 has a nice feel. It fits in the hand very well and has a nice weight. It stands almost 4½ inches tall (without the antenna) by 2¼ inches wide. The Li-ion battery is easy to release from the back. The radio case is constructed of a high density plastic, similar to most other radios on the market.

The radio has one knob on top that turns the unit on and adjusts the volume. The PTT (push to talk) button is on the left side (looking at the front of the radio). Right below the PTT is a small MONI button that opens the squelch and beneath that is a red CALL button. On the right hand side of the radio is a small panel that can be pulled open to reveal two jacks for the optional external speaker/mic.

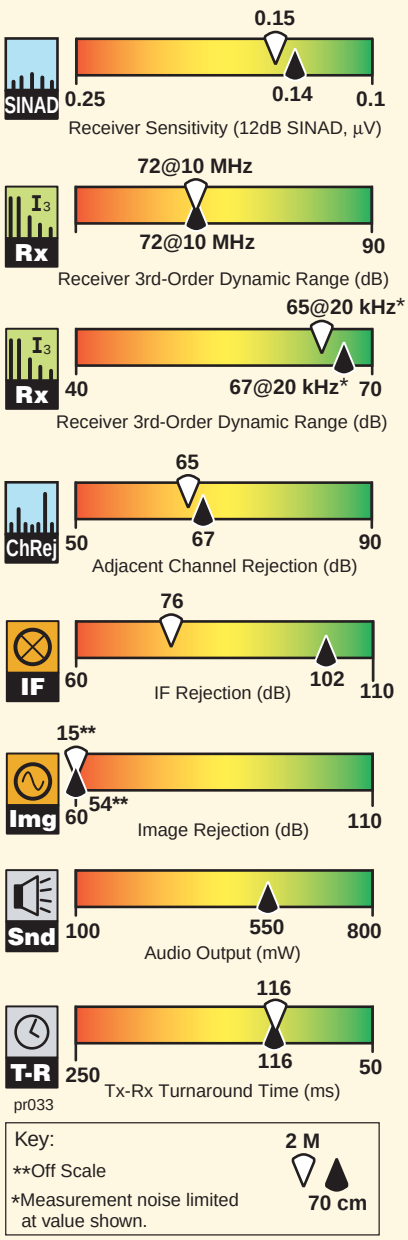
The front of the radio is laid out similar to other popular handheld radios. The front-firing speaker is above the 1 × ½ inch LCD display. The keypad has 0-9 numbers with (*) and (#) function keys. There is a bright red MENU key along with UP/DOWN arrow keys and a U/V key. These will be discussed later in the review. Of course each number key also serves a separate function, for example, the #5 key helps to control the SQUELCH setting (accessed by pressing MENU and the number). All in all the aesthetics of the radio look just fine.

Turning the radio on revealed a nice amber display with two frequency rows (VHF and UHF). A small arrow indicated which row was in receiving mode. Using the U/V button, you can easily switch between the two rows. You can change the color of the display from amber to blue or light purple. I liked the blue.

Learning to Use the TH-UVF1

The owner's manual is small, about the size of a CD case book insert. The manual has 42 pages that describe the features of the

Key Measurements Summary



Bottom Line

The TYT TH-UVF1 dual band handheld offers a good basic feature set at a nice price. The user interface and instructions need work, but the radio works well once you have figured out how to program and use it.

Table 2

TYT TH-UVF1, serial number 1007A30405

Manufacturer's Specifications	Measured in the ARRL Lab
Frequency coverage: Transmit, 144-148 and 430-450 MHz; receive, 70-108 (WFM), 136-174, 245, 350-390 and 400-520 MHz.	Transmit, 144-148, 430-450 MHz; receive, 136-173.995, 400-469.995 MHz, 70-108 MHz (WFM).
Modes: FM, FM narrow.	As specified.
Power requirements: 7.2 V dc (battery only).†	Receive, battery power, 258 mA (max volume, no signal, lights on), 84 mA (standby, lights off), 54 mA (power save on); transmit, 146 MHz, 1.56 A (high), 0.56 A (low), 440 MHz, 1.52 A (high), 0.83 A (low) at 8.3 V dc (full charge).
Receiver	***Receiver Dynamic Testing***
FM sensitivity: 12 dB SINAD, < 0.18 µV.	For 12 dB SINAD, 146 MHz, 0.15 µV; 162.4 MHz, 0.18 µV, 440 MHz, 0.14 µV.
FM two-tone, third-order IMD dynamic range: Not specified.	20 kHz offset: 146 MHz, 65 dB*, 440 MHz, 67 dB*; 10 MHz offset: 146 MHz, 72 dB, 440 MHz, 72 dB.
FM two-tone, second-order IMD dynamic range: Not specified.	146 MHz, 67 dB, 440 MHz, 103 dB.
Adjacent-channel rejection: Not specified.	20 kHz offset: 146 MHz, 65 dB, 440 MHz, 67 dB.
Spurious response: Not specified.	IF rejection, 146 MHz, 76 dB, 440 MHz, 102 dB; image rejection, 146 MHz, 15 dB, 440 MHz, 54 dB.
Squelch sensitivity: Not specified.	At threshold, 0.1 µV; 0.27 µV (max).
Audio output: >0.5 W.	0.55 W at 10% THD into 8 Ω (external speaker). THD at 1 V RMS, 1.7%.
Transmitter	***Transmitter Dynamic Testing***
Power output: VHF, 5 W, UHF 4 W.	146 MHz, 5.4 W (high), 0.75 W (low), 440 MHz, 3.6 W (high), 1.1 W (low) at 8.3 V dc (full charge).
Spurious signal and harmonic suppression: >60 dB.	146 MHz, 45 dB, 440 MHz, 54 dB, meets FCC requirements.**
Transmit-receive turnaround time (PTT release to 50% of full audio output): Not specified.	Squelch on, S9 signal, 116 ms.
Receive-transmit turnaround time ("tx delay"): Not specified.	146 MHz, 56 ms, 440 MHz, 58 ms.

Size (height, width, depth): 2.2 × 4.5 × 1.2 inches (not including projections); weight, 9 oz.

Price: $130. USB cable and programming software, $20.

†7.4 V, 1500 mAh Li-ion battery, drop-in charging base and ac adapter supplied. Replacement battery, $22. Cigarette lighter adapter for charging base, $10. Mobile battery eliminator, $15.
*Measurement was noise limited at the value indicated.
**Spurious output, worst case (low power), did not exceed 25 µW.

radio, the warranty, the MENU options, how to change the MENU settings, accessories and a section on "Optional Signalings."

Most of the manual introduces each of the 34 MENU items and then follows with explanations of how to either turn each function on/off and how to adjust the settings. The manual does little to explain what each function does — that is left up to the operator to figure out on their own. I had trouble understanding how to use some of the different functions. If you have successfully used other handheld radios, programmed memory channels and banks, entered CTCSS tones and so on, then you should be able to figure out the TH-UVF1. If this is your first time operating a handheld radio, some of these instructions might as well be written in Greek.

As we were completing the review, we learned that Nifty Ham Accessories (**www.niftyaccessories.com**) now makes a handy Quick Reference guide for the TH-UVF1. This laminated reference folds down to wallet size and includes step-by-step instructions for using the radio's various features. Given the radio's poorly written instruction manual, the Nifty reference card is good news.

You can download support software from the manufacturer's website by going to **www.tyt888.com**, or you can purchase a USB programming cable along with the software on a CD as I did. The optional software really helps programming go faster. Opening the program is fairly easy once it has been downloaded to your computer. You will need to choose a COM port for the program to "talk" to your radio. I have a three year old HP Pavilion with *Windows Vista* and everything worked just fine. Next, just choose your favorite repeaters, enter receive and transmit frequencies (keep in mind the + or – offset frequency), any CTCSS access tones, transmit power level and even a channel name. I programmed a few of my local repeaters within just a few minutes and downloaded them to the radio.

How Does it Play?

Once you program your favorite repeaters, you will need to toggle between MANUAL mode and MEMORY mode by pressing and holding the U/V button. This function was explained to me by the ARRL Lab team since the owner's manual did not mention this step. I also discovered that a full reset of the radio can be accomplished by turning the radio on while pushing the MENU button. Be careful when toggling between MEMORY and MANUAL modes that you don't accidentally press the MENU button instead (which is right next to the UP arrow key). Don't ask me how I know this. Luckily, a friendly voice will ask you if you want to reset the radio before applying this function. Pressing the U/V button will allow escape from any function.

With my favorite repeaters now programmed into the radio I was able to cycle through them fairly easily by using the UP/DOWN arrow keys and after transmitting my call sign, the radio's front firing speaker sprang to life. The speaker sounded fine as our local repeater identified itself. Almost immediately I was in a contact with another ham. The audio report was a bit nasally, but completely readable. Next, I brought up several other repeaters, one 20 miles and the other 30 miles away. Of course I was using full power (5 W). Both repeaters sounded great considering the distance. I half expected to hear a lot of static, which was not the case.

I enjoyed the FM broadcast receiver function. It can be toggled on and off by pressing the MONITOR button while holding the MENU button. While enabled, broadcast reception is interrupted by activity (such as a friend calling on the local repeater) on the previously tuned frequency or memory channel. Once on-channel activity quiets down, FM broadcast returns automatically.

Lab Notes

In the Lab, most of the measurements were as expected for a current dual band handheld with extended receiver coverage. A few measurements stood out, though.

The radio barely met FCC spectral purity requirements on 2 meters at the low power setting. Most VHF transceivers we've reviewed recently have spurious signal and harmonic suppression of 70 dB or more on 2 meters.

Reception in the "narrow band" mode did not improve adjacent channel rejection. In fact, the noise heard (without any adjacent signal) is higher and speaker audio tended to cut out at times.

Image rejection on the 2 meter band is only 15 dB. There was no specified IF frequency, but the Lab found it at 38.850 MHz. That means for 146 MHz, there's an image frequency at 223.7 MHz so you might experience interference from 1.25 meter signals depending on activity in your area.

Final Thoughts

If you can get past the lack of information and explanations in the owner's manual, the TYT TH-UVF1 dual band radio is a good performer. It did everything I needed it to do for accessing local repeaters in south Georgia and north Florida. Of course, I had also procured the software and USB cable to help in programming. The radio offers a wide range of features for its price. The FM broadcast feature is fun; however, you will have to turn this feature off before switching back to either MANUAL or MEMORY modes. I should also point out that in MANUAL mode, the scan function seems quite slow. Recently TYT made some changes to increase scanning speed and fix a problem with scanning memory channels with alpha tags. There is also a new option for tuning in steps of 7.5 kHz.

While the price might make this radio attractive to the "inexperienced new ham" buying a first radio, I didn't find the user interface intuitive and was frustrated by the poor owner's manual. The Nifty Quick Reference and programming software can help. I would recommend this radio for someone who has a lot of patience and/or a ham who has successfully played with handheld radios before.

For the price of most single band radios, the TYT TH-UVF1 offers a dual band package — all too tempting for some. Accessories won't break the bank either. Lastly, I certainly hope that TYT will improve its owner's manual, which will really make this radio shine.

Thanks to Bob Allison, WB1GCM, in the ARRL Lab and Bill Simpson, N1JBS, of Lentini Communications for their help with this review.

*Manufacturer:*TYT Electronics Co Ltd, Block 39-1, Optoelectronics-information industry base, Nan'an, Quanzhou, Fujian, China; **www.tyt888.com**.

New Products

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W1ZR

THE DOCTOR IS IN

Q Scott, N6PG, asks: In the March 2011 column, you answer a question regarding the use of RG-6, 75 Ω coax. I don't understand your statement: "If there is no tuner, you may find that you have to adjust the line length to make it work on some bands, since many transmitters start 'folding back' at an SWR of around 2:1." I thought that the load mismatch to the characteristic impedance established the SWR. It was my understanding that as one travels along the feed line, the resistance appearing will go up and down, but the SWR along the line will still be the same.

A You are absolutely correct that the SWR on the cable stays the same — except it appears to be slightly reduced by any loss. So if the SWR on the 75 Ω cable is, let's say 2:1, at the lengths at which the impedance is resistive, the resistive impedance will be 75/2 = 37.5 Ω and ¼ wave farther 75 × 2 = 150 Ω.

Those impedances are both exactly 2:1 on the 75 Ω transmission line. Unfortunately, the transmitter doesn't know what kind of line you are using — it is looking for a 50 Ω load. In most cases it will tolerate perhaps a 2:1 SWR with respect to 50 Ω.

From the transmitter's perspective, the 150 Ω it might encounter will look like a 3:1 SWR. If you change the length so it presents a 37.5 Ω load, the radio thinks it's a 1.3:1 SWR. Other lengths will have complex loads all with a 2:1 SWR on the 75 Ω cable, and all looking like 3:1 or less to the 50 Ω transmitter. In this way, the length of line changes the apparent SWR as seen by the transmitter — even though the 75 Ω SWR is a constant 2:1.

This is strictly the case resulting from using a transmission line with a characteristic impedance different from the transmitter's design load. This, by itself, is not a problem — one just needs to understand the implications.

Q Joe, K9DMV, asked (at the Wheaton, Illinois hamfest live "Doctor" session): What are the differences between two technologies of balanced antenna tuners — the E. F. Johnson Matchbox tuners of the 1950s and the current crop of balanced antenna tuners?

A The configuration of the E. F. Johnson tuners was that of a link coupled parallel tuned circuit — similar to the output circuits of early transmitters from almost the very beginning of radio. This circuit arrangement (see Figure 1) was commonly used to feed balanced antenna systems. The circuit was tuned to resonance, generally using plug-in coils. Johnson, however, added bandswitching aligning to the bandswitching radios of the period. In the traditional tuner arrangement, the antenna connections were moved in and out on the coil until a match could be obtained — a variable impedance arrangement.

Johnson's major improvement was to add a differential variable capacitor across each half of the coil to simulate moving the tap position — eliminating the need to manually move taps around every time you changed bands or antennas. This made for a very convenient operating situation. No coils or taps needed be changed — as easy to tune as your bandswitched transmitter.

The current balanced antenna tuners generally use a balanced, L or T network that is variable over the entire range of values (see Figure 2). This allows coverage of a wider range of frequencies (we have more HF bands to tune now than in the '50s) and usually a wider range of impedances.

In ARRL Lab testing, we found that if a load could be matched with a Johnson tuner it had comparable or better loss performance than many current tuners. The range of loads that it would match, however, was somewhat less.[1] In addition, the '50s vintage Matchboxes were not designed for

[1]J. Hallas, W1ZR, "Product Review — A New Generation of Balanced Antenna Tuners," *QST*, Sep 2004, pp 60-66.

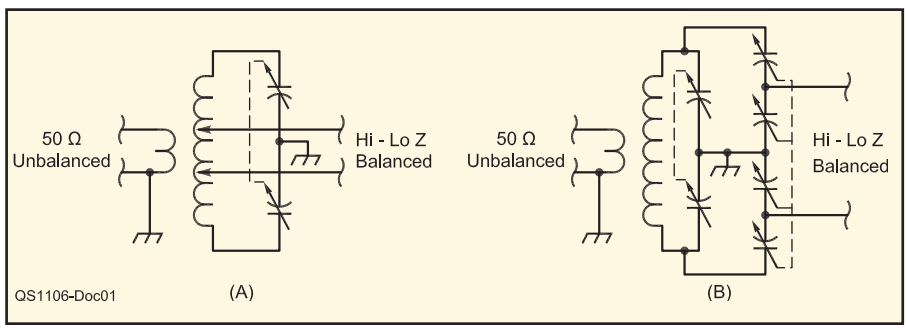

Figure 1 — At A, the traditional tank circuit based antenna tuner from before WW2. The position of the output taps is adjusted to match the load impedance. At B, simplified (bandswitching not shown) circuit of a '50s era E. F. Johnson Matchbox antenna tuner. The differential capacitor on the output sides acts like moving the taps.

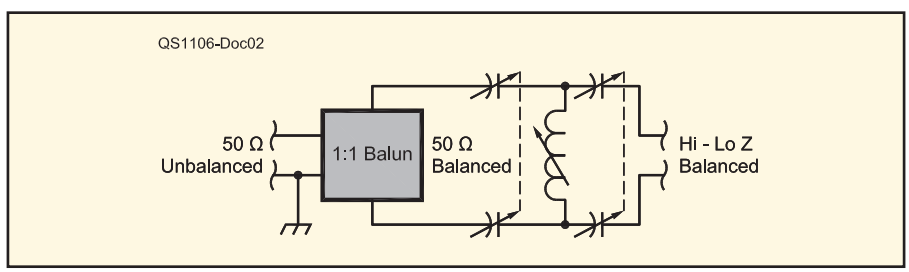

Figure 2 — Typical continuously adjustable balanced T network antenna tuner.

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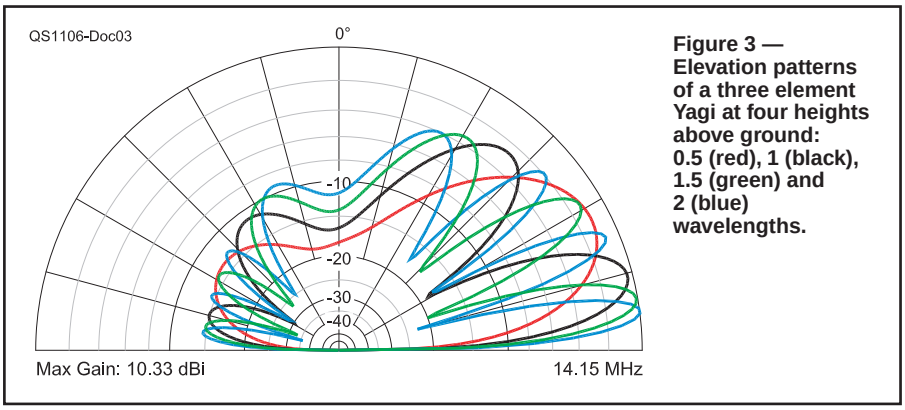

Figure 3 — Elevation patterns of a three element Yagi at four heights above ground: 0.5 (red), 1 (black), 1.5 (green) and 2 (blue) wavelengths.

Table 1

Peak Elevation Angle and Elevation Beamwidth versus Antenna Height

Height (wavelengths)	*Height (feet at 20 M)*	*Peak Elevation Angle (°)*	*Elevation 3 dB Beam Range (°)*
0.5	33	28	13 to 47
1	66	14	7 to 23
1.5	99	10	4.9 to 15
2	132	7	3.7 to 11

160, 30, 17 or 12 meters. Some loads can be matched on 12 meters using the 10 meter position, and some 17 meter loads may be matchable using the 20 or 15 meter bandswitch positions, but it's catch as catch can.

The Johnson Matchbox tuners are still popular items often available at flea markets or auction sites. There were two basic models, a "275 W" and a "kW" version. Note that the ratings were based on the way transmitter power was specified in the '50s — dc power *input* for the typical AM transmitter. We now rate transmitters based on PEP output. Thus, 275 W dc input would correspond to about 190 W AM carrier output, or 770 W PEP. Similarly, the kW model should be able to handle about 2.5 kW PEP. In each size, there were variants with and without SWR metering.

Q Henry, KB1QU, asks: I am putting some antennas up at my summer camp on a lake in the Maine woods. The location is surrounded by dense forest with trees around the shack towering to over 100 feet. I read somewhere that trees and foliage are invisible to RF, but it sure seems that it would be nice to get my HF beam up above the canopy. On the other hand, I would prefer not to shell out the bucks for that much steel. What do I lose, if anything, by having the antenna below the tree line? If it is necessary to get above the trees, would it be better to site the tower 150 feet up the hill where the trees are only 60 feet high and accept the cable losses of a longer coax run?

A Everything I have heard suggests that foliage does not interfere with HF operation (but does significantly on 2 meters and above). The height of a Yagi then becomes more a question of desired elevation angle. Over typical earth, a single Yagi will have an elevation pattern as shown in Table 1 and Figure 3.

Note that as the height increases, the first elevation lobe gets lower and narrower and additional elevation lobes appear. The lower elevation angles provide for better propagation at longer distances, but have the disadvantage of having nulls in the elevation pattern. Having the tower up the hill is a lot like having a higher antenna, and may well be worth the small extra loss if you use good coax, especially at HF.

Q Henry also asks: I plan to also have an HF vertical. Should I put the vertical in the lake? I know that salt water makes a great ground plane, but wouldn't radials in fresh water also be good? It is my subjective impression that the vertical at my home location performs better when a snow or rainstorm comes through during a contest and the ground becomes saturated with water.

A While pure fresh water is an insulator, most water isn't that pure and will be at least somewhat conductive due to the impurities. The water will thus likely decrease your ground resistance. If you have a decent ground system, however, there isn't a lot of room for improvement here. See Rudy Severns' great article about grounds in *QST* for March 2010.[2]

Hamspeak

Antenna tuner — Device that sits between an antenna and a transmission line, or a transmission line and a radio, and transforms the impedance to match the radio or line.

L network — Two element, generally passive circuit, with one series element and one shunt element. The circuit diagram is reminiscent of the letter "L." Such networks can be composed of resistors and used as attenuators, or inductors and capacitors used as filters or impedance matching networks.

PEP (peak envelope power) — The average power supplied to the antenna transmission line by a transmitter during one RF cycle at the crest of the modulation envelope taken under normal operating conditions.

SWR — Standing wave ratio. Measure of how well a load, such as an antenna, is matched to the design impedance of a transmission line. An SWR of 1:1 indicates a perfect match. Coaxial cables, depending on length, type and frequency can often work efficiently with an SWR of 3:1, sometimes higher. Solid state transmitters frequently require an SWR of 2:1 or less for proper operation.

T network — Three element, generally passive circuit, with two series elements surrounding a single shunt element. The circuit diagram is reminiscent of the letter "T."

The folks who get the best improvement from being next to a salt water beach are those trying to contact in the direction of the salt water path. Here the water reflection (completely independent of efficiency due to ground loss resistance) is in phase at very low angles. This is a geometric effect and relatively easy to compute depending on the position and size of your pond compared to the path. It takes quite a few wavelengths in front of the antenna to make a difference at the very low angles.

Many folks confuse the effects of ground resistance on efficiency and more distant ground reflection on propagation angle. While both are related to conductivity, the first is a function of the ground within about a half wavelength of the antenna base, while the second depends on the ground conditions at some distance.

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

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

NØAX

HANDS-ON RADIO

Experiment 101
Rotary Encoders

Look behind the front panel of most commercial radios and you won't find a fat harness of wires running to multiple variable resistors. You're far more likely to encounter the subject of this month's column — rotary encoders.[1] With nearly every adjustment now performed under the control of a microprocessor it's logical (so to speak) that the controls should be digital, too. And since the encoders are what you put your hands on, what better topic for this column?

Encoder Types

The word *encoder* is used for more than one purpose — you may be more familiar with a *tone encoder* that generates DTMF or CTCSS audio tones for controlling repeater systems. The rotary or shaft encoder we'll discuss here translates rotary mechanical motion into a digital code representing the motion of the shaft.

Mechanical encoders use a disc with a circular pattern of metal strips that make contact with sliding contacts. The disc is mounted to a rotating shaft so that as the shaft turns, circuits are opened and closed to form the digital bits. Mechanical cams are also used to open and close switches. *Optical encoders* substitute phototransistors for sliding contacts (see Figure 1). A plastic *interruptor disc* replaces the strips and contacts with patterns of opaque and clear areas that turn the phototransistors on and off. In both cases, the encoder uses an array of two or more switches to create the on-off pattern representing the shaft's motion or position.

Regardless of whether the switches are optical or mechanical there are two families of encoders. The on-off configuration of the switches in an *absolute encoder* represents the exact position of the shaft as it rotates, whether it is moving or not. In an *incremental encoder* the switches only indicate whether the shaft is moving and if so, in what direction. For both types of encoders, it is up to the interface circuit to keep track of the shaft's motion and translate that into a useful control input.

[1]en.wikipedia.org/wiki/Rotary_encoder

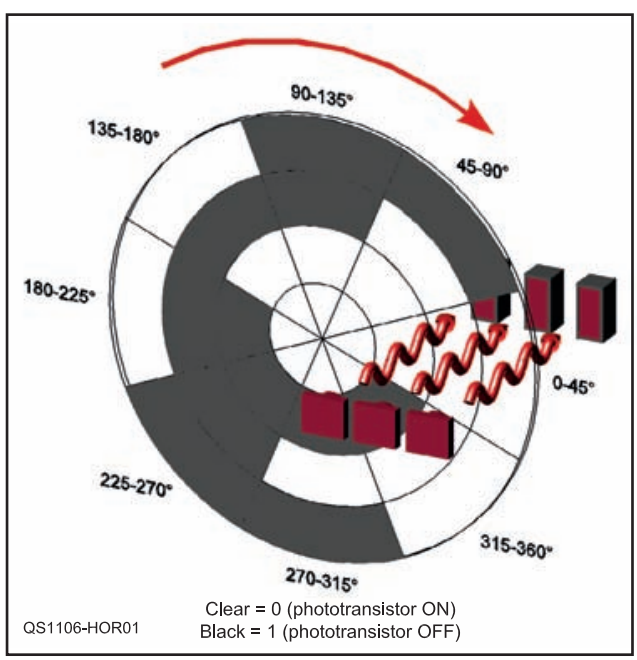

Figure 1 — An optical encoder uses phototransistors instead of mechanical switches. In this figure, a three bit Gray code interruptor disc blocks or passes light from an LED to a phototransistor. The combination of which phototransistors are ON and OFF forms a three bit data word representing the position of the encoder shaft with bit 0 on the outer ring.

You Say You Want Some Resolution

Encoders also vary in their resolution — the number of digital bits available to represent shaft position or motion. Absolute encoders are similar to analog-to-digital converters in that they translate an analog input variable (position) into a digital value called a *data word*. The number of bits in the data word determines how many different values of position can be generated by the encoder. An n bit data word can represent 2^n different positions as values from 0 to 2^n–1; 8 bits = 256 different positions (0 to 255) and each bit represents 360/256 = 1.4°.

The resolution of incremental encoders depends on how many pulses or switch on/off changes occur during a complete revolution. A 12 pulses/revolution encoder generates one pulse for every 360/12 = 30° of movement. From the frequency of the pulses, the speed at which the shaft is rotating can be determined as pulses/s × degrees/pulse = degrees/s. This simple frequency to angular rate conversion is the basis of a *tachometer*.

Incremental encoders are also available with an *index* output that closes a switch once per rotation. This provides a means of sensing absolute position by resetting a counter or otherwise synchronizing a circuit or software routine.

Knowing the Codes

The simplest type of digital code used by absolute encoders is binary in which the data word counts from 0 through 2^n–1. If we had a three-bit absolute encoder as shown in Table 1, the data word would count through eight values from 000 through 111 in a complete revolution and then change back to 000 and begin again. Binary code has a problem, however, at the transitions from one value of the data word to the next. For example, take a look at the change between data word values 001 and 010. Two bits are changing at the same time — bit 1 from 0 to 1 and bit 0 from 1 to 0. If both bits always changed at exactly the same instant this

Table 1

Three Bit Binary and Gray Codes (see Figure 1)

Angular Position	***Binary***			***Gray Code***		
	Bit 2	*Bit 1*	*Bit 0*	*Bit 2*	*Bit 1*	*Bit 0*
0 to 45°	0	0	0	0	0	0
45 to 90°	0	0	1	0	0	1
90 to 135°	0	1	0	0	1	1
135 to 180°	0	1	1	0	1	0
180 to 225°	1	0	0	1	1	0
225 to 270°	1	0	1	1	1	1
270 to 315°	1	1	0	1	0	1
315 to 360°	1	1	1	1	0	0

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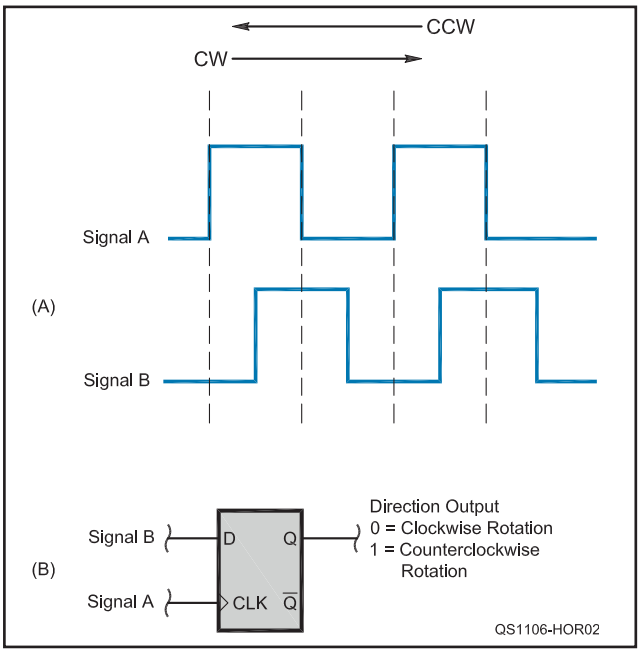

Figure 2 — The quadrature encoder's output contains information about both speed of rotation (pulse frequency) and direction (phase relationship). By comparing signals at a specific signal transition, the direction of shaft rotation is determined. A D-type flip-flop can be used as a direction of rotation sensing circuit.

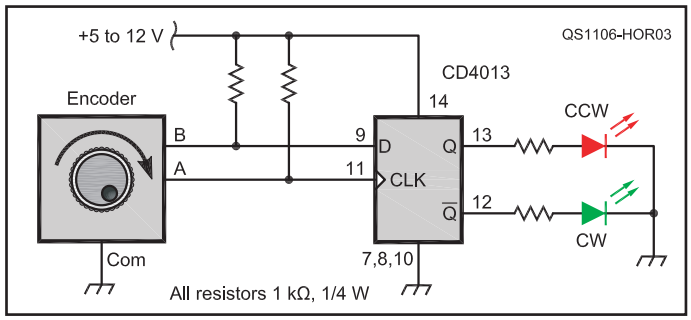

Figure 3 — A CD4013 D-type flip-flop's output drives LEDs to show the direction of rotation visually. Pull-up resistors (1 kΩ) convert the encoder switch closures to electrical signals.

wouldn't be a problem. But let's say that due to minute manufacturing misalignments, bit 1 changes just before bit 0 changes. That means the digital circuit reading the switches would see the data word change from a value of 001 to 011 for a short time before returning to 010. This can cause a lot of problems and it occurs at half of all position changes in a binary code counting in either direction!

For this reason, *Gray code* (named for its inventor, Frank Gray) is used. Look carefully at the Gray code portion of Table 1. You will see that only one bit changes between any two data word values. That means minor misalignments between the switches don't result in large ambiguities in position. The encoder disc in Figure 1 illustrates 3 bit Gray code. Note that only one track changes between opaque and clear at any time.

Encoders are also available that output data as *octal* — binary bits in groups of three that have values from 0 to 7 — and *binary-coded decimal (BCD)* in which four-bit groups form individual digits with values from 0 to 9.

Most encoders used in radios are incremental encoders because it's not usually necessary to know exactly where a knob is pointing or where a dial is set — there are no dials! Absolute encoders are more likely to be found in electromechanical control systems and are quite a bit more expensive than incremental controllers. The rest of this column will focus on incremental encoders.

Using an Incremental Encoder

To be useful in controlling a radio's power output or filter bandwidth it's also necessary to know the direction of the rotation. The radio's controlling microprocessor reads he digital signals from the encoder and determines which way the shaft is rotating, how fast, and how far.

In incremental encoders, the bits form a *quadrature* output in which two digital square waves with a 90° phase difference create a two-bit Gray code as shown in Figure 2A. The digital signals A and B combine in four sequential A-B combinations from left to right: 0-0, 1-0, 1-1 and 0-1. It's easy to tell how fast the encoder's shaft is being rotated simply by counting pulses of either A or B.

Telling the direction of rotation is a bit more subtle. Look carefully at each low-to-high transition of signal A. If the encoder shaft is rotating clockwise (CW), the transition occurs when signal B is low. If the rotation is counterclockwise (CCW), the transition occurs when signal B is high. A circuit that senses the low-to-high transition of signal A can evaluate the state of signal B and determine the direction of rotation.

The D-type flip-flop shown in Figure 2B can accomplish this function by using signal A as its clock input. At each low-to-high transition of signal A, the value of signal B is transferred to the Q output. If the shaft is rotating CW, the Q output is high and vice versa if the rotation is CCW. (This function is easy to perform in software, too!)

Figure 3 shows a circuit you can build to see this for yourself. You'll need a mechanical quadrature encoder, such as one of the Bourns PEC16-series encoders available from **www.digikey.com** for a bit more than 50 cents each. (The PEC16-4120F-N0012-ND part number is a convenient-to-use panel-mount encoder with PC mounting pins and 12 pulses per revolution. A complete data sheet can be downloaded from Digi-Key.)

These and other similar encoders are very simple to wire, being made of just the two switches (A and B) and a common connection (COM). Use 1 kΩ resistors to "pull up" each switch so that when the switch closes, the output is low. (If you use an optical encoder, the phototransistor equivalent is an *open-collector* output and you will have to supply dc power to the LEDs.) Connect each input to the appropriate pin of a CD4013 D-type flip-flop as shown in the schematic. (Be sure to connect the flip-flop's pins for SET (8) and RESET (10) to ground as shown or the flip-flop won't change states.) Any small LED will do for the indicators. When you first apply power, either LED may light but as soon as you begin twirling the encoder the LEDs should light according to the direction. If the LEDs seem reversed, you probably have the A and B signals reversed.

To convert the incremental encoder into an absolute encoder experiment with the programmable up-down counters described in Experiment #36.[2] The index pulse feature of a suitably equipped encoder could be converted into a reset pulse for the counter although you may have to experiment with some spare logic gates to convert the index signal to a reset pulse that appears at the right time.

Parts List

4 — 1 kΩ, ¼ W resistors
2 — Miniature LEDs
1 — CD4013 D-type flip-flop
1 — Incremental mechanical encoder

Recommended Reading

To get an idea of how many different types of encoders are available, enter ROTARY ENCODER in the PART SEARCH window of the Digi-Key home page, then click ENCODERS on the next page.

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

AG1YK

HINTS & KINKS

AUDIO INTERFACING AND GROUND LOOP SOLUTIONS

◊Having built my own version of the Pac-12 portable vertical antenna (**www.njqrp.org/pac-12**) I decided that I wanted to use my Yaesu FT-817ND transceiver and Toshiba laptop for portable digital communications, but I didn't have a spare sound card interface. I came across Ernie Mills', WM2U, excellent soundcard interfacing site (**www.qsl.net/wm2u/interface.html**) where he suggested that you try the simplest possible interface and only get more complicated if you have ground loop problems. I tried his simple interface and it worked great, except I had a terrible 60 Hz hum on transmit — the feared ground loop. So I decided to try the next simplest idea that Ernie suggested — use isolation transformers. I didn't have any in my junk box so I placed an order with RadioShack.

While waiting for the transformers I got a new radio/cd/mp3/aux player installed in my car. Driving home it hit me. I should be able to connect the audio from my Yaesu FT-857D transceiver to my new car radio's auxiliary input and get rid of that unsightly speaker stuck to my dash. So I did. The receive signal sounded wonderful. I then tuned to 7.258 MHz and checked into the MIDCARS net (**www.midcars.net**). Wow, the RF feedback on my car radio was terrible and when I quit transmitting my new car radio acted strangely. After a few minutes of cold sweat thinking about what I might have just done to my expensive new radio, it occurred to me that all microprocessor controlled stuff today has a reset button — which, thankfully, returned it to normal operation.

MARTIN HUYETT, KØBXB

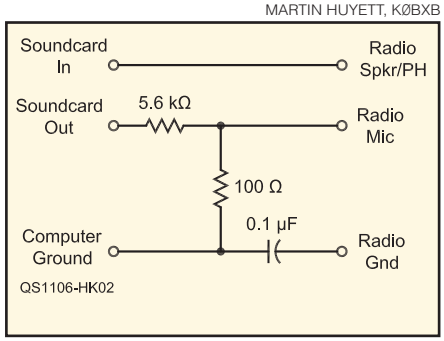

Figure 1 — Schematic of the laptop to transceiver interface that uses a capacitor in the ground line to avoid ground loop problems.

I went back to the Internet where I landed at Alan Applegate's, KØBG, excellent site (**www.k0bg.com**) all about mobile installations, including ground loop problems. Simply put, you have a potential ground loop whenever two pieces of equipment are interconnected with some noticeable resistance (like a car body) between their respective ground terminals. My Yaesu has a #10 AWG negative (ground) lead coming directly from the battery. I have no idea where the car radio ground lead goes. I could easily imagine that when I transmitted, a voltage would develop across the ground resistance, raising the rig's ground above chassis ground. Incidentally, according to KØBG my ground and power leads should probably be #8 AWG or even larger.

While I pondered that experience, I got tired of waiting for those isolation transformers for my portable setup. The thought occurred to me that I might try modifying Ernie's interface to isolate the dc ground between the FT-817 and my laptop by putting a capacitor in the ground side of the audio cables. I modified the interface by cutting the cables and putting a 0.1 µF capacitor in the ground lead between the transceiver and laptop (see Figure 1). No more hum and my digital signal is perfectly clean on the receiving end. To compensate for the approximately 1.5 kΩ reactance added to the audio path by the 0.1µF capacitor I replaced the 10 kΩ series resistor with 5.6 kΩ. I've had a number of contacts with it and it seems to be working well. [This interface may work for PSK31 but results may vary for other digital modes, especially if a reduced frequency response or roll-off causes problems. Also, before going on the air check that the audio level isn't overdriving the transmitter. Add a gain control if needed. — *Ed.*]

That got me thinking about my car radio problem again. Digging around in my capacitor junk box I found a 1 µF nonpolarized capacitor that I had removed from an old oscilloscope. So I cut my patch cord and inserted the capacitor in series with the ground lead. Not even a little RF was noticeable in the car speakers on any band at 100 W and my new car radio's microprocessor doesn't even know there is a transceiver in the neighborhood.

I realize this is probably considered an unconventional way to isolate the gear, but it is so simple and worked so well for me I wanted to pass it on to others for consideration. — *73, Martin Huyett, KØBXB, 7735 Big Pine Ln, Burlington, WI 53105,* **huyettmeh@tds.net**

NINE DOLLAR MICROPHONE BOOM

◊Having experience some years ago in professional broadcast stations, I got somewhat tired of having to hold the microphone in my shack when I transmitted. I knew what professional desk-style flexible microphone mounts looked like, but I also knew they were pretty expensive.

But things changed when my wife and I went to a local IKEA store. I was looking for a flexible desk lamp for my shack. That was a revelation because they offer a desk lamp for only $8.99. Now that's in my budget. So I went ahead and bought two of the lamps, one for the lamp and one for my microphone.

First, I removed the lamp cord that was threaded through the upper boom arm. Then I unscrewed the lamp shade and lamp socket to access the inside of the lamp assembly. Now, I could reach the two small screws that hold the lamp assembly to the lamp mounting plate. It turned out that the diameter of the lamp assembly was about the same as 2 inch PVC pipe. So, it's off to the hardware store for another very inexpensive part for the project. The pipe should be shorter than the microphone. This allows the rubber bands used to hold the microphone to extend outward and backward from the pipe and give better shock mounting. I particularly wanted a shock mount so moving the microphone wouldn't trigger the voice-operated transmit/receive switch.

I drilled and tapped 4-40 threaded holes for screws to mount the pipe to the curved lamp mounting plate. Then I drilled and tapped more screws to secure the rubber bands. Notice that I have two bands on the top side of the microphone (to hold its weight) and one on the bottom. The bands should not be pulled very tight. If they are a little soft,

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

STEVE LITTLE, AB9YN

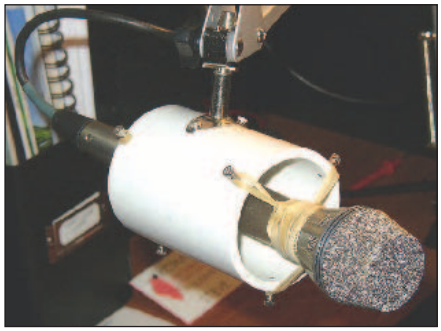

Figure 2 — The finished microphone suspended in a makeshift holder on the end of the lamp "boom."

they absorb vibration better (see Figure 2).

I had a microphone on hand from my audio recording experience years ago. That was good news and bad. I didn't have to go out and buy a microphone, but this one happened to be a low-Z unit (AKG 190D) and my rig is designed for a high-Z microphone. So, check the impedance of the microphone input on your rig to see what you need. I could have just remounted the Kenwood MC-50 desk microphone that I have, but I wanted to keep that for portable operations.

I finished the project with a 2 × 4 inch plastic box from RadioShack. A metal box would provide better shielding against hum and buzz. I built in a red button as a PTT switch and the black toggle switch for long term transmit. I also added a 50 kΩ potentiometer for gain control mounted on the back side of the box. Once it is adjusted for proper sound level, it won't need to be adjusted again.

Using the MONITOR position on the rig you can hear the audio and adjust the gain, processor levels, etc. Check the manual for your rig for information on resistor values if the output of your microphone is too high. *— 73, Steve Little, AB9YN, 749 Hunter Rd, Glenview, IL 60025-3402,* **ab9yn@arrl.net**

NO HOLES SUV MOUNT

◊After purchasing a GMC Yukon and trying to decide where and how to install the antennas, I found I couldn't use the same method as my previous SUV since the Yukon's trailer hitch is an integral part of the frame and rear bumper.

While searching for a mounting method, I shared my problem with Grady Ball, WB3JUV (he has the same vehicle) and we came up with the following no-welding solution.

The parts required are:

2 — Diamond K-400 heavy duty mounts
1 — ¾ inch × 8½ to 9 inch threaded stainless rod (**www.speedymetals.com**)
1 — ⅝ inch OD × 7½ inch round stainless tube (**www.speedymetals.com**)
2 — ¾ inch stainless nuts and lock washers
4 — ¾ inch stainless flat washers
1 — 3 inch stainless bolt, nut and flat washer
1 — truck mirror mount (two for heavier antennas)

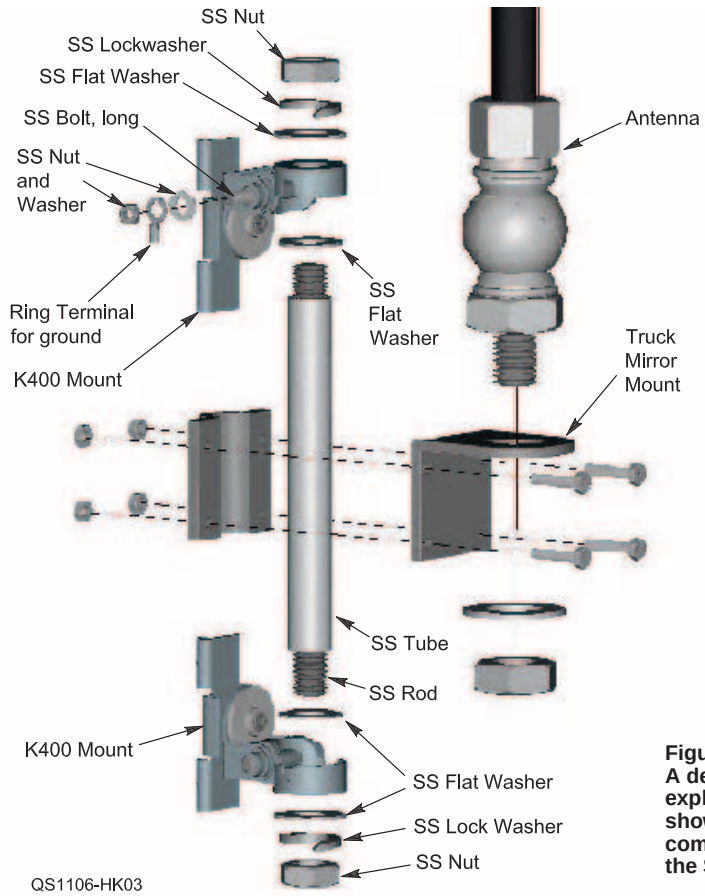

Figure 3 — A detailed exploded view showing the components of the SUV mount.

Refer to Figure 3 and the Diamond K-400 mounting instructions. Begin assembly by discarding the flat grounding strips that come with the K-400 mounts. Loosely assemble the dual mount on the bench by inserting the threaded rod into the tube, add a flat washer and insert this into the bottom of the flange of a K-400 mount. Then add a flat washer, lock washer and nut. Do the same for the opposite end, mounting it into an inverted K-400, and loosely tighten the two nuts. Attach the dual mount to the vehicle and loosely tighten all eight mount setscrews. Make any final adjustments to both K-400s and finish tightening the top and bottom nuts.

Remove the factory socket bolt holding the antenna mount to the trunk base bracket from the upper K-400 and insert the 3 inch bolt with the inner bushings, washer and nut; this will be your ground post for the antenna.

Ground the mount by installing a stainless self-tapping screw into the chassis with as short a ground strap as possible and attach the strap to the 3 inch bolt. The shield from your coax will be attached here also (depending upon how the coax is attached).

The final step is to attach the mirror mount to the antenna platform. For heavier antennas use two mirror mounts, one upright and one inverted, for added strength. Presently I am running a HI Q 3/80 (**www.hiqantennas.com**) and before that a Tarheel 100 and a Tarheel 40A (**www.tarheelantennas.com**). I have driven well over 20,000 miles on my 2008 Yukon XL SLT since the installation without a problem. *— 73, Anthony McAlister, KE9PH, 9141 S Paxton Ave, Chicago, IL 60617-3858,* **ke9ph@arrl.net**

CLEANING CORRODED ANTENNA WIRE

◊One day my lawn-mowing teenaged neighbor showed up at the door with a puzzled expression on his face and a hank of bare copper wire in his hand. Well, normally I don't need much excuse for some antenna work but this was perfect. I gathered up the remnants and found only a couple of feet that had made too many trips through the mower. I could splice the rest back together but of course it had been in the air for several years and was very corroded. I needed an easier method than the sanding and scraping I was used to, so I was off to the kitchen for some experiments.

I wanted a method that involved no scraping and as little elbow grease as possible. Also, since I'm not a chemist, I avoided mixing ingredients that could cause dangerous results — and I suggest you do the same! Caution — you'll find there are no scientific methods ahead; I just recorded go-no-go results.

Bleach: nada

Ammonia: big effect on me but none on the wire

Mr Clean Magic Eraser: not even a dent

Lemon juice and baking soda: don't bother

Then my spouse suggested lemon juice and salt — bingo!

I used about a half-cup of juice and 20 seconds of shaking the salt into a butter tub. Stir until dissolved. Spread the wire strands out and soak the ends for 20 minutes, swishing occasionally (it helps to tape the wire ends to the tub). Maybe half way through you can help it along by rubbing a little with a paper towel soaked in the juice. You're done when the copper has a slight reddish tinge. It will tin up just fine. — *73, Mark Albert, KB9VKE, 1760 Riverwood Dr, Algonquin, IL 60102,* **kb9vke@arrl.net**

FORMING ANTENNA INSULATORS FROM PVC CONDUIT

I was experimenting with various wire antennas and found I did not have enough insulators to complete the project. I needed at least 12 insulators for my project and rather than purchase them new, I decided to experiment with making insulators from blue plastic corrugated conduit that I had left over in the shack.

The flexible PVC conduit was first cut to the desired length of about 3½ inches with a ratchet tubing cutter. The ends were then heated with a commercial heat gun for about 1 minute until soft. Next, I used sheet metal locking pliers to crimp the ends, holding the clamp in place until the ends cooled. Finally, the end holes were completed with a ⅜ inch drill. After a short time, I was able to fabricate the insulators for a few cents each. Aside from the ease of fabrication, the corrugated conduit is strong and light weight. Views of the before and after insulator are shown in Figure 4.

MARK LANDRESS, WB5ANN

Figure 4 — Both side and top views of a finished insulator and a piece of the conduit used for their construction.

Corrugated conduit has many potential uses and over the years I have used the material to construct standoff insulators, ladder line separators, non-conductive bushings and other antenna parts. With a length of corrugated conduit in the shack, you will never be without insulators again. — *73, Mark Landress, WB5ANN, 1011 W31st St, Houston, TX 77018,* **wb5ann@arrl.net**

IC-229H REPAIR

◊As I was repairing one of my hamfest finds, an ICOM IC-229H, the major problem appeared to be in the microphone. This model came with the HM-56A DTMF encoder microphone. Intermittently, when the radio was powered up, it would go into transmit mode.

The problem turned out to be leaky aluminum electrolytic capacitors in the microphone. I have worked with this type of capacitor in the past. When they leak, they tend to cause all manner of problems.

Soon after replacing the capacitors, I began to intermittently lose audio. On further inspection, I found that the electrolyte from one of the capacitors had damaged the PC board. ICOM used a double-sided board in the HM-56A and plated-through holes are used between the top and bottom side of the board. [Plated-through holes are holes drilled through the board that are copper plated and tinned to provide a "jumper" between the surfaces. — *Ed.*] One of these plated-through holes was intermittently open.

After cleaning and tinning the plated-through holes (top and bottom), a short piece of small gauge wire was inserted and soldered in place. I keep some short pieces of #18 AWG stranded wire on my workbench. The small strands are perfect for this type of repair. After the repair, my ICOM works like a champ. [When experiencing problems with dual or multilayer PC boards it is always wise to check the plated-through holes for continuity. — *Ed.*] — *73, John Myers, KD8MQ, 510 W Harrison St, Alliance, OH 44601-1617,* **kd8mq@arrl.net**

IAMBIC PADDLE CONVERSION

◊I was interested in Larry Winslow's method of achieving single paddle operation with iambic paddles in the October 2009 "Hints and Kinks."[1] I have a mechanical method for using iambic paddles as a single paddle. I just adhesive taped a small piece of plastic between the two paddles. The thickness of the plastic has to be adjusted so that there is clearance for only one paddle to move at a time. When the thickness is correct, you can press the dash paddle (for example) and the plastic will prevent the dot paddle from being pressed at the same time. When you press the dot paddle the dash is disabled. It works perfectly.

My plastic gimmick has been there several years. Since the plastic I used is clear, you can't even see the gimmick without looking closely. — *73, Dave Billheimer, W1GQL, 110 Deer Run Ln, Waldoboro, ME 04572,* **w1gql@arrl.net**

[1]L. Winslow, WØNFU, "Single Paddle Operation with Iambic Paddles," *QST*, Oct 2009, p 61.

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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

Feedback

◊ In "JT65 – The Musical Mode" [Apr 2011, pp 45-46] the call sign of Joe (not John) Large should be W6CQZ. W4CQZ was his former call sign. The duration of a JT65 transmission is 46.8 seconds, not 47.7 seconds as stated. Finally, JT65 features the synchronizing tone plus 64 additional tones, not 65.

New Products

G4TPH PORTABLE MAGLOOP ANTENNAS

◊The G4TPH Portable Magloop antennas have been redesigned with several improvements over the original antennas. The new ML-40 MKII now covers 40 through 15 meters. Tuning bandspread is said to be improved, and power handling is now rated at 35 W because of new capacitors and improvements to the inductive loading units. The ML-20 MKII (20 to 10 meters) has similar improvements. Once the antenna is tuned for the center of the band of operation, SWR of 1.5:1 or better is said to be achievable across the band without retuning. For more information or to order, visit **www.g4tph.com**.

Field Day: It's Not About the Fish

Field Day brings two hams together after 5 years of radio friendship.

Norm Fusaro, W3IZ

Figure 2 — Neal Layman, N4XU, lends some perspective to the spectacular view of Virginia from the mountain top Field Day site.

It has been said that fishing is not about the fish and the same can be said about Field Day. Yes, there are radios and antennas and lots of RF in the air on the last full weekend in June but the real attraction is friendship. Every year I look forward to this annual event: working with friends to raise the antennas, set up the stations, prepare the food and work with club members so they can have fun on the air. The late night ragchews with friends over hot coffee can be just as enjoyable as a nice run on 20 meters.

Field Day 2010 was a special one for me. This Field Day story started about 5 years ago. I was looking through some club newsletters here at ARRL Headquarters when I saw a story in the March 2005 Massanutten Amateur Radio Association's (**cob.jmu.edu/fordham/mara**) newsletter, the *Monitor*. It was about a seventh grader whose Amateur Radio demonstration won him best in show at the county science fair (see sidebar). James McDowell, NN4JM, was just 13 years old at the time and a newly minted Technician class radio amateur. He was very proud of his achievement and so were his family and his fellow members of the Massanutten ARA.

This seemed like a good story for the ARRL web pages so I sent James a letter asking him a few questions about himself and his ham radio activities. I included an *ARRL General Class License Manual* and a code practice oscillator kit suggesting that he continue his ham radio pursuits and to feel free to ask any questions that he may have.

James stuck with it and has since upgraded to Amateur Extra class. He has become a very proficient radio operator. He enjoys chasing DX and is a very good CW operator. He acts as net control on the local 2 meter repeater and another net on 80. In addition to developing great Amateur Radio skills, James has honed his vocational talents and is working as an electrician, a field he enjoys very much.

James was never shy about asking questions and experimenting with antennas or attempting to repair equipment. Often our e-mail exchanges or on-air conversations would become quite detailed as we examined an issue. Patience is key when Elmering over long distances.

We stayed in touch with e-mail and on the 80 meter phone band, but we had never met in person. When I asked James if he would be participating in Field Day he said he would be at the combined Massanutten ARA and the Valley ARA (**www.qsl.net/w4xd**) Field Day. In fact, he was on the planning committee. "Great," I replied "I am going to be there." I planned to drive to Virginia and spend some time with James and some of the people I had met on the Virginia Fone Net (**rhtiller.com/vafonenet**).

Figure 1 — The rough mountain road leading to the Field Day site.

Finally Face-to-Face

The anticipation was building during the months leading up to Field Day. Finally, the Wednesday before Field Day I left Connecticut pulling my camper southbound.

The next day I was in Harrisonburg, Virginia talking to James on 2 meters as we headed toward a local restaurant where at last, after 5 years, we sat down face to face and chatted over a long lunch.

We were there for quite a while and could have stayed longer but we had to get going and head up the mountain to the Field Day site. I followed James as we drove the rural winding roads through some beautiful farmland until we got to the base of the mountain. From there it was a steady and steep climb to the 4350 foot peak where the view of Virginia is spectacular. James and I communicated on 2 meters as he pointed out local landmarks and places he had talked about in our many contacts. The last part of the journey was a steep dirt and rock road that required careful maneuvering around ruts and obstacles (see Figure 1).

The camp was a great Field Day location with tall trees, an open field and terrain that drops off in all directions (see Figure 2). James' grandparents, Norman, KA4EEN, and Doris Benner were on the mountain already and so were Neal Layman , N4XU; Jeff Rinehart, W4PJW, and Bennie Cook, N4BCC, all people I had spoken with many times. Now I could place faces with familiar voices.

Not long after setting up the camper we saw a violent storm heading toward our camp site. Wow! The winds and rain were unbelievable. The storm brought winds in excess of 50 mi/h that blew down trees and even overturned a tractor trailer down in the valley. My pop-up camper was slightly repositioned but sustained no damage.

When the storm had cleared the skies were blue and the weather for the remainder of the weekend was gorgeous — warm and sunny during the day and temperatures in the mid 50s at night. More people arrived Thursday and Friday. Setup for Field Day began at 2:30 Friday afternoon.

Solar GOTA

This Field Day was well organized and cooperative. We operated class 2A using a CW station and a phone station as the primary stations (see Figure 3). There was also a VHF station, a satellite station and a Get On The Air (GOTA) station. A number of the youngsters were eager to activate the GOTA station and tried to earn a certificate for making 20 contacts. The control op was Bob Steere, N1QEQ. Anyone who has worked with children knows they have a short attention span, flitting from one activity to another and Bob deserves a medal or perhaps a bronze statue for his patience when it came to working with this energized group of youngsters.

Figure 3 — James, NN4JM, works CW as Jerry Brunk, K4RBZ, watches.

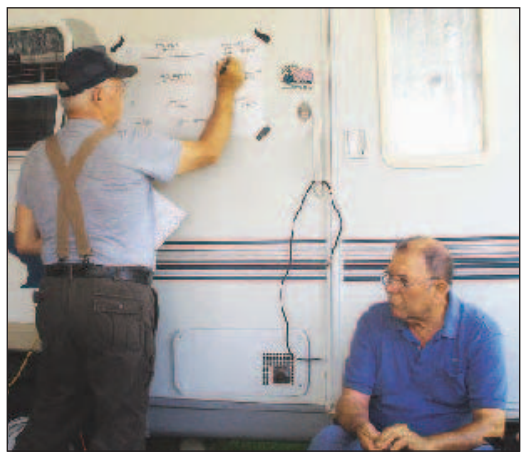

Figure 4 — Jeff Rinehart, W4PJW, explains dipole antennas to new radio operators.

Figure 5 — James McDowell, NN4JM (left) leads the J-pole antenna workshop with John Keller, W4ZAO (second from right).

A unique feature of the GOTA station was that it was completely powered by solar energy. Matthew Huffman, KD4UPL, owns a company that sells and installs solar energy systems. (James works with Matthew installing solar systems and wiring new homes.) Matthew brought his demonstration trailer. The trailer is equipped with multiple solar panels on the roof and a sophisticated computer controlled charging system that charges and monitors a bank of storage batteries.

The GOTA station trailer also had an Internet connection. Yes, 4350 feet on a mountaintop without water, commercial electricity or a cell phone signal and we had the Internet. This was provided by a camp-wide wireless network (Wi-Fi), which included a Voice Over Internet Protocol (VOIP) telephone with a local phone number for the camp. The Internet was managed by Jason Armentrout, N4DSL. He set up a 2.4 GHz dish in the valley 17 miles away and 4300 feet down and aimed it toward the mountaintop where he installed another dish to relay the signal to the GOTA trailer. Jason is no stranger to long distance Wi-Fi. His record is 56 miles using 802.11b at 2.5 mb/s. It was exciting to see this kind of innovation and enthusiasm from young hams like Jason, Matthew and James.

About 60 people were in attendance for the potluck dinner Friday night. There is nothing like good ol' home cookin' to bring folks together. Throughout the weekend Grandma Doris made sure that there was plenty of coffee, fruit and snacks for the radio operators and visitors.

Station setup continued Saturday morning and the clubs did an incredible job capturing the educational bonus points. Jeff, W4PJW, directed a seminar on dipole antennas that included calculating the antenna length, materials and construction techniques (see Figure 4). The classroom was under the canopy of Jeff's camper and he taped large sheets of paper on the side of the camper to aid with calculations and illustrations. Later in the day James led an antenna building workshop where participants built 2 meter J-pole antennas from discarded pieces of window line (see Figure 5). There were plenty of coaches to assist with

Seventh Grader Takes Best in Show with Ham Radio Science Project

When James McDowell, KI4FZY, suggested that his science fair project be about Amateur Radio his science teacher was reluctant. It seems that his teachers were not aware of Amateur Radio and how it related to his studies. James was persistent and finally convinced them that his experiment, demonstrating the relationship between peak envelope power (PEP) and effective communications, would be a relevant project.

His persistence paid off when his project was chosen to represent the school in the Augusta County Middle School Science Fair. James' entry was one of approximately 80. While tending to his display James answered many questions about the project and about Amateur Radio. He spoke with the judges, visitors, retired engineers and members of the media.

The day wore on and eventually James heard the judges announce the winners. As prizes were awarded in the various categories James thought his chances at winning a prize were all but gone. Then he discovered that the judges saved the best for last. "I was shocked when they called my name for Best in Show" James said.

For his outstanding achievement James was awarded several prizes including a GPS unit, a calculator and a large trophy that he proudly displays. James brought the trophy back to his school to show everyone. He received a lot of attention because this was the first time anyone representing Stewart Middle School had taken Best in Show.

measuring, cutting and soldering. Watching these guys work with young hams really exemplified the mentoring spirit of ham radio (see Figure 6 and 7).

Of the many things that I have done in Amateur Radio, taking the opportunity to meet with James was a real high point. I have watched him grow as a radio amateur and as a person turning into a fine young man, which is a nice reflection on his family and community. No matter what James does or where he goes he will make many friends and leave his mark on this world.

The Field Day stations were active throughout the 24 hour operating period as would be expected. James and I had plenty of time to visit and talk. James brought

Figure 6 — Jon working on the J-pole.

Figure 7 — The J-pole antenna made an excellent father and son project.

his QSL cards for me to check for his first DXCC award. Because we had an Internet connection in camp we were able to connect to the ARRL website and make his DXCC application through Logbook of The World. Congratulations — James is now a member of the DX Century Club.

A QSL card is reminiscent of a human interaction. It bookmarks a point in time when two people connected with each other through the magic of radio. Technology continues to evolve turning today's great technical wonder into tomorrow's antique, but the thing that remains constant is people. It is the people we meet who make ham radio interesting and fun.

Photos by Norm Fusaro, W3IZ.

Norm Fusaro, W3IZ, is Assistant Manager of the ARRL Membership and Volunteer Programs Department. He can be reached at **w3iz@arrl.org**.

US/Canada Section Abbreviation List

Those new to the ins and outs of Field Day will find this list of Section abbrevi-ations useful — for those in the US and Canada, they're an important part of the FD exchange, along with station call sign and class. Be sure to bring a copy of this Section Abbreviation List with you to FD 2011.

1

Connecticut	CT
Rhode Island	RI
Eastern Massachusetts	EMA
Vermont	VT
Maine	ME
Western Massachusetts	WMA
New Hampshire	NH

2

Eastern New York	ENY
Northern New York	NNY
NYC / Long Island	NLI
Southern New Jersey	SNJ
Northern New Jersey	NNJ
Western New York	WNY

3

Delaware	DE
Maryland – DC	MDC
Eastern Pennsylvania	EPA
Western Pennsylvania	WPA

4

Alabama	AL
Southern Florida	SFL
Georgia	GA
Tennessee	TN
Kentucky	KY
Virginia	VA
North Carolina	NC
West Central Florida	WCF
Northern Florida	NFL
Puerto Rico	PR
South Carolina	SC
Virgin Islands	VI

5

Arkansas	AR
North Texas	NTX
Louisiana	LA
Oklahoma	OK
Mississippi	MS
South Texas	STX
New Mexico	NM
West Texas	WTX

6

East Bay	EB
San Diego	SDG
Los Angeles	LAX
San Francisco	SF
Orange	ORG
San Joaquin Valley	SJV
Santa Barbara	SB
Sacramento Valley	SV
Santa Clara Valley	SCV
Pacific	PAC

7

Alaska	AK
Nevada	NV
Arizona	AZ
Oregon	OR
Eastern Washington	EWA
Utah	UT
Idaho	ID
Western Washington	WWA
Montana	MT
Wyoming	WY

8

Michigan	MI
West Virginia	WV
Ohio	OH

9

Illinois	IL
Wisconsin	WI
Indiana	IN

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Colorado	CO
Missouri	MO
Iowa	IA
Nebraska	NE
Kansas	KS
North Dakota	ND
Minnesota	MN
South Dakota	SD

Canada

Maritime	MAR
Saskatchewan	SK
Newfoundland/ Labrador	NL
Alberta	AB
Quebec	QC
British Columbia	BC
Ontario	ON
Northern Territories	NT
Manitoba	MB

DICK ORANDER, KD4ISC

Get Up and Get-On-The-Air

A little coaching goes a long way toward making your Get-On-The-Air (GOTA) station a success.

Gary Pearce, KN4AQ, and Dick Orander, KD4ISC

We need new hams. We need young hams. We need to get inactive hams back on the air. Three birds, one stone — the GOTA station at Field Day.

We've been running the GOTA station for the Raleigh Amateur Radio Society (RARS) in North Carolina for several years and we've learned a few things about making it work. Strike that. We've learned a few things about making it fun.

The first thing we do is promote GOTA in advance — at club meetings, on-the-air nets, to our e-mail list and in the newsletter. We give some simple "how to make a Field Day contact" instructions and invite the target audience to participate. The best potential pool is our club members' families — especially their kids. And that brings out club members who otherwise might not show up.

At Field Day, we set up the GOTA station as far as we can from the other stations, within the 1000 foot circle. We'd like to be in the middle of the action where visitors can find us easily, but interstation interference is a problem. The GOTA station can operate in any band, but since RARS is usually 7 or 8A, we have a station on almost every band already. Adding a third or fourth signal in close proximity is a technical challenge that most hams never have to face outside Field Day. Seventy-five and 40 meter operation is the most successful.

Three-stage Process

We introduce our new operators to Field Day in a three-stage process, with two coaches. New arrivals meet with one coach outside the operating tent and go over a simple set of instructions on how to make a contact. Then they practice logging with a dummy computer log. Next, they observe the current on-air operation while the first coach gives them the play-by-play. Finally, they take their positions as loggers and operators, with the second coach looking over their shoulders and guiding their operation. We rotate loggers and operators so everyone gets to do both.

We don't try to schedule operators. It's impossible to tell how long any one person's interest will hold up. If there are people waiting, we keep a "shift" down to 15 minutes or so.

The first to find us are usually the family members — spouses and kids. They keep us busy from start time until dinnertime. Not all spouses are wives, but most of them are. We see as many girls as we do boys. Most of these people are good for one or two contacts. And this is where we have learned our most important lessons:

- Making contacts is *hard*
- Tuning single sideband is *hard*
- Picking out call signs and contact information on a noisy, busy band is *very hard*
- Making 20 contacts for the extra bonus points is *really hard*

Search and Pounce

We do "search and pounce" operation. That is, we tune across the band looking for stations calling "CQ Field Day," and contact them. It's not feasible to have inexperienced operators try to hold a "run" frequency (call CQ and work station after station on the same frequency). The pace is just too fast. Now and then we come across another GOTA station trying to do just that.

For our first group of family members, making even one contact can be an exercise in frustration. We try to minimize that, at least for the conditions that are under our control.

Okay, time to get on the air. The operator tunes the band…

Wait. "Tunes the band?" What's that mean? For a seasoned operator, it is so second nature that we don't realize that this is an alien concept to most people, especially in this age of push-button digital tuning. Then, consider that the signals these people are tuning are SSB and the alleged voices squawking from the speaker sound truly alien, change pitch as you tune and never seem to be really tuned in correctly.

Our new operators always tune v-e-r-y s-l-o-w-l-y. To us it is painful. Yet if we encourage them to tune faster, they will sail across the correct pitch and never settle on understandable speech. We advise them to "tune only when there's a signal and stop when the person stops talking." But to their ears there is always a signal, especially on a busy Field Day band. They haven't learned to separate the desired signal from the ones just above and below. Of course, the station they're tuning always stops transmitting just as they almost have them tuned in right and it takes forever for that station to come back on the air.

When our struggling new operator does finally settle on a signal, it's never tuned in "right." And it's almost always tuned in high-pitched. As DXers know, it's easier to understand SSB speech when it is high-pitched. You may not know that if you tune someone in this way, you will sound low-pitched and a bit garbled to them.

Hopefully, the run station is using RIT (Receiver Incremental Tuning) and tunes each caller to taste without affecting their own transmit frequency, but why not give yourself the best chance of being the one picked in a pileup? Tune them a little low pitched and you will be the nice, sharp signal. We try to explain this, but it's a very advanced concept at GOTA. The tuning process tests our patience and most of the time our patience passes the test. Coaches need an endless supply of the stuff.

Strange Exchange

Once we're all tuned in, the contact information — call sign, class, section — flies by and our novice operator's ears miss most of it on the first pass, and on the second pass, and the third. Even on a nice, quiet band without interference, the sound they're hearing is so strange and it's coming so fast that it's difficult to make sense of it. Phonetics are designed to help, but they're just a foreign language. We coaches end up translating a lot and get much admiration for our ability to make sense of this gibberish. The coaches are not allowed to operate the equipment or log, but we can translate.

Experienced search and pounce operators know that it's wise to fill their log with the target station's information whenever they can before actually making the contact. The GOTA station can afford the time to listen to their target make several other contacts and slowly absorb the data before nervous fingers finally grip the microphone and make the call.

And when it's time, we have their lines printed out on a cheat-sheet. We follow the "minimalist" approach. When we answer the CQ, it's just "Whiskey Four Romeo November Charlie." Just once in phonetics.

If we get a reply, we've probably already copied and logged the other station's data. Our turn again and we say, "Roger, 8 Alfa, North Carolina. 73." Missed or miscopied information upsets the system, of course. We guide the operators through the correction process. We found that an extended set of written instructions that covered all contingencies was just too complicated to remember or follow.

Given all this, the family member who may be there mostly to please their spouse or parent is happy (and exhausted) to squeeze off one or two contacts. We celebrate a job well done, thank them profusely and move on. This may have taken 15 minutes or more, especially if they had to wade through a pileup to be acknowledged. There are bonus points for operators who make more than 20 contacts but that goal is not realistic.

There are also bonus points for operators 18 and under. Some of our guests are very young children — age 4 to 8. We want them to enjoy the experience and not be too frightened. The coach may have to turn the dial or squeeze the transmit button. That breaks the GOTA rules, so we don't count the points. But we don't erase their memories.

Each year we have a few stalwarts who come back after the pack is done to spend some quality time on the air. Usually these are hams in their first year or hams from the "inactive" category. In 2010 we had three: Aaron Gauger, KC6URO, made 23 contacts, Richard Mitchell, N4ENL, made 24 and our champion, Gary Shelby, KJ4QBT, made 42! They kept us going until 1 AM on the noisy 75 and 40 meter bands and came back to burn up 15 meters on Sunday morning.

The Get On The Air Station

The purpose of the GOTA station is to get nonhams, hams licensed less than a year and inactive hams on the air. Any class A or F station may operate a GOTA station. It must use a different call from the primary Field Day station but can use the same exchange. It is limited to 150 W and a control operator must be present. The GOTA station can earn a maximum of 500 points plus any GOTA Bonus points that are applicable.

How Did We Do?

Not bad for a station designed as the introduction to the Field Day experience. There were 17 people who made 144 contacts. Nine held no amateur license, five were new hams and three were brought out of inactivity. Six of our participants were 18 years old or younger.

Our efforts were also fruitful in helping our club place first in our 8A class. The GOTA station provided 288 points for the 144 contacts. Our 18 and under participants added 100 bonus points and our three coached hams, who made over 20 contacts each, provided an additional combined 160 bonus points. The GOTA total was 548 points. For a competitive club, that can be the difference between first and second place, but then the competitive clubs all know this and have GOTA stations.

This Year's Improvements

Here are some ideas we are considering for Field Day 2011:

- Add "This is GOTA Station Whiskey Four Romeo November Charlie" to every contact. Maybe we'll get a little extra TLC from the far end.
- A special receive-only station to let people practice tuning sideband before they operate. You can't get too much practice at that.

Gary Pearce, KN4AQ, is an ARRL life member, QST *contributor, freelance video producer and creator of the Amateur Radio//Video News series of programs* (**www.arvideonews.com**). *He has just released a new DVD,* The Last BIG Field Day. *Gary can be reached at* **kn4aq@arrl.net**.

Dick Orander, KD4ISC, is an ARRL member and Amateur Extra class operator who was first licensed in 1992. He is employed as a senior engineer for Genband, Inc. Dick can be reached at **kd4isc@arrl.net**.

US Amateur Radio Bands

US AMATEUR POWER LIMITS

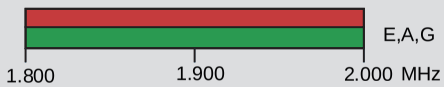
FCC 97.113 An amateur station must use the minimum transmitter power necessary to carry out the desired communications. (b) No station may transmit with a transmitter power exceeding 1.5 kW PEP.

Effective Date
May 6, 2008

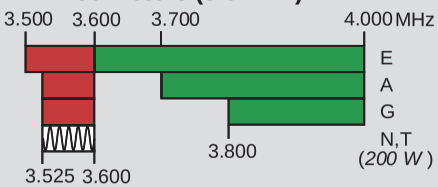
Published by:
ARRL The national association for AMATEUR RADIO®
www.arrl.org
225 Main Street, Newington, CT USA 06111-1494

160 Meters (1.8 MHz)

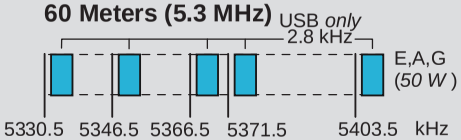
Avoid interference to radiolocation operations from 1.900 to 2.000 MHz



80 Meters (3.5 MHz)

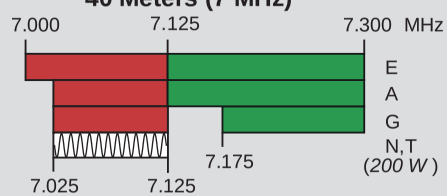


60 Meters (5.3 MHz) USB *only*



General, Advanced, and Amateur Extra licensees may use the following five channels on a secondary basis with a maximum effective radiated power of 50 W PEP relative to a half wave dipole. Only upper sideband suppressed carrier voice transmissions may be used. The frequencies are 5330.5, 5346.5, 5366.5, 5371.5 and 5403.5 kHz. The occupied bandwidth is limited to 2.8 kHz centered on 5332, 5348, 5368, 5373, and 5405 kHz respectively.

40 Meters (7 MHz)



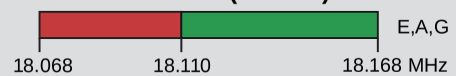
Phone and Image modes are permitted between 7.075 and 7.100 MHz for FCC licensed stations in ITU Regions 1 and 3 and by FCC licensed stations in ITU Region 2 West of 130 degrees West longitude or South of 20 degrees North latitude. See Sections 97.305(c) and 97.307(f)(11).
Novice and Technician licensees outside ITU Region 2 may use CW only between 7.025 and 7.075 MHz and between 7.100 and 7.125 MHz. 7.200 to 7.300 MHz is not available outside ITU Region 2. See Section 97.301(e). These exemptions do not apply to stations in the continental US.

30 Meters (10.1 MHz)

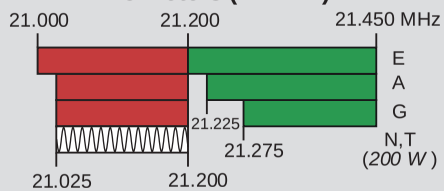
Avoid interference to fixed services outside the US.

20 Meters (14 MHz)

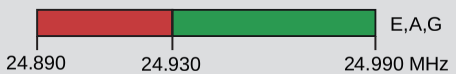
17 Meters (18 MHz)



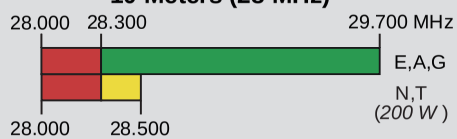
15 Meters (21 MHz)



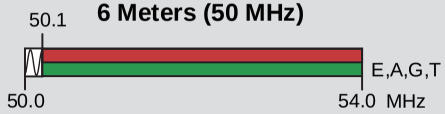
12 Meters (24 MHz)



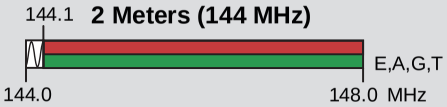
10 Meters (28 MHz)



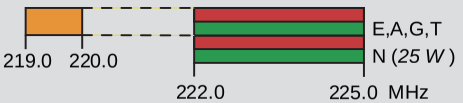
6 Meters (50 MHz)



2 Meters (144 MHz)



1.25 Meters (222 MHz)



*Geographical and power restrictions may apply to all bands above 420 MHz. See *The ARRL Operating Manual* for information about your area.

70 cm (420 MHz)*

33 cm (902 MHz)*

23 cm (1240 MHz)*

All licensees except Novices are authorized all modes on the following frequencies:

2300-2310 MHz	10.0-10.5 GHz	122.25-123.0 GHz
2390-2450 MHz	24.0-24.25 GHz	134-141 GHz
3300-3500 MHz	47.0-47.2 GHz	241-250 GHz
5650-5925 MHz	76.0-81.0 GHz	All above 275 GHz

KEY

Note:
CW operation is permitted throughout all amateur bands except 60 meters.

MCW is authorized above 50.1 MHz, except for 219-220 MHz.

Test transmissions are authorized above 51 MHz, except for 219-220 MHz

= RTTY and data
= phone and image
= CW *only*
= SSB phone
= USB phone *only*
= Fixed digital message forwarding systems *only*

E = Amateur Extra
A = Advanced
G = General
T = Technician
N = Novice

See *ARRLWeb at www.arrl.org* for detailed band plans.

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Looney Tuners

Crowded bands, hot contests and rare DX are no excuse for sloppy operating.

Steve Sant Andrea, AG1YK

"Okay, Chuck, let me turn it back to you. KØXYZ this is W1AW."

"W1AW, KØXYZ. Fine Business, Steve, well I'll tell you, instead of the usual gamma match on my homebrew beam I decided to try a [... drone of a heterodyne ...]. It was a little tricky to design. The main issue being [... drone of a heterodyne ...] and then I had to [... drone of a heterodyne ...] done all that the match worked fine. Afterward I realized it would have been much easier [... drone of a heterodyne ...] try doing it that way. It's very effective. Let me turn it back to you [... drone of a heterodyne ...]YZ.

Okay, Quiz Time

How many mistakes did the Droner make? Let me see a show of hands. How many for one? Get those hands up. Alright now two mistakes? A lot more of you this time. Shall we go for three? Hmm, not too many. So what's the answer? Who gets to operate the DXpedition and who gets to handle the QSLs?

Well, put those keys and microphones away folks 'cause you're all wrong. The Droner made *four* mistakes.

First, Droner didn't listen to the frequency before starting to tune up. Second, he didn't call to see if the frequency was in use. Third, he didn't pretune at low power. And to cap it all off, he didn't bother to identify *any* of his transmissions.

Inconsiderate Interference

This problem of inconsiderate tuning, especially visible in pileups, has been exacerbated by our sunspot drought. Poor conditions have encouraged many operators to use amplifiers and pushed a lot of activity to lower frequencies, leaving the bands below 14 MHz overcrowded.

It takes time to be considerate, it takes time to be courteous and it takes time to use good operating technique. In our fast paced world of crowded bands and high adrenaline operating events the temptation to cut corners is great. But it's important to take a few extra seconds to be aware of conditions on the specific frequency where you have your big dial set.

Cutting corners may gain you a few seconds, make things a tad easier, but the cost is paid for by the other hams whose contact you have interfered with. The Droner didn't *save* himself time; he *stole* it from the rest of the stations calling by forcing the DX to repeat information when he could have been making another contact.

Shift your frequency 5 or 10 kHz to a clear frequency. Switch to a dipole or vertical to make a quick call to check that it's clear. Their broader pattern will let you hear stations that the directivity of a beam will not. If you're running barefoot, cut your power to 10 or 20 W and tune up. With an amplifier, use a dummy load to get it into the ballpark then peak it up on the air.

Helping Hams

Hams are a widely varied group. A constant stream of new licenses are being issued. Our crowded airwaves contain a fair percentage of new, inexperienced hams and also hams — both experienced and inexperienced — who may have a disability that impacts their ability to operate. For DX stations language or cultural differences may cause problems of understanding.

We are all part of the same community. Each of us should be flexible enough in our own operating to accommodate those we might contact who may be inexperienced, lacking in some operating ability or hail from a different culture.

If you contact a station and they ask your consideration, give it. Slow down your code, speak more slowly or use standard phonetics for difficult words. Remember, one of the great things about ham radio is chewing the rag with other hams the world over to learn about the lives they lead.

Whose Frequency Is It Anyhow?

Nobody's. Our bands are a first come, first served type of operation. FCC regulation 97.101(b) specifically prohibits any station or net from "owning" a frequency. At the same time, there is some practical efficiency in allowing special purpose nets access to a specific frequency where stations who may need the net's assistance know where to find it. The best example of this is the Maritime Mobile net on 14.3 MHz. In operation since 1968, this net handles traffic for all maritime mobiles and deployed military personnel, and is a vital resource for vessels in trouble. This net has been active for so long that 14.3 MHz has become a de facto emergency frequency. In fact, IARU Region 1 (Europe, Africa, Middle East, and northern Asia) has declared it the "Global Center of Activity Frequency."

> ***"It takes time to be considerate, it takes time to be courteous and it takes time to use good operating technique."***

Maybe you were there first, but with modern rigs moving a few kilohertz doesn't require elaborate retuning. If you find yourself in a contact on the frequency of a long-running net, consider yielding the frequency.

Remember, the first operating practice of The Amateur's Code, a list of six standards of operating practice that an amateur should aspire to, is to be considerate. So next time you are ready to key the transmitter, stop and think whether you have done all that a good operator should do.

Steve Sant Andrea, AG1YK, is an Assistant Editor for QST. *He can be reached at* QST

Houston, We Have Amateur Radio!

Mission Control Room for the International Space Station. ARISS contacts are officially placed in the ISS schedule by the OPSPLAN Mission Controllers. Graphics showing the ISS orbital position and attitude, critical command and telemetry data, as well as countdown clocks to upcoming critical events can be seen on the screens in the front of the control room. During high activity periods there is normally one controller at each of the 15 console positions, each supporting a specific technical discipline of ISS operations.

Kenneth Ransom, N5VHO, ISS Ham Radio Project Coordinator, demonstrates the Kenwood dual-band TM-D700 144/440 MHz Amateur Radio transceiver mounted against the wall in the Russian Service Module mockup, the same area that it is located in the ISS. NASA engineers will also be installing an Ericsson Radio system in the Columbus Module (ESA) training mockups at JSC similar to the actual ISS installation. There is no chair for the operator. In micro gravity, the astronaut/radio operator floats next to the radio.

In March, I visited the Johnson Space Center in Houston, Texas, I was there to discuss the ARISS (Amateur Radio on the International Space Station) program with some of the folks from NASA. The ARISS program is a joint venture between the ARRL, NASA, AMSAT (The Radio Amateur Satellite Corporation) and other international space agencies. The ARISS program schedules Amateur Radio contacts between ISS astronauts and cosmonauts and schools. More than 600 ARISS QSOs have been conducted to date.

Johnson Space Center is comm central for ARISS and the shuttle missions that first brought hams into space.

Harold Kramer, WJ1B

Another shot of the dual-band radio mounted on the wall of the ISS. This is the transceiver head; the rest of the transceiver is to the right out of view. The blue cards on the wall are fuse locations marked in both Russian and English. The manual is attached to the wall to the right of the radio. The Russian segment of the ISS runs on 28 V dc and the US segment runs on 120 V dc. The Kenwood radio in orbit uses a Russian power supply to step the voltage down from 28 V to 13.6 V. The station in the mockup is functional. For test purposes, NASA hams often make contacts with local schools from inside the mockup. NASA hams have also used IRLP from this location to contact schools in other parts of the US, Canada and Europe.

The mockup of the Russian Zarya (Sunrise) Module, also known by the technical term Functional Cargo Block or the Russian acronym FGB, as seen from the forward vestibule looking aft. When walking between modules, you have to duck your head a lot and be careful where you place your feet. It's tight quarters!

If you look closely, you can see the dual band 144/440 antenna mounted on the ISS mockup. (Antenna attached to the Service Module; the bracket is located on the top rear of this module.) The bracket is specially fabricated for this application. The coax is mounted along the outside of the ISS. Special cable is used with a covering that protects it from damage due to exposure to the harshness of space. The service module has dedicated RF feeds through specific feed points. The cable is attached there, fastened with real wire ties and then is tied to various handles and protruding structures along the outside of the ISS where the antenna is mounted.

Incoming Club President John J. Maca, AB5SS, Information Technology Team Lead & ISS Chief Information Officer with WJ1B at W5RRR, the Johnson Space Center Amateur Radio Club. The station is located at the Gilruth complex at the JSC. The old club building was demolished about 4 years ago and there is a brand new facility in the same location. There are about 30 members in the club (www.w5rrr.org/).

From the left standing next to an ISS module are Astronaut Don Pettit, KD5MDT; Kenneth Ransom, N5VHO, and Mark Severance, N5XWF, ISS National Laboratory Education Projects Manager. Kenneth and Mark manage the ARISS program for NASA. Don made 12 school contacts and some general QSOs during his time on orbit as part of the Expedition 6 crew from November 2002-April 2003. He will be returning to the ISS as part of the Expedition 30 crew in November 2011.

A communications panel in the Columbus module of the ISS. These are used for both internal communications within the spacecraft and for radio communications with the ground controllers. These are familiar looking controls to radio operators: XMIT Mode, VOX, VOL and PTT. A ham would feel right at home.

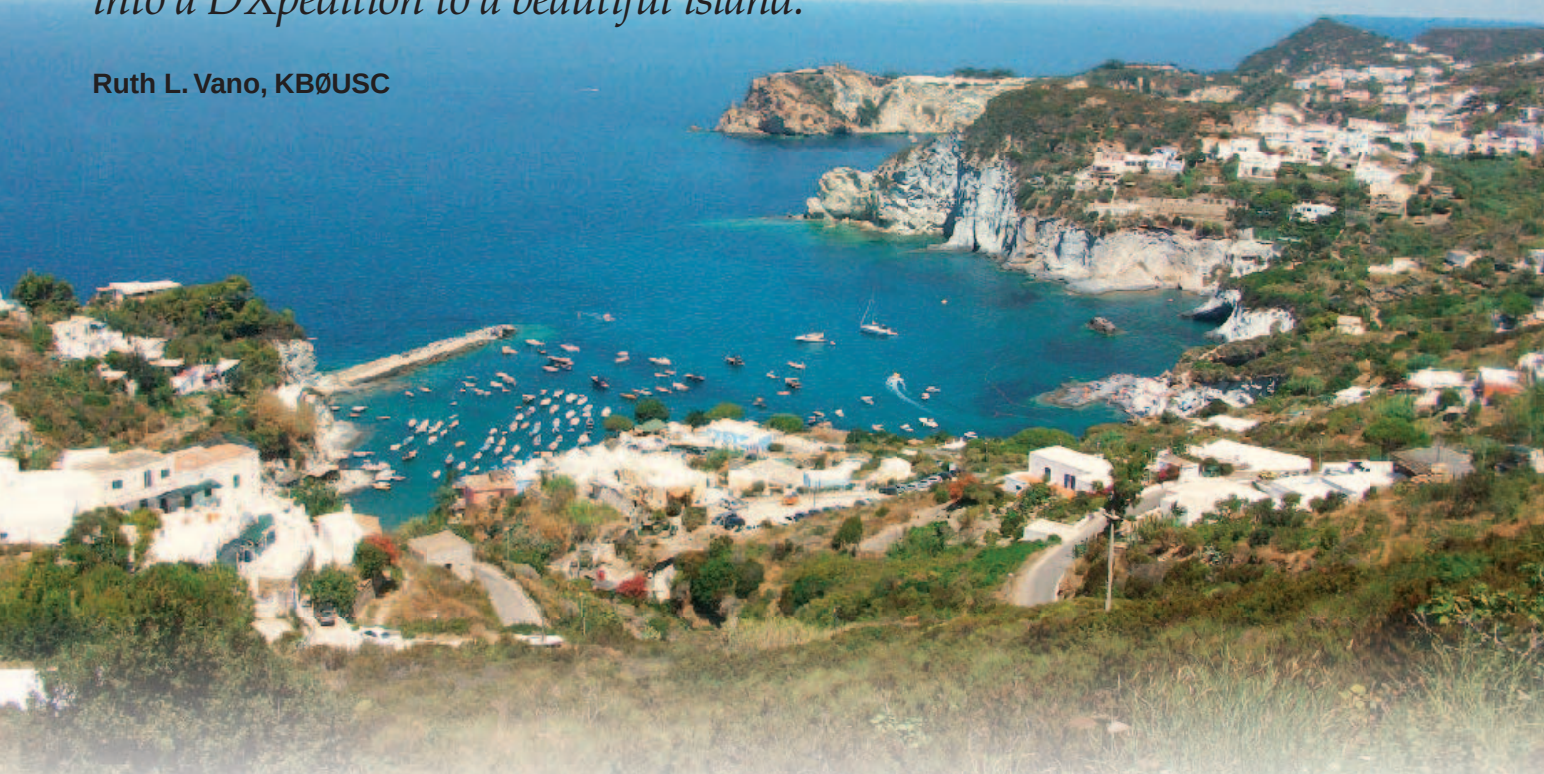
The satellite antenna tower at the Johnson Space Center Amateur Radio Club, W5RRR. It is equipped with M² circular polarized satellite antennas.

Thanks to Kenneth Ransom, N5VHO, for his assistance with this article.
All photos by the author. Harold Kramer, WJ1B, is Chief Operating Officer of the ARRL. He can be reached at **hkramer@arrl.org**.

DXpedition to Ponza Island

A trip to Italy in search of family history turns into a DXpedition to a beautiful island.

Ruth L. Vano, KBØUSC



An international group of Amateur Radio operators from Italy, Canada and the United States, all with a common love of Amateur Radio and desire to visit a unique location, created an exciting opportunity for our family.

My husband, James, KBØMZF, and I decided it was time to visit the Italian village of Brocco where his grandparents were born. Brocco, renamed Broccostella in 1954, is located 70 miles southeast of Rome. With its peaks and valleys, it is in the picturesque Apennine Mountains and has a population of around 3000 people. Immediately adjacent to Broccostella is the quaint and friendly city of Sora.

As we discussed the trip, I never imagined that through Amateur Radio we would make new friends that we would eventually meet face to face and that that meeting would lead to our taking part in a DXpedition to the beautiful, exotic Italian island of Ponza.

As my husband was monitoring EchoLink one evening he made contact with Edmondo Conetta, VA3ITA/IWØGVP, an Italian ham currently residing in Canada, who was born in Sora. Edmondo quickly became a good friend. His enthusiasm for Amateur Radio and all things *Italia* is unsurpassed. His willingness to assist us with our adventure was heartwarming. Since he was born and raised in Sora, he put his resources to work on our behalf. Soon he had his family assisting my husband in locating family records. He contacted Vincenzo, IØSXV, who had worked for the city of Broccostella and asked him to assist in the search. Vincenzo ultimately introduced us to my husband's second cousin.

A Different Kind of Trip

During his conversations with James, Edmondo shared his plans to be in Italy at the same time we were. Edmondo told us that he and the Italia Zero DX Group were organizing a DXpedition to Ponza Island. He would also be spending some time visiting his father, Michele, in Sora.

We had spent several hours at our home in Kansas planning out an itinerary to visit all the major tourist sites of Italy and the small town where James' grandparents had lived. But, after a few conversations with Edmondo, he convinced us to change the itinerary to travel to Ponza. The visit would not only be to sightsee but also for James to take part in the DXpedition. My son, Isaac, KCØZYN, my daughter, Glenna, KDØEWF, and I are Technicians and did not meet the international qualifications to participate. But my husband could operate in Italy with our new-found friends.

Time flew by with the preparations, including our family attempt at mastering basic Italian. With a feeling that it was too soon but not soon enough, we were at last enduring the long 10 hour flight to Rome. After eating a lot of gelati and seeing wonderful tourist sites in Florence, Pisa and Venice, we were met at the train station in Frosinone by Edmondo and his friend and fellow operator Giovanni, IZØPSA. We made our way to the home of Edmondo's father where we met Michele, as well as Edmondo's wife Laura, VA3LIA, her Canadian friends Lois and Diana and Edmondo's sister Laura. They treated us to a traditional Italian lunch as we socialized like we had known each other for years. Early the next morning we began the DXpedition adventure to remote Ponza Island.

Dark Clouds

The anticipation and excitement could not be dampened by a series of problems that accompanied the group. On a sad note, the ham who suggested Ponza for the DXpedition, Mauro Santini, IN3SAU, and, Nuccio Meoli, IØYKN, who helped plan the DXpedition and had provided his own vertical antenna for it, became silent keys before the DXpedition began. Everyone is grateful for their contributions. They will be greatly

missed by their friends and the entire ham community.

Everyone met in Sora at 6 AM to drive to the coast where we would catch a ferry to the island. On the way to the ferry, an accident created a bumper to bumper traffic jam, which resulted in all of the crew missing the reserved ferry ride to the island. By the way, if you have never seen bumper to bumper traffic in Italy, that is an experience in itself. It is amazing how they can turn a two-lane road into four lanes of traffic! You have just got to see it yourself to believe it.

Accompanied by extremely talented operators, land support and the call sign IBØY, the group toting equipment finally caught a later ferry for the trip over the deep blue Tyrrhenian Sea and came into view of Ponza. Rugged and rocky with its high stone peaks, multishaded stones and pastel-colored houses, the island of Ponza is breathtaking. Steep cliffs start from the crisp light blue skies and drop sharply to come to the sea's sparkling deep blue water where waves crash on the rocky shore.

Ponza

The pastel-colored buildings on the island are built on the inland side for protection from the strong winds, so the view from the gentle rock of the ferry is natural and rugged. The island itself is mountainous, being the remains of an ancient caldera (volcanic crater), and the shape is long and narrow. The group secured a location at the top side of the high mountain. It took several trips up steep steps to get the equipment to the DXpedition location. Looking off in the distance the boats appeared as miniature toys floating on the immense sea. The sun sparkled on the waters and gave nutrition to the small gardens of green located in patches along the hillsides where the locals grow fresh produce, red grapes, greens and tomatoes.

Marked with Canadian, Italian and American flags, the site took shape as antennas were hoisted up and secured. This DXpedition qualified for the IOTA Award, with reference EU045, for the Italian Island Award with reference LT-001 and also for the Italian Summer Activity 2010. The DXpedition was partially sponsored by Budd, W3FF, and his outstanding Buddipole antenna and Emilio, IZØNNI, with QSL and merchandise support.

The antenna setup included a vertical I1UJX antenna provided by Nuccio, the Buddipole and a handheld Arrow antenna to work the amateur satellites. Radio equipment included a Yaesu FT-857 transceiver, a Yaesu FT-920 transceiver and a Kenwood TH-F6 handheld transceiver. The crew worked

James Vano, KBØMZF, showing off his Ponza Island team member certificate.

Giovanni Gasparri, IZØPSA, putting another station in the Ponza log.

James Vano, KBØMZF, attempting a satellite contact with the Arrow handheld antenna.

Ponza Island DXpediton Results

Coverage of the DXpedition, which ran from August 1-8, 2010, can also be found on the **QRZ.com** website — search for IBØY. Additional coverage can be found at various locations on the web, including DX World (**dx-world.net**).

80-2 meters using CW, SSB and the digital modes. A multiband dipole was set up and the first contact for the group was made at 1727 local time on 40 meters with DK7IA.

On the Air and the "Tube"

The late setup due to travel delays, antenna issues and problems all week long with the propagation affected the bottom line contact numbers. One side of the location backed up to the mountainside, contributing to the issues. But nothing could dampen the fun and fellowship. The food and Italian hospitality made everything extraordinarily wonderful.

The multilingual Giovanni, also the QSL manager for IBØY, is an extremely efficient and talented operator. He obtained his license only in March 2009 and his speed and ease of operating contrast with his short amateur experience. It was a pleasure to listen and watch as he continuously made contact after contact, pulling call signs out of the often severe static and hash, efficiently recording and detecting calls from over 57 countries. Apparently in addition to his radio talent, he is also an apt cinematographer. He created and posted a YouTube video about the trip that can be found at **www.youtube.com/watch?v=iAOLe05B3WE**.

My husband, arriving on Ponza on his 60th birthday, thoroughly enjoyed working the HF station and he introduced the group to the use of an Arrow handheld antenna/transceiver combination for satellite operations. Researching satellite passes he attempted contacts, even monitoring the orbit of the space station. The satellite station was also used in a boat traveling around the jagged rock formations jutting out into the sea.

Edmondo, organizer and enthusiast, and man with a vision, managed every aspect of the excursion. Not only did he spend many hours organizing and setting up the DXpedition details, he spent countless hours before the trip conversing with James on Skype, by e-mail and over the telephone about Italy. An amazingly intelligent operator with the energy of 10 young men, he resourcefully contributed to the contact numbers working the stations quickly and efficiently.

Edmondo and his wife Laura, VA3LIA, celebrated their first anniversary during the trip to Ponza. Laura is also a multilingual operator. Between cooking for the crew, spending time with her Canadian friends Lois and Diana and patiently teaching some Italian to my 12 year old daughter, she likewise assisted in making DXpedition contacts.

Others joined the group in Ponza and were soon helping to set up the site. In fact, upon meeting everyone we had an instant feeling of friendship and family. The project was supported by many people. Other land support included VA3TEP, IZØOVY, IZØPGJ, IKØITC, IZØQYW and IØOCD. Also, we must not fail to mention another terrific new friend, Antonio, IZØQYH, who was our guide in driving around Sora and also an active participant and supporter of the DXpedition.

Edmondo Conetta, VA3ITA, sports his Ponza Island DXpedition T-shirt.

A Short Visit with Long-lasting Memories

Although our stay in Ponza was brief, it has created a lifetime of memories and long lasting friendship with fellow Amateur Radio operators. No matter where you live, or where you are going, there are friendly contacts to be made. The group is already thinking about the next DXpedition. With ham radio and Italian friends you are sure to be welcomed and treated like family. Listen for the Italia Zero DX Group.

Photos courtesy Ruth Vano, KBØUSC.

Ruth Vano, KBØUSC, an ARRL member, is an attorney who has been in private general practice for 24 years. She obtained her Amateur Radio license in 1995. Ruth has taken part in storm spotter certification with the Johnson County Emergency Communication Services, Inc and is a member of the Santa Fe Trail Amateur Radio Club. Ruth volunteers as counsel for these two organizations. She is also a member of the area CERT program. She has two Yaesu FT-7900R U/VHF transceivers, one for her vehicle and one for a base station. She enjoys EchoLink operation. Ruth can be reached at 11713 Hardy St, Overland Park, KS 66210, **kb0usc@arrl.net**.

Strays

WE BE BIG

◊A new book from a couple of *New York Times* bestselling authors who are also nationally syndicated broadcast personalities offers readers unprecedented exposure to Amateur Radio. *We Be Big* is the autobiography of Rick Burgess and Bill "Bubba" Bussey, KJ4JJ, whose morning radio show is heard in over 50 cities across America as well as on XM satellite radio. Bussey is a longtime active ham radio operator who cites Amateur Radio as one influence that led to a career in broadcast engineering, ownership and on-the-air success. Bussey often discusses Amateur Radio on the show. Additionally, the book was co-written with the help of national-bestselling author Don Keith, N4KC. It is available from Amazon and other booksellers.

I would like to get in touch with…

◊hams who currently or have ever worked for Tektronix Inc or its subsidiaries. I am working on a history project (see **www.vintagetek.org**). — *Don Tucker, W7WLL,* **w7wll@arrl.net**

◊any radio operators who assisted — or have knowledge of — weather observers at remote sites or airfields in Maine, Canada, Greenland, Iceland or Scotland during WW II. An interview will help me write a history for the North Atlantic Flyway Route, the system that guided thousands of combat crews in new planes to Great Britain. — *John T. Gaffey (ex-W6SMC and former Route pilot), 949-786-2313 or* **JTG7862313@aol.com**.

◊home call information on old Okinawa calls KR6CF, CI, EJ, FG, IB, JG, KS, LL, MU, TX or ZZ. — *Don Tucker, W7WLL,* **w7wll@arrl.net**

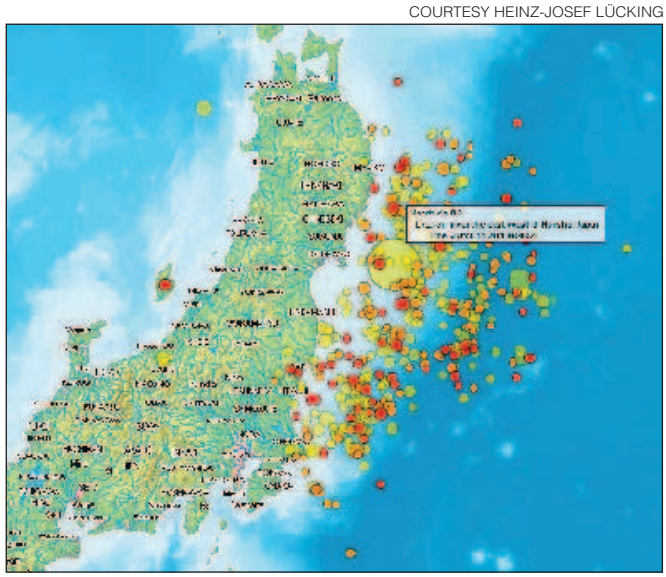
MARTIN HYDE, VA7HYD/AE5NP

Do you know the way to…RFI? **No one in VA7HYD's home town of Maple Ridge, British Columbia has any trouble sniffing it out!**

Radio Amateurs in Japan Keep Providing Communications Support in Earthquakes' Aftermath

Amateur Radio operators became involved in the rescue effort soon after the March 11 9.0 earthquake and devastating tsunami — now known as *Higashi Nihon Daishinsai* or The Eastern Japan Great Earthquake Disaster — that hit Japan, and that effort continues nearly two months later. "In the early stage following the earthquake and tsunami, several radio amateurs were able to activate their stations with car batteries or small engine generators, despite the electric power outages," IARU Region 3 Secretary Ken Yamamoto, JA1CJP, told the ARRL. "They transmitted rescue requests and information on the disaster situation — including refugee centers and their needs — and the availability of basic infrastructures, such as electricity, water and gas supplies." After the earthquake and tsunami, there was no electricity, water or gas service in many of the affected areas.

COURTESY HEINZ-JOSEF LÜCKING



This map shows the March 11 earthquake and its associated aftershocks through March 14, 2011 at 11:20 PM JST. The size of the circles is a function of magnitude and the color indicates the date: March 11, light green; March 12, yellow; March 13, orange, and March 14, red.

In his report to the ARRL, Yamamoto said that the Japan Amateur Radio League (JARL) quickly activated JA1RL, its headquarters station in Tokyo, to assist in the rescue effort. With the help of many other amateurs, it also activated its regional headquarters station JA3RL in Osaka to communicate with amateurs in the areas devastated by the tsunami, including its Tohoku headquarters station JA7RL in Sendai. "The communications were mostly on the 7 MHz band in daytime and the 3.5 MHz band at night," Yamamoto explained. "Short range communications were also made on the 144 and 430 MHz bands. The information gathered through Amateur Radio communications was reported to the rescue and disaster relief organizations for their appropriate deployment. Some other amateurs accepted health-and-welfare inquiries from the [impacted] areas and then posted the information on the Internet."

Japan's Ministry of Internal Affairs and Communications — that country's equivalent of the FCC — approved the use of an additional 300 UHF/VHF transceivers in the affected areas.

With gasoline and natural gas in short supply, Yamamoto said that the fuel shortage was "a very serious problem in the cold climate. Calls for fuel were received over radio from many disaster areas, but delivery remained very difficult at least for the first week as the access roads were hacked up everywhere. Several days later, some Amateur Radio clubs reached the affected areas with their radio equipment and established communications for supporting disaster relief."

Yamamoto told the ARRL that several radio equipment manufacturers offered "hundreds of VHF/UHF transceivers to JARL for the use at refugee centers and local disaster relief centers. These transceivers should help to establish mutual communications between refugee and disaster relief centers, and to facilitate smooth and appropriate delivery of disaster relief goods."

As of April 19, more than 800 aftershocks of magnitude 4.5 or greater have occurred since the initial quake. United States Geological Survey (USGS) Director Marcia McNutt explained in a television interview with CBS News on March 12 that aftershocks follow Omori's Law: "There are aftershocks on Day One, half as many aftershocks on Day Two and one-third as many aftershocks on Day Three. It keeps going on for literally years afterwards. The largest aftershock from an 8.9 earthquake will be a 7.8 earthquake. It will taper off in time, but this could go on for years."

As of noon JST on April 12 (0300 UTC), Japan's National Police Agency announced that more than 13,000 people have been killed and nearly 15,000 people have been reported missing in the earthquake and tsunami.

AMATEURS ASSIST WITH OCEAN RESCUE

At 10:04 AM PDT (1704 UTC) on March 21, Rex Weinheimer, KC5AGO, of Stonewall, Texas — a member of Maritime Mobile Service Net (MMSN) — heard and responded to a weak and broken MAYDAY call. The call was from the sailing vessel *Gloria Jean*, a 30 foot sailboat that was in the Pacific Ocean about 120 miles west of Ensenada, Mexico. Weinheimer heard the distress call on 14.300 MHz, a frequency monitored by the MMSN.

MMSN Net Controller Lee Langford, KG4DZN, told the ARRL that through the combined efforts of several net stations, the net was able to ascertain the situation and the position of the stricken vessel. MMSN operators contacted both the US and Mexican Coast Guards and both services deployed

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

FCC News

♦**FCC Completely Overhauls Website**: The Federal Communications Commission has announced that it has launched a complete overhaul of its website. According to an April 6 press release from the FCC, the new website is "architected with a more intuitive user experience and the addition of Web 2.0 technologies, improving and simplifying the **FCC.gov** experience for consumers, government, public safety agencies and the business community." This is the first major update to the Commission's website in 10 years. The press release explained that the new FCC website is built using web services — a series of standards employed across many of the web's most popular sites. These standards empower citizen developers to build off the new FCC site in innovative ways: "By building the new site using an open source, cloud-hosted and scalable architecture, the FCC has leveraged modern tools as a long-term cost-saving strategy, lowering the barriers to future development and innovation among other public and private sector websites." Find the new website at **http://beta.fcc.gov**.

assets to the scene. The US Coast Guard (USCG) dispatched an MH-60 Jayhawk helicopter from San Diego and a C-130 Hercules plane from Sacramento. According to the USCG, the *Gloria Jean* had no propulsion, food, water or safety equipment.

"The sailing vessel *Estarma* — an MMSN net participant — changed course to assist the crippled *Gloria Jean* and provided information on scene," Langford told the ARRL. A USCG rescue swimmer was lowered from the helicopter as it hovered near the disabled sailboat. The 77 year old sailor and his dog were hoisted aboard the helicopter at 2:50 (PDT) that afternoon.

"It was about 15- to 18-foot seas, with the boat dead in the water," Coast Guard Aviation Survival Technician Mike Linehan told San Diego television station KGTV. "The waves were pushing it away from me as I was trying to get to it. It was challenging swimming to the boat. It was really hard to talk to him at first. We found out later that he didn't have his hearing aids in."

The sailor told USCG personnel that he had been stranded for days and that he was on his way to Tahiti. He was running low on food, water and safety supplies. "The boat was unable to sail," said USCG Lieutenant Commander Chip Lewin. "The sails were ripped and the master and his dog were sitting inside."

USCG SECOND CLASS PETTY OFFICER HENRY G. DUNPHY

A sailor and his dog were rescued off the coast of Ensenada, Mexico, after a ham in Texas heard his distress call on 14.300 MHz. In this USCG photo, he is pictured safely aboard a USCG helicopter with USCG Petty Officer Second Class James Johnson.

Langford offered his thanks to all the Amateur Radio operators "who assisted with relays and patiently provided a clear frequency. Without them, this rescue would not have been possible."

"It's truly is a wonderful thing to be able to help anyone in need. Amateur Radio is based on service," Weinheimer said.

The Maritime Mobile Service Net mission is handling traffic from maritime mobiles and deployed service personnel overseas. MMSN operates on 14.300 MHz USB — a recognized Center of Activity frequency — with its sister nets Intercontinental Traffic Net and Pacific Seafarer's Net.

NCVEC DELETES QUESTION FROM AMATEUR EXTRA QUESTION POOL

Due to the FCC revising the rules concerning Spread Spectrum, the Question Pool Committee of the National Council of Volunteer Examiner Coordinators (NCVEC) has decided to delete a question from the Amateur Extra class question pool. According to QPC Chairman Rol Anders, K3RA, as of April 29 — when the new Spread Spectrum rule change goes into effect — the answer to question E1F13 in the Amateur Extra class question pool will no longer be correct.

In March 2011, the FCC — acting upon a 2006 *Petition for Rulemaking* filed by the ARRL — eliminated the requirement that amateur stations transmitting Spread Spectrum use Automatic Power Control (APC) to reduce transmitter power. At the same time, the Commission reduced the maximum power of a Spread Spectrum emission from 100 to 10 W PEP.

The current Amateur Extra class question pool is effective through June 30, 2012.

ARRL CHANGES PROVIDERS FOR EQUIPMENT PROTECTION, CLUB LIABILITY INSURANCE PLANS

On May 1, the ARRL began a new partnership to provide its ARRL-sponsored Equipment Insurance and Club Liability Insurance plans. The League has signed an agreement with Hays Affinity Group to serve as the program administrator to provide equipment insurance to its members who choose to elect coverage. In addition, Hays will also provide club liability insurance to ARRL Affiliated Clubs for those clubs that wish to take advantage of that program. Hays replaces Marsh Affinity Group Services as the program's administrator and will be introducing new policies for both plans, underwritten by the Hanover Insurance Company.

Not only is equipment protection coverage through Hays Affinity Group slightly less expensive than with Marsh, it's easier to enroll in the plans. You can sign up online at **www.arrlinsurance.com** and even schedule your equipment online, too. With Hays Affinity Group, you can have all your radio equipment covered, even the computers, hard drives and printers in your shack. You can also elect to have coverage for your towers and antennas, up to $15,000 replacement cost. All losses are settled on the replacement cost value you have stated for your equipment. In addition, any newly acquired equipment during the policy term, up to a value of $2000, will be covered until your next policy renewal. All this — and more — with only a $50 deductible.

Be assured that if you currently have equipment or club liability insurance provided through Marsh Affinity Group, your coverage will continue through the end of your current policy. But keep in mind that when your policy expires, your coverage will not automatically be switched over to Hays. You will need to enroll with Hays to continue coverage under an ARRL sponsored plan. If you wish to switch to either of the new insurance policies now, you will have to cancel your policy with Marsh and sign up with Hays, or wait until your policy with Marsh is due for renewal and then sign up with Hays for coverage. If you choose to cancel with Marsh before renewal, you will receive a pro-rated refund of any unused premium fees you have paid.

The ARRL has been providing opportunities for equipment insurance to its members for more than 25 years. By choosing to let Hays Affinity Group cover your equipment, you are helping to support the ARRL; a portion of each premium comes back to the League to help fund programs that enable you to enjoy your on-air privileges.

NEW MARS ROVER TO FEATURE MORSE CODE

As the Jet Propulsion Laboratory (JPL) builds the next Mars rover — this one is named *Curiosity* — to deploy to the red planet in the fall of 2011, they're having a little fun with it. Back in 2007 when the

Curiosity team was putting together the rover, its wheel cleats had a raised pattern with the letters JPL, leaving a little stamp of the rover's birthplace everywhere it rolled. "At the time, I asked whether the real rover would have those wheels, and they said, no, they weren't going to get to advertise JPL with each turn of each of the rover's six wheels; the real rover would have some other pattern," said Emily Lakdawalla of The Planetary Society in her blog. Lakdawalla is the organization's Science and Technology Coordinator.

Lakdawalla said that there is nothing special about the shapes of the markers in *Opportunity*'s wheels; they are just square holes through the wheels through which the wheels were bolted to the lander during cruise and landing. *Opportunity* is the name of the rover that went to Mars back in 2003. "But *Curiosity* didn't need holes in its wheels for attaching to any lander — there isn't one. So the engineers got to make the markers in any shape they wanted to."

But in March 2011, she saw a video of the rover as it is today: "I had to chuckle at those 'visual odometry markers' [on its tires]. Before I explain why, I'll point out that they really are useful things to have in rover wheels. The repeating pattern of the 'visual odometry markers'...makes it fairly easy for both the rover and human operators to determine visually how far the rover has roved using rear-view imagery."

So what pattern did JPL choose to put on *Curiosity*'s wheels? One that Lakdawalla called "very amusing. The holes are in a pattern of short squares and longer rectangles — almost like dots and dashes. Morse code." And what does it spell out in Morse code? JPL.

According to JPL, *Curiosity* is about the size of a small SUV — 10 feet long (not including the arm), 9 feet wide and 7 feet tall — or about the height of a basketball player — and weighs 2000 pounds. It features a geology lab, rocker-bogie suspension, a rock-vaporizing laser and lots of cameras. *Curiosity* will search areas of Mars for past or present conditions favorable for life and for conditions capable of preserving a record of life. It is set to launch between November 25 and December 18, 2011 from Cape Canaveral, Florida and will arrive on Mars between August 6 and 20, 2012. The prime mission will last one Mars year, or about 23 Earth months.

NASA/JPL

The tires on the new Mars rover — set to launch in November or December 2011 — will display the letters JPL in Morse code.

TWO ASTRONAUTS GET THEIR HAM TICKETS

Even though they aren't scheduled to go to the International Space Station until 2013, two astronauts — Chris Cassidy and Luca Parmitano — are now licensed amateurs. Cassidy, who received the call sign KF5KDR, is scheduled to head to the ISS in March 2013 as part of Expedition 35. Parmitano, who is KF5KDP, goes up two months later in May, as part of Expedition 36.

"Our aim is to have at least one crew member licensed and trained in on-air protocol, who is excited about ham radio and the Amateur Radio on the International Space Station program (ARISS), per expedition," explained ARRL ARISS Program Manager Rosalie White, K1STO. NASA ISS Ham Radio Project Coordinator Kenneth Ransom, N5VHO, told the ARRL that both Cassidy and Parmitano are "excited and interested in the educational aspects of Amateur Radio on board the ISS."

Currently, there are three Russian cosmonauts, two US astronauts — Ronald Garan, KF5GPO, and Catherine Coleman, KC5ZTH — and one Italian astronaut on board the ISS as part of Expedition 28. Alexander Kaleri, U8MIR, and Oleg Skripochka, RN3FU are Russian; Paolo Nespoli, IZØJPA, is from Italy. In late June 2011, a new crew — Expedition 29 — reports to the ISS: Michael Fossum, KF5AQG; Sergei Volkov, RU3DIS, and Satoshi Furukawa, KE5DAW. This crew will join Coleman, Nespoli and Dimitri Kondratyev. According to the ISS schedule, at least three hams will be on board the ISS simultaneously through the end of 2012.

Ransom told the ARRL that he is especially excited about Expedition 29. "Mike Fossum is a Scoutmaster with a Boy Scout troop here in Houston," he said. "We are hoping that he will be active making Amateur Radio contacts with Scouts all around the world while on the ISS. The World Scout Jamboree is in Sweden this year in July and August, and Jamboree on the Air (JOTA) is near the end of his mission. Hopefully, he will be available for both events, giving Scouts an exciting QSO from space."

NASA

Chris Cassidy, KF5KDR

ESA

Luca Parmitano, KF5KDP

In Brief

● **Thormod Bøe, LA7OF (SK)**: Thormod "Tom" Bøe, LA7OF, of Horten, Norway, passed away on March 21. He was 71. Bøe was President of the Norsk Radio Relae Liga (NRRL), Norway's IARU Member-Society. Bøe actively worked for the Amateur Radio cause throughout his adult life in both a private and professional capacity. For many years, he worked on spectrum management matters with the Norwegian administration, was extremely active in CEPT and ITU forums and served as Director of the European Radiocommunications Office in Copenhagen from 1998-2006. ARRL Chief Executive Officer David Sumner, K1ZZ, remembered Bøe fondly: "Tom was the spokesman for Norway in Committee 5, which was responsible for all frequency allocations — and I do mean all, as the entire radio spectrum was under review at WARC-79. Norway was an outstanding supporter of Amateur Radio at the conference, and Tom was recognized as the 'most valuable delegate' by the IARU team."

DAVID SUMNER, K1ZZ

Tom Bøe, LA7OF, and his wife Brit in Switzerland during the 2005 IARU Region 1 Conference.

Incident Command System at Field Day

Jim Aylward, KC8PD
EC, Portage County, Ohio
kc8pd@arrl.net

Across the nation, hams who want to remain active in emergency communication services are being required by state and local emergency management agencies to obtain training on the National Incident Management System (NIMS) and the Incident Command System (ICS). The reason is simple, the staff and volunteers for those agencies must meet these requirements or the agency may lose federal funding opportunities. The "Five-Year NIMS Training Plan," which explains more about this is available online.[1]

At a minimum, Emcomm volunteers should complete the following courses: ICS-100, *Introduction to the Incident Command System*; ICS-200, *ICS for Single Resources and Initial Action Incidents*; ICS-700, *National Incident Management System (NIMS), An Introduction*; and ICS-800, *National Response Plan (NRF), An Introduction.* All of these courses are available online for free from FEMA's Emergency Management Institute.[2] Many other online classes can be found there and they are all worthwhile.

Many of you may have already completed these courses, although there has been a fair amount of grumbling from hams who are unhappy at having to complete training on topics that have little to do with emergency communications in general or Amateur Radio in particular. But those who kept an open mind learned a good deal about both NIMS and, more importantly, the ICS. If we want to be involved in providing supportive services for disaster relief and other incidents we need to understand the basic operational concepts, the same as all the other public and private participants who will be involved.

The essence of the ICS is that everyone — governmental and tribal agencies, private sector and nongovernmental organizations — work together using a common set of operating principles and terminology. No matter where we go or who we work with we should be able to understand how the operation is being managed and where we fit into it.

That is about as briefly as NIMS and ICS can be summarized. Unfortunately, that is also all that a lot of people who have taken the ICS/NIMS training remember about it. Why? Most likely because, in order to satisfy the training requirement, they quickly worked their way through the online courses that provide a wealth of information but offer only minimal interaction or other reinforcement of the material and since then have had no chance to apply what they studied.

You get your certificate and then promptly begin forgetting what you just learned. This is not unique to ICS and NIMS. Spend time learning any complex material and if you don't have a practical way to put it to use it will slip from your memory fairly quickly. Ask any of us who learned Morse code for a license upgrade and never got into the habit of using CW.

So, you ask, what can hams do to make the ICS any easier to understand or remember? Simple: put it to use.

ICS Basics

NIMS training teaches us that the ICS can be used for both incidents and events. Incidents are those unexpected occurrences that require immediate response actions through an ICS organization. On the other hand, events are future activities that will include the activation of an ICS organization.

Field Day, of course, is an event. It doesn't come up unexpectedly, though if you don't plan for it, it may seem that way. In fact, as an annual event, not only do we have a year to plan for the next one but we can apply the lessons learned each year to enhance and improve our plans for the following year. So let's take a look at how neatly your Field Day operation can fit the template of an ICS event.

Figure 1 shows the basic ICS organizational chart. At the top is the Incident Commander (IC) and directly below the IC are the members of the Command Staff: the Public Information Officer (PIO), Safety Officer (SO) and Liaison Officer (LO). The General Staff consists of four different Section Chiefs: Operations, Logistics, Planning and Finance.

Their tasks are largely self-explanatory. The IC has responsibility for the overall operation. The PIO manages communications with the community at large as well as ensuring a dissemination of mission-oriented information to the staff. The SO is primarily responsible for monitoring issues related to

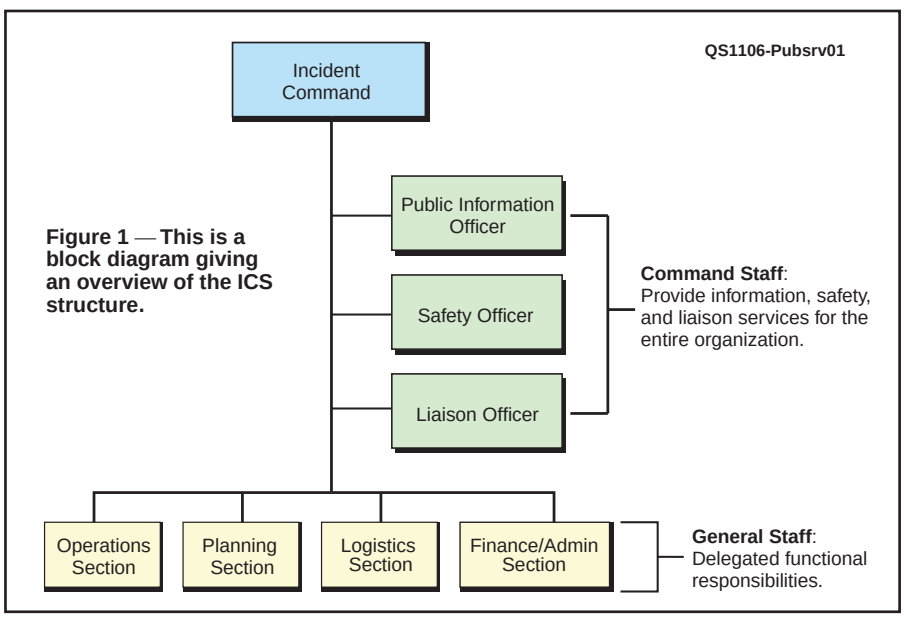


Figure 1 — This is a block diagram giving an overview of the ICS structure.

[1]**www.fema.gov/emergency/nims/NIMSTrainingCourses.shtm**
[2]**training.fema.gov/EMI**

operational safety, including, in particular, the health and safety of all staff. The LO is the point of contact for all other agencies and organizations.

For the General Staff, the Finance section is responsible for matters such as budgeting, recordkeeping and fiscal matters. Planning is responsible for collecting, evaluating and disseminating information about the event to other Command and General staff, as well as drafting operational plans and alternatives.

Logistics must provide facilities, services, materials and other resources in support of the event activities as well as assisting with the preparation of Incident Action Plans (IAP). Operations probably has the greatest challenges since that section must supervise all of the elements of the operation that are part of the IAP.

In order to facilitate their efforts, Logistics may be divided into Service or Support Branches, each of which may be composed of separate Units. Operations may also be divided into Branches, which may then be subdivided into Divisions or Groups, as well as Task Forces (multiple specialties) or Strike Teams (single specialty) Units.

Important to the overall operation are the concepts of Unity of Command and Span of Control. Those mean that each individual only has one supervisor and each supervisor has no more than five to seven people to supervise. The whole organization can be scaled up or down depending on the size of the event. In other words, for a small event one person could be the entire Planning Section. On the other hand, for a larger or expanding event supporting personnel can be added to assist any position.

Field Day

So how might we use all this for Field Day? Starting at the top, the IC is your Field Day Chairperson. That should be fairly obvious. The same for your PIO who will be handling all of the pre-event publicity as well as a public information table at your Field Day site. Remember, there are bonus points for both of those.

If you haven't used an SO before you have been missing a crucial participant. The SO can identify risks before they happen as well as the unforeseen ones that crop up on site. A LO can be very helpful to coordinate with public officials (remember those bonus points), safety forces, etc.

Your Finance section can establish a budget for the event, determine if extra funds are needed and recommend the ways to raise them, manage and document all receipts and expenditures and provide a report on the overall cost. The Planning Section has the important task of developing the IAP, that is, your Field Day plan. The IAP will cover topics such as location, entry category, set up and teardown strategies, tracking resources such as loggers and operators and so on. Planning staff can examine your group's previous Field Day efforts as well as those of other clubs in order to gather all necessary information.

One of the first responsibilities of Logistics is letting Planning know whether the planned for resources will actually be available or not. If, for example, Logistics reports that a Field Day site is unavailable or that only four antennas can be located, Planning needs to shift gears. Logistics also needs to coordinate those important meals, snacks and coffee for the Field Day crew, handle on-site communications, provide for first aid, maintain site security and ensure that all other supplies and equipment will be available when and as needed. Logistics also schedules all volunteers.

In addition to Logistics, Operations is the other section that makes things happen. Operations can have a Staging Area Manager who keeps track of all resources, both staff and equipment, as they arrive. A Branch could be set up for Station Operations, with separate Divisions or Groups for each station, for example, GOTA, 20 meters, digital, etc. Separate Branches could be responsible say for antennas or power generation and distribution. Of course, Operations will also need to make arrangements for set up and teardown, in other words both the activation/deployment and the deactivation and demobilization for the entire event.

Your Field Day weekend can begin with an initial briefing and review of the IAP and then be divided into Operational Periods of, for instance, 6 or 8 hours. At the end of each period the Command and General staff can conduct a review of the operation, change the IAP if necessary and relief personnel can be briefed before staff changes occur.

After Field Day an After Action Review can be conducted. From that, both an After Action Report and an Improvement Plan can be developed as you begin planning for next year.

Try It Out

The heart of all this is a division of labor with clear lines of authority. No one gets stuck doing everything and all tasks are assigned. You know what you are to do and who you report to. If more help is needed, the system has the flexibility to add or shift personnel. What doesn't work this year can be changed for next year. And most importantly, these concepts can be applied whether you have two participants or 50.

Plenty of ICS resources including forms are available online and a convenient pocket-size NIMS Incident Command System Field Guide is also available for easy reference.[3]

Give it a try. You will be amazed at how quickly the ICS makes sense to you and how easily you can incorporate it into Field Day as well as public service events. Your knowledge of the ICS will be crucial to your intelligent interaction with your local and regional emergency managers and first responders.

[3]Available from Informed Publishing, **www.InformedGuides.com**

NTS DISCUSSED IN WHITE PAPER

Richard Webb, NF5B
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The ARRL Programs and Services Committee of the ARRL Board of Directors requested a response from the National Traffic System (NTS) regarding its ability to provide emergency communications circuits and related capabilities. The NTS publicized the work that had been ongoing for quite some time by the NTS Winlink committee. This has resulted in some new concepts in digital communication that are being proposed and introduced as a revised "Chapter 6" of the "NTS Methods and Practices Guidelines," Appendix B of the *ARRL Public Service Communications Manual* (**www.arrl.org/public-service-communications-manual**).

The proposed revised "Chapter 6" is available for reading at **wx4j.com/mpg6_ntsd_radioemail.htm**.

In an effort to provide further input, I drafted and submitted a white paper on NTS manual operations that focused on future challenges and opportunities. I submitted this white paper to the Subcommittee on the Field Organization of the Programs and Services Committee in late 2010.

I encourage you to read the white paper and provide comments. It can be downloaded from **www.wpusa.dynip.com/files/fdist/hamnews/ntsfutur.zip** or **ftp.wpusa.dynip.com/pub/fdist/hamnews/ntsfutur.zip**.

You'll need *WinZip* or its equivalent to extract the text document within, but any word processor or text file viewer should be able to read it.

Central Florida D-Star Academy

The Central Florida D-STAR Academy will be held on July 30, 2011 in Mount Dora, Florida. There will be an informal gathering on Friday night and the Academy will run from 0800 to 1730 EDT on Saturday with lunch served on-site. Learn about D-STAR: what it is, programming, linking, high and low speed data, ID-1 and D-RATS. For information go to **www.cfldsg.org**; contact Ed Biederwolf, W9CHA, at **ed@w9cha.com,** or see the July issue of *QST*.

OP-ED

New Project, New Interest, New Discoveries

Steve Stronczek, WA9IDZ

There certainly have been changes in communications technology. Being first licensed in 1963 and having operated through a number of sunspot cycles, built lots of equipment and toiled as an electronics engineer, I am sensitive to new developments and new ways of doing things. I may be a bit slow to accept the changes sometimes, but I am certainly inquisitive and willingly accept proven positive changes.

It Can't Work, But It Does

In thumbing through *The ARRL Handbook* I once again looked at the direct conversion (DC) receiver theory and construction projects. One paragraph in particular caught my eye, stating that superheterodyne receivers of the '70s are far superior to those of the '30s and the same holds true for DC receivers. That statement struck a chord with me as I started out with an RME 45 receiver, then a Collins 51S-1 receiver and now modern transceivers. The new stuff certainly outperforms the old RME.

I had been quite curious about these "newfangled" DC receivers. How could a receiver without any "front end," that actually had loss in its toroid transformers, broadband filter networks and diode ring mixer(s), hear anything at all. Further, all the gain is in the audio amplifiers, not the distributed-gain filters commonly used. Finally, it has a potentiometer from the antenna terminal to ground to divide down the antenna input signal — sacrilege!

From there it was on to study DC receiver theory, read some Mini-Circuits specification sheets and bone up on quadrature hybrid phase shifters, I-Q theory, etc. Thumbing through the *Handbook* again, I chose Rick Campbell's I-Q Binaural Weekender project.[1] I ordered some parts, etched the PC boards, stuffed them, built and calibrated a nice shielded VFO with sloooow tuning. For me, home building is where the real fun is and I get lots of satisfaction and pleasure from planning, building and completing a project.

I finally made the last solder connection, tightened the last screw, checked my installation of the old Jackson Brothers tuning drive I scrounged out of the junk box and then the apprehension set in. I checked each and every connection and PC trace for accuracy, parts placement and battery polarity. I felt the tuning action while thinking to myself: "Well, I sure hope this was not a big waste of time building a receiver without any front end and no real tuned circuits." I hooked up the antenna, plugged in the David Clark headset and turned the unit on.

"For me, homebuilding is where the real fun is and I get lots of satisfaction and pleasure from planning, building and completing a project."

Wow, I was just astonished! I could not believe my ears. I was amazed at how well it heard. Even with a 1 kΩ potentiometer from the antenna to ground, turned almost all the way down. I heard less noise but the signals were still there. How does this thing hear like that with no gain in the front end? And the binaural mode, well that was just a giant kick. It sure is great to be building again. I can't wait to dream up a project using this newfound technology.

Power Out Causes a Noise Rout

Earlier today the power went out. As I waited, I cast a glance at the little battery-powered I-Q receiver and thought I'd see what was on 40. I donned the headphones and found 40 was hopping. There were lots of CW and SSB signals and I was amazed at how easy it was to tune one in. And then it hit me that there was almost no noise across the band. No "clumps" of raspy humming noise, no big static crashes and the general noise level was far less than usual.

I had read articles about power grid generated noise but this was the first time I really experienced it and had a ruler to measure the difference. As I was listening to a CW contact the grid returned and so did the noise. The intelligibility was almost totally gone on one station and the other was certainly compromised but readable. Thinking back 50 years ago I didn't remember such high noise levels on the bands as we find now. It makes 160 almost unusable at times. Eighty isn't much better. Seems like there is work to do in cleaning up the grid.

All in all, building the I-Q receiver has rejuvenated my building interests and has given me many hours of pleasure, both in building the project, planning additional projects, giving me motivation to improve my antennas and using the new toys. What a wonderful hobby this has been over my whole lifetime.

Steve Stronczek, WA9IDZ, an ARRL member, obtained his Novice license in 1963 receiving the call WN9IDZ. Later that year he passed his General. Steve served in the US Army during Vietnam. After the war he obtained his Extra class license. Steve is an avid homebrewer. His first homebrew receiver was a 40 meter regenerative set he built from a magazine article.

Steve has a BSEE degree and has worked in the heavy truck, motor coach and locomotive industry for 28 years. He is now retired and living in the Smoky Mountains where he operates a complete homebrew station with a Collins S-Line for backup. He can be reached at 229 Dark Hollow Rd N, Andersonville, TN 37705-1954, **sstevecu@gmail.com**.

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).

[1]R. Campbell, KK7B, "A Binaural I-Q Receiver," *QST*, Mar 1999, pp 44-48. Also available as a Supplemental File on the 2011 *ARRL Handbook for Radio Communications* CD, chapter 12, "Binaural I-Q Receiver Project."

This Month in Contesting

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

JUNE: SPORADIC-E, FIELD DAY AND VHF!

As we roll into June, one of the finer ionospheric events comes into play. I'm talking about sporadic-E propagation. Bands that have been dormant for many months (10, 6 and even 2 meters on occasion) suddenly burst to life with strong signals during the warm summer months. Two signature ARRL events occur in June, timed in part to take advantage of these excellent openings.

Sporadic-E is caused by clouds of ionized gas in the E layer of the ionosphere. It's difficult to predict when these clouds will become dense enough to allow radio waves to be reflected (hence the name "sporadic"). What is known about sporadic-E is that it is typically strongest and most frequent during the summer months. A single-hop opening can allow QSOs over roughly 500-1000 miles with very modest gear.

With this in mind, participating in the ARRL June VHF QSO Party the weekend of June 11-12, and Field Day on the weekend of June 25-26, becomes a no-brainer. The antennas for 6 and 10 meters are relatively small, which is ideal for portable operating. Both events cater to portable operations — the June VHF uses grid squares as the multiplier, and Field Day is…well, when you're supposed to operate in the field.

The June VHF QSO Party is all about grid squares. If you're not familiar with what a grid square is, you can look them up on the ARRL website, **www.arrl.org/gridsquares**. You can operate the June VHF QSO Party from your home, from a nearby hilltop in a really rare grid square, or even as a *Rover*, a station that operates in its vehicle from more than one grid during the contest. If the band opens up, the QSOs will come and go very fast, so be ready! Six meters has been sensational during this contest for the past three years, so don't miss out on some excellent operating time.

There is an added incentive for operating 6 and 2 meters in Field Day this year: All class A stations get a free VHF transmitter, meaning they can operate a rig on HF and a separate rig on 6 and 2 meters simultaneously and still enter as class 1A. This is a big, big deal! Being able to operate on 6 and 2 meters during Field Day at the height of the sporadic-E season means there are a lot of free points to be had. Never operated 6 or 2 meters in Field Day before? Steve Ford, WB8IMY, and I wrote a cheat sheet on how to maximize your effort on VHF in Field Day. It includes a lot of excellent information such as where to call CQ on 6 meters **(not in the DX Window between 50.100 and 50.125 MHz!)**, general ideas on antennas, and how to use SSB and CW on bands that most folks think are for FM only. You can find our *Field Day VHF Operating Tips* at **www.arrl.org/fieldday**, under the "At a Glance" area.

The standard protocol for long-distance QSOs on VHF bands means operators use SSB or CW and a horizontally polarized antenna. Antennas for 6 meters can be as simple as a homebrew wire dipole thrown into a tree or to the side of a tower or other support; they're only 9.4 feet long and easy to build. For the more adventurous, a 3 element Yagi or a quad will provide gain and still have a small footprint. Two meter Yagis can be quite small; a 3 element Yagi can be made out of almost anything and is about a square yard in size. Longer antennas will provide you with more gain, however. You can find several commercially available 6 or 2 meter beams or you can build one yourself with plans from *The ARRL Antenna Book*. Ten meter dipoles are only about 16.5 feet long and will perform quite nicely up in a tree.

Lastly, don't forget that all of the bands where sporadic-E occurs are available to Technician class licensees. If you're a Tech, I can't encourage you enough to get on and enjoy these bands and start making some long-distance QSOs. June and sporadic-E propagation go hand-in-hand, and with the June VHF QSO Party and Field Day in the mix, you have the opportunity to make some great operating memories. Why sit on the sidelines? Go have fun!

All Things Must Pass, Including TMIC

When I joined ARRL staff as Contest Branch Manager, I was asked to write a monthly column pertaining to contest-related topics. I have done my best to shed light on the joy and pleasures of contesting, address some questions and encourage every amateur to give Radiosport a try. It appears some folks took notice; overall log submission for ARRL events is up by about 18% since 2007, even at the bottom of the sunspot cycle. That's a lot of submitted logs!

Radiosport: The combination of radio and sport. One definition of *sport* is "an athletic activity requiring skill or physical prowess and often of a competitive nature." Another is "diversion; recreation; pleasant pastime."

I love contest pileups. I've won my share of certificates and plaques, operated from the Other Side of the Pileup numerous times, and still the main focus for me is the *fun*, not the competition. There are hundreds, perhaps thousands, of contest operators better than I am. But I question whether they have as much fun as I do. However you approach contesting (or Amateur Radio in general), remember to keep it fun. Learn from others. Try new things. Explore. Isn't that what Amateur Radio, at its core, is all about?

I've tried to focus my monthly column on operating fun and enjoyment. For now, I've said all I have to say, so I'm going to let the column go. I'll still be in the Contest Branch every day churning out results, and I'll still be answering your questions and e-mail. I hope you have learned something from my column, and I hope that I'll work you on the air soon.

In the May/June "Contesting 101"

"Following the sun." Kirk, K4RO, discusses basic propagation as it relates to contesting. Contesting 101 can be found in the *National Contest Journal*, published six times per year. For subscription information, visit **www.arrl.org/ncj**.

June 2011 W1AW Qualifying Runs

W1AW Qualifying Runs are 10 PM EDT Friday, June 3 (0200Z June 4) and 7 PM EDT (2300Z) Wednesday, June 22. The West Coast Qualifying Run will be transmitted by station K6KPH on 3581.5, 7047.5, 14047.5, 18097.5 and 21,067.5 kHz at 2 PM PDT (2100Z) Saturday, June 11 (40-10 WPM). Unless indicated otherwise, speeds are from 10-35 WPM.

CONTEST CORRAL

in association with the *National Contest Journal*

JUNE 2011

Start and Finish	HF	VHF+	Contest Title	Phone	CW	Digital	Exchange	Sponsor's Web Site or Contact
Jun 3, 0200Z - Jun 3, 0300Z	1.8-14		SNS and NS Weekly Sprints		✘		Serial number, name, S/P/C	www.ncccsprint.com/rules.html
Jun 4, 0000Z - Jun 5, 2400Z		1.2G	Worldwide EME Contest	✘	✘		TMO/RS(T) and "R"	www.dubus.org
Jun 4, 0000Z - Jun 5, 2400Z	28		Ten-Ten Open Season			✘	Call, name, S/P/C, member numbers	www.ten-ten.org
Jun 4, 1100Z - Jun 4, 1500Z	14		LZ Open 20 Meter Contest		✘		6-digit serial and serial from previous QSO	www.lzopen.com
Jun 4, 1200Z - Jun 5, 0300Z	1.8-28	50,144	Maritime QSO Party	✘	✘		RS(T), Maritime county or S/P/C	www.maritimecontestclub.com
Jun 4, 1200Z - Jun 5, 1200Z	3.5-28		SEANET Contest	✘	✘	✘	RS(T), serial	seanet2011.com/contest.htm
Jun 4, 1300Z - Jun 5, 1300Z		50	UKSMG Sporadic E Contest	✘	✘	✘	RST, member nr, 6-digit grid locator	www.uksmg.org
Jun 4, 1500Z - Jun 5, 1459Z	1.8-28		IARU Region I Field Day		✘		RST, serial	IARU Society Web sites
Jun 4, 1600Z - Jun 5, 0400Z	1.8-28		Alabama QSO Party	✘	✘		RS(T) and county, state, province, or 'DX'	www.alabamaqsoparty.org
Jun 5, 1100Z - Jun 5, 1700Z	28		DARC 10 Meter Digital Contest			✘	RST, serial number	www.darc.de/referate/ukw-funksport
Jun 7, 0200Z - Jun 7, 0400Z	3.5-28		ARS Spartan Sprint		✘		RST, S/P/C, and power	www.arsqrp.blogspot.com
Jun 8, 1300Z - See Web site	3.5-14		CWops Monthly Mini-CWT Test		✘		Name and member number or S/P/C	www.cwops.org/onair.html
Jun 11, 0000Z - Jun 11, 2400Z	3.5-28		Portugual Day	✘	✘		RS(T) and serial or district code	portugaldaycontest.rep.pt
Jun 11, 0000Z - Jun 12, 2359Z	1.8-28		WFF Green Days	✘	✘	✘	RS(T) and WFF number if available	wff44.com/en/contest/
Jun 11, 0000Z - Jun 19, 2400Z	1.8-28	50-432	World Wide QRP Contest	✘	✘		RS(T)	en.jaqrp.org
Jun 11, 0000Z - See Web site	3.5-28		DRCG Long Distance Contest			✘	RST, CQ Zone, and UTC time	www.drcg.de
Jun 11, 0600Z - Jun 12, 0600Z	3.5-28		Australian Shires Contest	✘	✘		RS(T) and VK Shire or CQ Zone	groups.yahoo.com/group/vkshires
Jun 11, 1100Z - Jun 11, 1300Z	14-21		Asia-Pacific Sprint	✘			RST, serial	jsfc.org/apsprint/aprule.txt
Jun 11, 1500Z - Jun 12, 1500Z	3.5-28		GACW WWSA CW DX Contest		✘		RST, CQ zone	www.wwsatest.org
Jun 11, 1600Z - Jun 12, 1600Z		50	REF DDFM Six Meter Contest	✘	✘		RST, serial number, grid square	concours.ref-union.org
Jun 11, 1800Z - Jun 13, 0300Z		**50+**	**ARRL June VHF QSO Party**	✘	✘	✘	**Grid square**	www.arrl.org/contests
Jun 15, 0030Z - Jun 15, 0230Z	3.5-14		NAQCC Monthly QRP Sprint		✘		RST, S/P/C, and NAQCC mbr nr or power	naqcc.info
Jun 16, 0800Z - Jun 16, 1000Z	7		SARL Youth Day Sprint	✘			RS and age	www.sarl.org.za
Jun 18, 0000Z - Jun 19, 2400Z	1.8-28		All-Asian DX Contest		✘		RST, operator age (YL may send 00)	www.jarl.or.jp/English
Jun 18, 0000Z - Jun 19, 2359Z		50	SMIRK QSO Party	✘	✘		Grid square and member number	www.smirk.org
Jun 18, 1600Z - Jun 19, 0200Z	3.5-28		West Virginia QSO Party	✘	✘	✘	RS(T), WV county or S/P/C	www.qsl.net/wvsarc
Jun 18, 1800Z - Jun 18, 2400Z	**3.5-28**		**Kid's Day**	✘			**Name, age, location, favorite color**	www.arrl.org/kids-day
Jun 18, 2000Z - Jun 18, 2200Z	28		Feld-Hell 10 Meter Sprint			✘	RST, QTH, Feld-Hell number	www.feldhellclub.org
Jun 19, 0900Z - Jun 19, 1500Z		50	WAB 50 MHz Phone	✘			RS, serial, WAB square or DXCC entity	www.worked-all-britain.co.uk
Jun 22, 0030Z - Jun 22, 0230Z	3.5-14		NAQCC Milliwatt Sprint		✘		RST, S/P/C, and NAQCC mbr nr or power	naqcc.info
Jun 23, 0000Z - Jun 27, 0000Z	1.8		SARL Top Band QSO Party	✘	✘		RS(T) and province or country	www.sarl.org.za
Jun 25, 1200Z - Jun 26, 1200Z	1.8-28		His Majesty King of Spain	✘			RS, serial or EA province	www.ure.es
Jun 25, 1400Z - Jun 26, 1400Z	1.8-28		Marconi Memorial HF Contest		✘		RST and serial number	www.arifano.it/contest_marconi.htm
Jun 25, 1800Z - Jun 26, 2100Z	**1.8-28**	**50+**	**ARRL Field Day**	✘	✘	✘	**Category, ARRL/RAC section or DX**	www.arrl.org/contests
Jun 25, 1800Z - Jun 26, 2100Z	1.8-28	50+	QRP ARCI Milliwatt Field Day	✘	✘	✘	Category, ARRL/RAC section or DX	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 websites for full rules, scoring information, operating periods or time limits, and log submission information.
No contest activity occurs on 60, 30, 17, 12 meters. Serial = Sequential number of the contact. S/P/C = State, Province, DXCC Entity. XE = Mexican state.
Publication deadline for Contest Corral listings is the first day of the second month prior to publication.

Check for updates and a downloadable PDF version online at www.arrl.org/contests

Results, 2010 ARRL November Phone Sweepstakes

"My unbroken string of missing the Sweep remains intact!" — *AL9A*

Steve London, N2IC
n2icarrl@gmail.com

Phone Sweepstakes continues to be one of the leading events of the contest season. Extreme weather on the West Coast hampered many participants with power outages and damaged antennas, but many still found a way to get on the air. The rest of us were undeterred by what we hope is only a temporary hiatus in sunspot cycle 24. This year, 1790 logs were submitted, reporting over 600,000 QSOs. When you add in those who did not submit a log you get a total of 4500 participants!

Evening, nighttime and early morning conditions on the low bands were outstanding, with 80 and 40 meters supporting equal numbers of QSOs. Twenty meters continues to be the daytime workhorse. Despite the sunspots, the number of 15 meter QSOs was down from last year. Ten meters showed some real improvement, however, with a solid opening between the northeast USA and the West Coast around noontime on Sunday as you can see in the chart of QSOs made during each hour of the contest.

To set a new record, you had to choose your operating category carefully, and put in a maximum effort. Only 6 new Division records and 30 new Section records were set.

The Ever-Elusive Clean Sweep

With challenging conditions making personal, Division and Section records a challenge, the "Clean Sweep" (working at least one station in each of the 80 ARRL Sections) becomes the goal for many participants. This year 287 earned a Clean Sweep, an increase of 5 Sweeps over 2009. Another 132 operators came so close — missing only one section. Which sections were the toughest? This year it was Puerto Rico (27 missed Sweeps), Newfoundland-Labrador (15 missed Sweeps), and Northwest Territories (14 missed Sweeps). For those of you still shaking your head, all three of those sections were well represented thanks to WP3US, NP4G, NP4A, NP3D, NP3CW, VO1KVT, VO1TA, VO1HE, VO1HP, VE8EV, VE8GER, VE8NSD and VY1EI. Many thanks to those ops for making their rare sections available. In the next tier of uncommon sections the Pacific, Quebec, Manitoba, and Mississippi sections were in demand. See the chart "79 Multipliers — Missed Sections" to see which were missed by those who worked 79 sections.

Who was the first to earn a Clean Sweep this year? That honor goes to the W6YI Multi-Op team, only 5 hours and 8 minutes into the

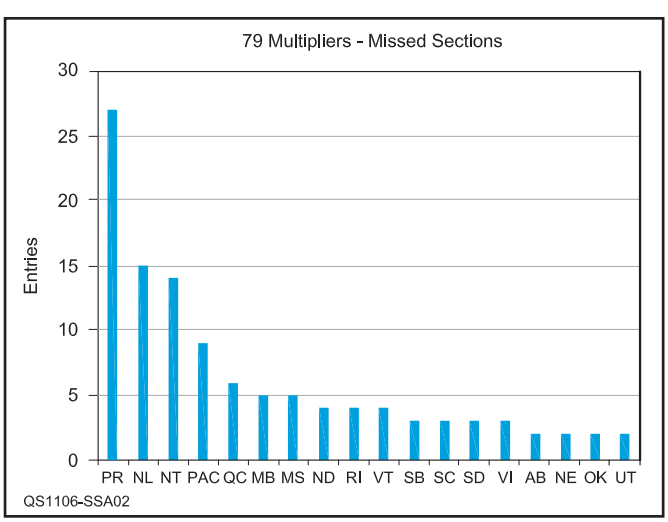

Figure 1 — This chart shows which sections were the ones most frequently absent from the logs of those who missed a Clean Sweep by only one section.

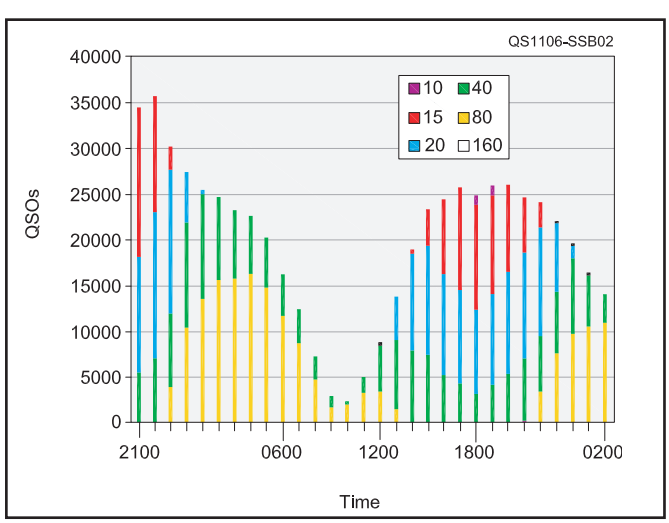

Figure 2 — The ebb and flow of contacts on each band is clearly shown in this graphic. Note the short opening on 10 meters around mid-day Sunday — a good omen for next year!

Affiliated Club Competition

	Score	Entries
Unlimited Category		
Potomac Valley Radio Club	21,489,580	273
Northern California Contest Club	20,159,038	286
Society of Midwest Contesters	9,798,106	173
Yankee Clipper Contest Club	7,597,768	98
Tennessee Contest Group	4,556,898	58
Minnesota Wireless Assn	6,261,496	108
Florida Contest Group	4,097,928	62
Medium Category		
Mad River Radio Club	3,531,598	40
Frankford Radio Club	3,488,752	45
Southern California Contest Club	3,298,500	46
Central Texas DX and Contest Club	2,922,760	27
Alabama Contest Group	2,860,704	44
Arizona Outlaws Contest Club	2,749,292	44
Western Washington DX Club	2,616,910	30
Grand Mesa Contesters of Colorado	2,616,660	30
North Texas Contest Club	2,000,432	19
Contest Club Ontario	1,901,498	38
South East Contest Club	1,781,992	21
Hudson Valley Contesters and DXers	1,638,914	25
Willamette Valley DX Club	1,293,746	19
Louisiana Contest Club	1,244,686	12
Maritime Contest Club	1,042,694	20
Rochester (NY) DX Assn	987,538	14
Kentucky Contest Group	947,124	11
CTRI Contest Group	857,518	14
Northern Rockies DX Association	855,750	6
Saskatchewan Contest Club	579,308	6
Oklahoma DX Assn	566,472	6
Allegheny Valley Radio Association	549,068	11
Contest Group Du Quebec	547,520	13
North Coast Contesters	520,728	8
BC DX Club	507,382	5
ORCA DX And Contest Club	492,978	7
Utah DX Assn	479,634	8
Central Oregon DX Club	460,858	5
Order of Boiled Owls of New York	449,804	7
Alberta Clippers	368,498	3
Missouri DX and Contest Club	309,352	4
East Coast Canada Contest Club	213,640	3
Motor City Radio Club	208,568	11
Western New York DX Assn	145,534	5
Mississippi Valley DX/Contest Club	109,300	3
Eastern Iowa DX Assn	99,130	3
Carolina DX Association	51,912	5
Local Category		
New Mexico Big River Contesters	1,286,004	10
Iowa DX and Contest Club	712,172	7
Kansas City DX Club	677,504	7
Spokane DX Association	641,372	9
Delaware ARA (Ohio)	376,870	5
Contoocook Valley Radio Club	239,470	3
Lincoln ARC	234,916	6
Sterling Park ARC	226,962	10
Utah Contest Club	220,224	3
West Park Radiops	208,598	7
Sussex County ARC	207,866	5
Hilltop Transmitting Assn	204,262	4
Bristol (TN) ARC	198,016	6
Portage County Amateur Radio	193,426	8
Ashe County ARC	186,304	4
West Allis RAC	182,076	3
Murgas ARC	156,166	3
South Jersey DX Assn	144,782	4
Skyview Radio Society	136,204	4
Badger Contesters	136,086	3
Fort Wayne Radio Club	133,468	3
Western Lake County ARS	108,112	6
Blue Ridge ARC	82,760	3
Southern Berkshire ARC	80,394	5
Hays-Caldwell ARC	74,998	5
Granite State ARA	70,634	3
Great South Bay ARC	60,346	5
Hazel Park ARC	59,306	5
Meriden ARC	57,168	3
New York University ARC	36,372	3
Nanaimo Amateur Radio	15,480	3

contest. Their last section? Vermont! W7WA was the first Single-Op station to make the Sweep at 0247Z.

Close Races

Every year there are a number of very close Section races. Some of these are completely accidental — in one race the two participants didn't even know they were competing in the same category — while others were clearly rivalries extending back many years.

This year the most exciting close race was the Single-Op, Unlimited category in the North Texas Section. There was a three-way battle between WBØTEV, N1CC, and N5JB. Only one QSO separated WBØTEV from N1CC and 7 more QSOs from N5JB! In the Alberta Multi-Op category VE6EX won over VE6AO by a margin of only 5 QSOs!

Thanks to great club activity Maryland-DC is always a competitive section. This year in the Single-Op, Low Power category, W3CB came out on top only 13 QSOs ahead of KB3OK and NS3T.

Close races are often decided by which operator was the most accurate. [*See last month's CW Sweepstakes results for an example of just how close it can get — Ed*] The Accuracy Honor Roll table lists stations whose operating gives us all something to shoot for.

Single-Op, High Power Category

Almost every year Single-Op, High Power is the most competitive of the six Sweepstakes categories. 2010 was an amazing year in this regard. Congratulations to Jeff Briggs, K1ZM who was operating from his VY2ZM Prince Edward Island QTH. There is so much exceptional about Jeff's win that it's hard to know where to start. This was the first Single-Op, High Power victory from Canada since 1948 and the first Canadian victory in any category in 10 years. And it was done from the far northeast extremes of Canada. And it was a come-from-behind victory over stations in the southern and western USA. How did Jeff do this? It all happened during 6 hours on Sunday morning between 1300Z and 1900Z.

A comparison with #3 finisher Steve, N2IC is interesting since Jeff and Steve's off-time strategies were virtually the same. At 1300Z, N2IC had a solid 77 QSO lead over VY2ZM. During each of the next six hours Jeff's QSO rates significantly exceeded Steve's. By 1900Z VY2ZM had a 109 QSO lead over N2IC and never looked back! During this time Jeff sat on 20 meters, racking up huge numbers of QSOs with stations in the densely-populated 2nd, 3rd, 4th, 8th and 9th call areas, all one F-layer hop away from Prince Edward Island. Steve tried to do the same thing, bouncing between 20 and 15 meters, but never had Jeff's QSO rates.

While VY2ZM earned a solid victory, the next three places were highly contested. Mitch, K7RL clawed his way up the ladder to #2 on Sunday, leapfrogging first over NR5M and then, in the last hour, over N2IC who barely held on to a 3rd place finish only 8 QSOs ahead of George, NR5M. George had a great last hour while Steve ran out of operating time and had to cool his heels listening to George run 'em on 40 meters. [Nothing smarts worse than having to listen to your competition and being out of operating time. — *Ed.*]

Not far behind in 5th place is perennial Top 10 finisher Dan, W7WA. 13 contacts separated 6th place finisher George, K5TR and Todd, WDØT operating at KDØS in South Dakota. The USA East Coast broke into the Top 10 with Rich, NN3W placing 8th. Ken, NØQO finished 9th while Rich, WC6H rounded out the Top 10.

Single Operator, High Power

VY2ZM (K1ZM, op)	349,022
K7RL	338,080
N2IC	333,920
NR5M	332,320
W7WA	324,960
K5TR	312,000
KDØS (WDØT, op)	309,920
NN3W (@ N4RV)	293,920
NØQO	289,456
WC6H	282,662

Single Operator, Low Power

W4AAA (KK9A, op)	236,960
AJ9C	203,040
N4PN	199,040
KU2M	196,078
W5MX	189,280
W4LT	178,080
NA4K	176,320
VE5ZX	169,760
K8BL	161,920
W7ZR	156,800

Single Operator, QRP

NØKK (@ NØAT)	109,440
W1XX	96,320
KH6LC (NH6V, op)	79,948
NN7SS (K6UFO, op)	70,350
N4JF	69,280
KA1LMR	67,624
NDØC	67,392
VA3DF	59,250
NØKE	56,248
KIØOV	52,984

Single Operator, Unlimited

WB1GQR (W1SJ, op)	276,640
K7ZSD	269,280
KW8N	267,520
K3MM	266,560
N4ZZ	265,920
W8MJ	258,560
NY3A	253,600
N2BJ	246,560
K1KD	243,840
NØXR (@ NØNI)	243,162

Multioperator

W6YI	329,760
WØNO	297,040
NK7U	282,080
WY7SS	272,320
KA1ARB	271,040
W5RU	269,760
W2PV	266,720
N8HR	265,920
N3OC	252,320
K7IR	250,400

School Club

W6YX	224,640
KØHC	223,520
NØUNL (WDØBGZ, op)	108,388
K2CC	87,680
W6RFU	68,016
W3ABT (K3BHX, op)	55,200
W1AF	53,712
W4UVA	44,304
W1YK	40,044
WØEEE	40,040

Single-Op, Low Power Category

The Low Power category continues to be the most popular category for SS participants with 840 submitted logs — almost half of the total. Those making the Low Power Top 10 came from all parts of continental North America.

John, KK9A operating as W4AAA in North Carolina, returned from a one year absence and again won the Low Power category with 1481 QSOs. Mike, AJ9C left some operating time on the table but still finished 2nd. Paul, N4PN placed 3rd. It's interesting to see that the three top finishers relied heavily on 80 meters for their QSOs.

Despite missing Puerto Rico for the Sweep, Pete, KU2M came in fourth and set a new Division record. Bryan, W5MX operating from Kentucky placed 5th. Bryan made a huge number of his QSOs on 80 meters but missed 4½ hours of operating time. Lu, W4LT jumped from 15th place to 6th place this year — great job! Steve, NA4K led the Tennessee crowd to 7th place. Syl, VE5ZX made Saskatchewan

Sponsored Plaque Winners

We are pleased to announce that the Overall and Division leaders in each category receive a sponsored Sweepstakes plaque. ARRL is grateful to ICOM America and numerous clubs and individuals for sponsoring Sweepstakes awards. For more information on awards sponsorship or 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**. Plaques cost $75 each, which includes all shipping charges.

Division/Category	*Winner*	*Plaque Sponsor*
Overall		
Single Operator High Power Phone	VY2ZM (K1ZM, op)	Don Lisle, K6IPV
Single Operator Low Power Phone	W4AAA (KK9A, op)	ARRL Contest Branch - Ken Adams, K5KA Memorial
Single Operator QRP Phone	NØKK (@ NØAT)	QRP Amateur Radio Club International
Single Operator Unlimited Phone	WB1GQR (W1SJ, op)	David Robbins, K1TTT
Multioperator Phone	W6YI	David Robbins, K1TTT
School Club Phone	W6YX	David Brandenburg, K5RQ
Atlantic		
Single Operator High Power Phone	N3RR	North Coast Contesters
Single Operator Low Power Phone	W3PP (K1RY, op)	Potomac Valley Radio Club
Single Operator QRP Phone	KF2U	ICOM America
Single Operator Unlimited Phone	K3MM	ICOM America
School Club Phone	K2CC	ICOM America
Multioperator Phone	N3OC	Mark Sickmeyer, KB3GJ Memorial
Central		
Single Operator High Power Phone	K9CT	Society Of Midwest Contesters
Single Operator Low Power Phone	AJ9C	Society Of Midwest Contesters
Single Operator QRP Phone	AI9K	Sean Kutzko, KX9X
Single Operator Unlimited Phone	N2BJ	ICOM America
Multioperator Phone	WD9CIR	ICOM America
School Club Phone	W9JWC	ICOM America
Dakota		
Single Operator High Power Phone	KDØS (WDØT, op)	Minnesota Wireless Association
Single Operator Low Power Phone	KØCN	Minnesota Wireless Association
Single Operator QRP Phone	NØKK (@ NØAT)	Tod Olson, KØTO
Single Operator Unlimited Phone	K1KD	Minnesota Wireless Association
Multioperator Phone	NØGF	In Memory of Jim Dokmo, KØFVF - Minnesota Wireless Association
School Club Phone	KØVVY	Tod Olson, KØTO
Delta		
Single Operator High Power Phone	N8OO	ICOM America
Single Operator Low Power Phone	NA4K	ICOM America
Single Operator QRP Phone	KC5WA	ICOM America
Single Operator Unlimited Phone	N4ZZ	ICOM America
Multioperator Phone	W5RU	ICOM America
School Club Phone	K5LSU	ICOM America
Great Lakes		
Single Operator High Power Phone	K8AO	Mad River Radio Club
Single Operator Low Power Phone	W5MX	Mad River Radio Club
Single Operator QRP Phone	KT8K	Mad River Radio Club
Single Operator Unlimited Phone	KW8N	ICOM America
Multioperator Phone	N8HR	ICOM America
School Club Phone	W8SH	In Memory Of Robert "Val" Edwards, W8KIC
Hudson		
Single Operator High Power Phone	KM2O	ICOM America
Single Operator Low Power Phone	KU2M	ICOM America
Single Operator QRP Phone	AA2VK	ICOM America
Single Operator Unlimited Phone	W2GDJ	ICOM America
Multioperator Phone	AB2DE	ICOM America
School Club Phone	W2DSC (WB2NVR, op)	ICOM America
Midwest		
Single Operator High Power Phone	KØRH	ICOM America
Single Operator Low Power Phone	KØOU	Society of Midwest Contesters
Single Operator QRP Phone	KIØOV	ICOM America
Single Operator Unlimited Phone	NØXR (@NØNI)	ICOM America
Multioperator Phone	WØNO	ICOM America
School Club Phone	KØHC	ICOM America
New England		
Single Operator Unlimited Phone	WB1GQR (W1SJ, op)	ICOM America
Single Operator High Power Phone	NC1I (K9PW, op)	ICOM America
Single Operator Low Power Phone	W1WBB	ICOM America
Single Operator QRP Phone	W1XX	QRP Club of New England
Multioperator Phone	W2PV	ICOM America
School Club Phone	W1AF	Michael McKaughan, K1DM

Division/Category	*Winner*	*Plaque Sponsor*
Northwestern		
Single Operator High Power Phone	K7RL	ICOM America
Single Operator Low Power Phone	W7YAQ	ICOM America
Single Operator QRP Phone	NN7SS (K6UFO, op)	Phil Yasson, AB7RW
Single Operator Unlimited Phone	K7ZSD	ICOM America
Multioperator Phone	NK7U	ICOM America
School Club Phone	No Entrant	
Pacific		
Single Operator High Power Phone	WC6H	The Carroll Dean Jensen Memorial (K6CDJ)
Single Operator Low Power Phone	N6ZFO	ICOM America
Single Operator QRP Phone	KH6LC (NH6V, op)	ICOM America
Single Operator Unlimited Phone	KH7Y (KB7Q, op)	ICOM America
Multioperator Phone	KH6MB	ICOM America
School Club Phone	W6YX	ICOM America
Roanoke		
Single Operator High Power Phone	NN3W (@N4RV)	Potomac Valley Radio Club
Single Operator Low Power Phone	W4AAA (KK9A, op)	Raleigh Amateur Radio Society - W4DW
Single Operator QRP Phone	K4WY	Ronnie Reams WA4MJF & Sherry Reams KB4EXL
Single Operator Unlimited Phone	W4NF	Ronnie Reams WA4MJF & Sherry Reams KB4EXL
Multioperator Phone	KA1ARB	Ronnie Reams WA4MJF & Sherry Reams KB4EXL
School Club Phone	W4UVA	Ronnie Reams WA4MJF & Sherry Reams KB4EXL
Rocky Mountain		
Single Operator High Power Phone	N2IC	Grand Mesa Contesters of Colorado
Single Operator Low Power Phone	K7VU	ICOM America
Single Operator QRP Phone	NØKE	Colorado QRP Club
Single Operator Unlimited Phone	WA5ZUP	Grand Mesa Contesters of Colorado
Multioperator Phone	WY7SS	ICOM America
School Club Phone	No Entrant	
Southeastern		
Single Operator Unlimited Phone	K4ZGB	Charlie Wooten, NF4A
Single Operator High Power Phone	K4SSU (NA4BW, op)	David Brandenburg, K5RQ
Single Operator Low Power Phone	N4PN	David Brandenburg, K5RQ
Single Operator QRP Phone	N4JF	ICOM America
Multioperator Phone	WW4LL	David Higdon Jr KD4ICT - With thanks to W4QO
School Club Phone	No Entrant	
Southwestern		
Single Operator High Power Phone	AA6PW	ICOM America
Single Operator Low Power Phone	W7ZR	ICOM America
Single Operator QRP Phone	KK7EL	N6HE and W6DLD
Single Operator Unlimited Phone	K6LL	ICOM America
Multioperator Phone	W6YI	ICOM America
School Club Phone	W6RFU	ICOM America
West Gulf		
Single Operator High Power Phone	NR5M	ICOM America
Single Operator Low Power Phone	N5UWY	ICOM America
Single Operator QRP Phone	AE5GT	ICOM America
Single Operator Unlimited Phone	W5ASP	ICOM America
Multioperator Phone	K5CM	ICOM America
School Club Phone	K5USA	David Brandenburg, K5RQ
Canada		
Single Operator High Power Phone	VY2ZM (K1ZM, op)	ICOM America
Single Operator Low Power Phone	VE5ZX	ICOM America
Single Operator QRP Phone	VA3DF	Frank Merceret, NA4CW
Single Operator Unlimited Phone	VE3RZ	ICOM America
Multioperator Phone	VE5PV	ICOM America
School Club Phone	No Entrant	

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easy for the rest of us in 8th place. Bob, K8BL moved up from 14th in 2009 to 9th place in 2010. Dick, W7ZR also made big strides jumping from 24th to 10th place.

Single-Op, QRP Category

This year, 76 entries braved the QRP category. My hat goes off to them! Kirk, NØKK overcame the Minnesota "Black Hole" to place #1 with 684 QSOs, a Clean Sweep, and a new Division record! And to show you really can do it with QRP, Kirk had a number of very nice runs on 20 and 15 meters, taking advantage of his SO2R (Single-Op Two-Radio) capabilities to interleave search-and-pounce QSOs while holding a run frequency. He even had a few short runs on 40 and 80 meters!

John, W1XX did a fine job from Rhode Island with a 2nd place finish. Rob, NH6V put KH6LC on the air with a 3rd place showing. Rob did great on 15 and 20 meters but struggled understandably on 40 and 80 meters. Mark, K6UFO operating from NN7SS moved up two slots this year to #4. Jerry, N4JF placed 5th. Chris, KA1LMR started the contest with a bang — VY1EI was his first QSO — on his way to a 6th place showing. Perennial QRPer Randy, NDØC came in 7th this year. Doug, VA3DF came in 8th just like last year. Ninth and 10th places were awarded to Phil, NØKE and Dan, KIØOV.

Single-Op, Unlimited Category

The Unlimited category continues to grow in popularity with 403 entries this year. Making the Top 10 was extremely competitive with only 210 contacts separating #1 from #10.

Congratulations to Mitch, W1SJ who was operating from WB1GQR in Vermont. As for a number of East Coast stations, 80 meters really played well for Mitch. On the other coast, Brad, K7ZSD came in 2nd splitting his

Accuracy Honor Roll

More than 500 QSOs with an error rate of 1% or less

Call	# QSOs	Category	Error Rate (%)
K1GU	670	U	0.1
N9CK	718	A	0.3
N9IO	552	U	0.5
W3BW	629	U	0.5
K1OU	513	A	0.6
K1TO	634	B	0.6
K4XD	709	U	0.6
K9OR	538	U	0.6
N2UT	819	B	0.6
W8TM	619	A	0.6
KB9OWD	558	A	0.7
W2ID	596	A	0.7
KH6LC	506	Q	0.8
N4BP	1245	B	0.8
N5UWY	513	A	0.8
ND8L	590	U	0.8
VE3RCN	705	A	0.8
W4MR	598	U	0.8
W7YAQ	793	A	0.8
W9FZ	640	A	0.8
WA6FGV	610	A	0.8
KØOB	846	U	0.9
K9JM	533	B	0.9
N6DE	994	U	0.9
VE3RZ	731	U	0.9
W9YK	626	M	0.9

contacts fairly evenly between 15, 20 and 40 meters. Only 11 QSOs back was Bob, KW8N placing 3rd and setting a new Division record. Just 6 contacts behind Bob, Tyler, K3MM came in 4th. Just 4 contacts separated Tyler from Don, N4ZZ in 5th place! Ken, W8MJ moved up from 13th in 2009 to 6th place in 2010. Congratulations! Steve, NY3A came in 7th. Barry, N2BJ moved up one slot taking 8th place. Grant, K1KD operating from Minnesota came in 9th. Dean, NØXR set a new Division record on his way to a 10th place finish.

Multioperator Category

The Multioperator Category continues its popularity, with 165 entries in 2010 — a great chance to operate with friends! The W6YI team of Jim, W6YI; John K6AM; Dan, N6MJ; and Dennis, N6KI did it again! The San Diego dynasty! How do they do it? A great group of operators, a great station, years of experience operating as a team, and by using all the freedom allowed by the Sweepstakes Multiop category rules. They typically operate two stations simultaneously but with an interlock that allows only one transmitter to be transmitting at a time. Looking at their log chronologically, they had an amazing 1148 band-changes!

The Kansas team at WØNO, moved up from 5th in 2009 to 2nd place in 2010 — a great job by Lee, KØWA; Mike, ABØTX; Jim, WØNO, and Bob, ABØS. The two-person team of Joe, NK7U and Scott, K7ZO placed 3rd.

In the "most improved" category, the WY7SS team from Wyoming moved up from 21st to 4th! Watch out, W6YI! A great job by Katie, WY7KRA; Dwayne, WY7FD; Leo, WY7LL, and Chris, WY7ML. More big improvements came from the KA1ARB North Carolina team and the W5RU Louisiana team. This year they both moved up placing 5th and 6th.

In 7th place was the W2PV team, operated by Dave, K1TTT; Gerry, W1VE, and Brian, NJ1F. Only 5 QSOs down was the N8HR team from Ohio. The N3OC team, operated by Brian, N3OC; Barry, WR3Z, and Jim, N1SZ took 9th place. Finishing the Top 10 is team K7IR.

School Club Category

Twenty-two schools competed in the School Club Category in 2010 and two put in full-time efforts to win. The result was an incredibly close race between W6YX, the Stanford University club station, and KØHC, the Hesston College club station. When the dust had settled, the all-alumni crew at Stanford beat the 1-teacher, 5-student team at Hesston by a mere 7 QSOs! It was a see-saw battle between the two teams. Stanford got out to an early lead that held through Saturday night. Hesston took the lead early Sunday morning and held the lead until mid-afternoon when Stanford again retook the lead for good. It is interesting to note that at the time of Sweepstakes none of the students at Hesston College were licensed, but they were all Air Traffic Control and Aviation students. Fertile ground for future contesters!

The University of Nebraska club, NØUNL operated by Alan, WDØBGZ placed 3rd. As was the case last year, NØUNL operated only on 40 meters. Moving up a notch, the Clarkson University Amateur Radio Club, K2CC made 548 QSOs and a Clean Sweep taking the #4 slot. Great job by Sam, KC2LRC; Jonathan, KC2WBV; Rosie, KC2WQO; Martin, KC2YRS; David, KB3EFS; Mike, KC2IXA; Virginia, NR2V, and Phil, KC2SGA.

The University of California, Santa Barbara, W6RFU operated by Steve, AC6T; John, KG6K, and Andrew, WØOOT had a very respectable 5th place finish. Other schools making the Top 10 were the University of Pennsylvania, W3ABT; Harvard University, W1AF; University of Virginia, W4UVA; Worcester Polytechnic Institute, W1YK, and University of Missouri-Rolla, WØEEE.

Club Competition

Again, many clubs led the charge to get their members on-the-air for Sweepstakes. The promotion of Sweepstakes by clubs is absolutely essential to the continued vitality of Sweepstakes. We can't thank the clubs, and of course, their members, for their commitment, dedication and understanding families. This year, 1840 participants submitted their CW and Phone SS scores towards their club aggregate scores.

In the Unlimited Club category, the Potomac Valley Radio Club and the Northern California Contest Club battled for the top spot. When the dust settled, the mid-Atlantic based PVRC again came out on top with 21.5 million points and 273 entries. The NCCC

COURTESY MICHAEL WILSON, K2KR

Michael, K2KR and Kristin, KCØINX were making West Texas an easy multiplier, Field Day style. Team K2KR took high honors in the Multioperator category in WTX.

was only 6.2% behind, with 286 entries and 20.2 million points. Watch out PVRC...the NCCC is closing the gap. The Society of Midwest Contesters again took 3rd place, with 173 entries and 9.8 million points. The Yankee Clipper Contest Club challenged the SMC for 4th place, with 7.6 million points.

There was a very close race for the top spots in the Medium Club category. The Mad River Radio Club emerged victorious, with 40 entries and 3.53 million points. Only 1.2% back was the Frankford Radio Club. Just one more entry, with about 300 QSOs would have changed the order of that finish. Right on their heels was the Southern California Contest Club. The next four places are almost as close, with the Central Texas DX and Contest Club, the Alabama Contest Group, the Arizona Outlaws Contest Club and the Western Washington DX Club separated by a total of 306,000 points. That's only a handful of entries difference.

In the Local Club Category, the Albuquerque-based New Mexico Big River Contesters ran away from the pack. Well done! The Iowa DX and Contest Club took 2nd place, and the Kansas City DX Club took 3rd place.

Acknowledgments

Many thanks to "Tree" Tyree, N6TR for his hard work checking the log and to George, K5TR for logistical and infrastructure support. In addition, K5OT, K9ZM, K9JK, KB9OWD, N6TV and K9DUR painstakingly typed in 55 handwritten logs with 8553 QSOs so they could be properly adjudicated.

Fill Your Sweepstakes Broom

The extended version of this write-up with more photos, tables, the complete line scores and a searchable database of results is available online at **www.arrl.org/contest-results-articles**. Don't forget to browse the photos and personal stories at **www.arrl.org/contests/soapbox**!

Results, 2010 ARRL 160 Meter Contest

A contest for every style of operating!

Gary Breed, K9AY
k9ay@k9ay.com

The ARRL 160 Meter Contest attracts serious contesters and avid 160 meter DXers but it is also an exciting adventure for hams who simply want to have fun exploring the low end of the Amateur Radio spectrum such as Vic, KI6VC who commented, "This was my first contest or even any real experience on 160. I think I'll be back for more!" In Vic's first 160 meter contest effort he made 374 QSOs with 71 multipliers from his California City, CA QTH.

2010 Contest Notes

As your author was reviewing the results, a few things stood out. The first was a record number of DX logs submitted and an overall increase in scores from Europe in the Low Power and Multioperator categories. It wasn't band conditions — 2010 was good, but 2009 had better propagation — the higher DX participation seems to be from more enthusiasm. Thanks to all of our DX friends! In addition, with 1306 logs submitted, the 2010 contest had the second-highest participation ever, just slightly below the record level of 2009.

It is impossible to talk about the 160 meter band without including propagation in the conversation. My own experience was that the second night was much better than the first but many hams from other parts of the country reported the opposite pattern. I saw below-average conditions everywhere to the west but other hams reported that the western stations were particularly loud and easy to work. Without a doubt, the unique Medium Wave propagation is one of the mysteries that makes Top Band a fascinating place!

Multioperator

K1LZ, operated by station owner Krassy with help from Velimir, K3JO and Mladen, NU5Y, captured the top spot in the Multioperator category and set a new scoring record for the Multioperator category with nearly 656k points.

Three other stations topped the 500k level in this category with W2FU in WNY and the W2GD crew on the Jersey shore (SNJ Section) taking 2nd and 3rd respectively. Out in Iowa, the operators at NØNI skillfully steered Toni's station to more than 509k points and the #4 spot, a notable achievement from the US Midwest with its greater distance from most DX activity. Other fine performances from the Midwest included WB9Z (7th) and WØAIH (10th).

Single-Operator, QRP

The top QRP score was earned by Glenn, WØGJ in Bemidji, MN whose 2010 score was just 1.4% below his 2009 record. Note that N7IR (5th) and K6EI (6th) are "Out West" where Top Ten scores can be hard to find. Great job, guys!

GLENN JOHNSON, WØGJ

You don't need a big antenna to get on 160 and have fun, but winning is another matter! This big vertical helped Glenn, WØGJ win the QRP category for the third year in a row.

W/VE

Single Operator, QRP

WØGJ	138,852
N8BB	101,885
K4CNW	80,770
NØUR	70,645
N7IR	62,826
W3TS	61,628
K6EI	54,216
N9NE	50,317
VE3MGY	43,384
AA1CA	40,474

Single Operator, Low Power

N1UR	238,543
K8FH	227,136
NE9U	216,678
N2ZN	214,920
WB8JUI	200,640
K1EP	200,335
K8BL	199,300
K4FT	186,816
WØUO	183,206
KØPK	177,284

Single Operator, High Power

VY2ZM (K1ZM, op)	864,753
K8PO	647,873
VE3EJ	586,929
K1DG	573,750
W8JI	573,520
K9DX	556,100
NO3M	507,494
K5NA	501,540
K1LT	477,056
AA1K	473,301

Multioperator

K1LZ	655,914
W2FU	580,354
W2GD	544,952
NØNI	509,696
K3WW	494,736
N1LN	488,630
WB9Z	457,800
N3UA	424,494
W3UA	415,896
WØAIH	413,699

DX

Single Operator, High Power

C6AGU (AA7JV, op)	206,560
ZF2AH	114,404
P4ØTA (K6TA, op)	103,950
VP5CW (W5CW, op)	82,960
XE2WWW	81,176
CT1JLZ (OK1RF, op)	62,578
EI2CN	47,792
CE1/K7CA	43,956
G4AMT	35,990
UX2X (UT2XQ, op)	24,480

Single Operator, Low Power

HI3TEJ	48,256
M5O (G3LET, op)	13,728
G4AFS	7,544
IKØXBX	2,240
UT5ECZ	1,848
G3RLE	1,824
DL1EMY	1,748
SP5CJY	1,680
HA8BE	1,628
PAØO	1,364

Single Operator, QRP

9A1CRJ (9A3QB, op)	2
ER3AU	2

Multioperator

C6AKQ	187,726
PJ2T	186,282
VP2MSC	108,264
E77DX	56,290
UU7J	38,164
OL7M	33,488
F2DX	33,394
DR4A	21,318
9A5MT	16,758
OK5Z	16,560

Division Winners by Category

Single Operator, QRP

Atlantic	W3TS	61,628
Central	N9NE	50,317
Dakota	WØGJ	138,852
Delta	KS4X	15,181
Great Lakes	N8BB	101,885
Hudson	KR2Q	18,648
Midwest	WTØA (KE5RX, op)	15,080
New England	AA1CA	40,474
Northwestern	W7YAQ	9,288
Pacific	K6EI	54,216
Roanoke	K4CNW	80,770
Rocky Mountain	WC7S	16,896
Southeastern	K3TW	29,160
Southwestern	N7IR	62,826
West Gulf	W5ESE	6,732
Canada	VE3MGY	43,384

Single Operator, Low Power

Atlantic	N2ZN	214,920
Central	NE9U	216,678
Dakota	KØPK	177,284
Delta	W4DAN	85,045
Great Lakes	K8FH	227,136
Hudson	W2ID	141,064
Midwest	KØDI	159,645
New England	N1UR	238,543
Northwestern	K7TQ	54,069
Pacific	N6RK	101,024
Roanoke	N8II	145,912
Rocky Mountain	WF4U	90,692
Southeastern	AA4LR	107,172
Southwestern	AC7A	59,520
West Gulf	WØUO	183,206
Canada	VE1ZA	58,596

Single Operator, High Power

Atlantic	NO3M	507,494
Central	K9DX	556,100
Dakota	WØSD (WØDB, op)	411,348
Delta	N8OO	346,905
Great Lakes	K1LT	477,056
Hudson	N2GC	174,303
Midwest	NØTT	264,264
New England	K8PO	647,873
Northwestern	K7RL	252,396
Pacific	W7RN (KY7M, op)	256,405
Roanoke	N4XD	321,196
Rocky Mountain	WD5COV	227,340
Southeastern	W8JI	573,520
Southwestern	N6MA	135,696
West Gulf	K5NA	501,540
Canada	VY2ZM (K1ZM, op)	864,753

Multioperator

Atlantic	W2FU	580,354
Central	WB9Z	457,800
Dakota	KØKX	239,890
Delta	WO4O	175,398
Great Lakes	W8MJ	353,916
Hudson	N2BA	266,532
Midwest	NØNI	509,696
New England	K1LZ	655,914
Northwestern	NK7U	237,699
Pacific	N6ML	258,570
Roanoke	N1LN	488,630
Rocky Mountain	KØRF	404,860
Southeastern	N4WW	235,724
Southwestern	N6SS	282,596
West Gulf	W5TM	402,083
Canada	VE2OJ	381,250

Single-Operator, Low Power

Low Power is the most popular and competitive category in this contest with 40% of all logs submitted. At the top of the Low Power list is Ed, N1UR in Vermont whose higher multiplier total made the difference.

The Ohio section was well represented with Fred, K8FH taking 2nd; Rick, WB8JUI reaching 5th; and Bob, K8BL in 7th. Other top finishers from the middle of the US were Scott, NE9U (WI) in 3rd; John, K4FT (KY) in 7th; and Paul, KØPK (MN) in 10th. In 9th place and the farthest west operator to make the Top Ten was Jim, WØUO in NTX. Completing the list are Ken, N2ZN (WNY) in 4th and Ed, K1EP (EMA) in 6th.

Single-Operator, High Power

The High Power category is always competitive with highly experienced operators at well-designed, well-equipped stations filling the Top Ten. The winner is VY2ZM manned by Jeff, K1ZM, who also broke his own High Power record. Second and 4th place finishes were achieved from Maine by Paul, K8PO, and Doug, K1DG. Sandwiched between them was John, VE3EJ, from his eastern Ontario QTH. Fifth place was captured from central Georgia where Tom, W8JI, piloted his superb station.

In 6th place was John, K9DX, operating from northern Illinois. This event was the last ARRL 160 Meter contest for his famous 9-circle array and other antennas, which are being dismantled following the 2010-2011 low band season.

DX Notes

Two DX stations managed to make one QSO each with QRP: 9A1CRJ (operated by 9A3QB) and ER3AU. Caribbean contester Ted, HI3TEJ was the top Low Power DX entry but nine Europeans completed the Top Ten.

In High Power, C6AGU (George, AA7JV, op) made an excellent score from the Bahamas where "high power" is just 250 W! P4ØTA (Ken, K6TA, op) turned in the top score from South America. Jiri, CT1JLZ (who is also OK1RF) had an excellent contest, finishing as the top High Power entry from Europe.

Another Bahamas operation, C6AKQ, topped the DX Multioperator list, operated by Mike, K4RUM and Bob, N4BP. Off the coast of South America, the active club station PJ2T took 2nd in DX with K8LEE and WØCG doing the operating.

Club Competition

The runaway winner for this year's gavel was the Yankee Clipper Contest Club, which made a concerted effort to encourage members to get on the air and make some QSOs. A close finish for the next two spots saw the Potomac Valley Radio Club edge out the Society of Midwest Contesters. Not far behind was the Minnesota Wireless Association. These four clubs represent 271 entries, or nearly 21% of all contest logs. Contest clubs are important; they certainly encourage plenty of activity!

At the top of the Medium category is the Tennessee Contest Group with more than 2 million points from its 27 entries, followed by the Mad River Radio Club, the Northern California Contest Club and the South East Contest Club. The Local Category saw the 7 entries from the Central Virginia Contest Club combine for nearly 1 million points.

Affiliated Club Competition

	Score	Entries
Unlimited Category		
Yankee Clipper Contest Club	9,858,091	92
Potomac Valley Radio Club	4,795,237	61
Society of Midwest Contesters	4,694,910	58
Minnesota Wireless Assn	3,967,194	59
Medium Category		
Tennessee Contest Group	2,019,244	27
Mad River Radio Club	1,805,105	14
Northern California Contest Club	1,387,730	36
South East Contest Club	1,368,851	12
Central Texas DX and Contest	1,252,806	8
Grand Mesa Contesters of Colorado	1,189,928	12
Contest Club Ontario	1,181,298	25
Rochester (NY) DX Assn	1,100,406	8
Alabama Contest Group	1,046,623	19
North Texas Contest Club	1,032,160	9
Florida Contest Group	974,147	16
Kentucky Contest Group	806,344	6
Frankford Radio Club	694,266	3
Arizona Outlaws Contest Club	669,847	21
Contest Group Du Quebec	639,672	8
Southern California Contest	625,454	14
Western New York DX Assn	601,215	8
CTRI Contest Group	555,135	6
Western Washington DX Club	449,205	11
Hudson Valley Contesters and DXers	437,349	14
Maritime Contest Club	360,005	10
Willamette Valley DX Club	346,713	8
Utah DX Assn	290,881	4
Order of Boiled Owls of New York	254,244	4
Louisiana Contest Club	215,258	3
North Coast Contesters	202,916	3
Carolina DX Association	184,542	4
Saskatchewan Contest Club	161,814	4
Local Category		
Central Virginia Contest Club	983,201	7
Iowa DX and Contest Club	599,954	3
Spokane DX Association	402,286	5
Mother Lode DX/Contest Club	343,368	6
Kansas City DX Club	289,166	3
Northeast Wisconsin DX Assn	268,664	4
New Mexico Big River	251,823	4
West Park Radiops	187,624	8
DELARA Contest Team	185,138	4
Sterling Park ARC	180,869	3
Blue Ridge ARC	137,006	4
Bristol (TN) ARC	36,408	3
Midland ARC	35,906	3
Bergen ARA	23,190	3

Final Thoughts

Whether you plan to be highly competitive, chase DX, or just want see what the 160 meter band is like, take advantage of summer weather to get your antennas ready for the first weekend in December (Dec 2-4), when the next ARRL 160 Meter Contest will fill the band with the QRM and general mayhem of a major contest...and lots of fun among good friends!

"Find An Opening Online"

The extended version of this article is available online at **www.arrl.org/contests** and includes more analysis, complete line scores and a searchable database. You can also find personal stories and photos in the ARRL Soapbox at **www.arrl.org/soapbox**.

Kids Day 2011: On the Air June 18

The third Saturday in June is the time to get youngsters on the air and share the joys and fun that Amateur Radio can provide. Kids Day returns on June 18, from 1800 to 2400 UTC.

Sponsored by the Boring (Oregon) Amateur Radio Club, this event helps bring the excitement of Amateur Radio to a younger audience. The exchange is simple: First name, age, location and favorite color. After that, the contact can be as long or as short as each participant likes.

Suggested frequencies for Kids Day are 28.350 to 28.400 MHz, 24.960 to 24.980 MHz, 21.360 to 21.400 MHz, 18.140 to 18.145 MHz, 14.270 to 14.300 MHz, 7.270 to 7.290 MHz, 3.740 to 3.940 MHz, as well as your favorite 2 meter repeater (with permission of the repeater's sponsor, of course). You can work DX, but be sure to remember any third-party traffic restrictions that may exist when a non-licensed operator is working a DX station.

After Kids Day be sure to visit the ARRL Online Soapbox at **www.arrl.org/soapbox** and share the operating story from your QTH. It is a great way to show the up-and-coming generation of operators the fun they can find in the magic of Amateur Radio.

BILL O'NEIL, KW8KW

Raiden Ehrenfried, grandson of Bill O'Neil, KW8KW, enjoyed working other Kids Day stations from his grandpa's shack in Cuyahoga Falls, Ohio.

Once Kids Day is over, be sure to log on to **arrl.org/kidsday**, fill out the online survey, and print a certificate for each of the kids who participated at your QTH. These certificates are suitable for framing and will help maintain their interest in Amateur Radio for some time to come.

Kids Day opens doors and opens minds. Open your shack doors and invite the youngsters over to learn and enjoy themselves. Let's all work to get some fresh, young voices on the air on Saturday, June 18!

kidsday@arrl.org

The 2011 IARU HF World Championships

1200 UTC Saturday, July 9 – 1159 UTC Sunday, July 10

- Summer HF operating at its finest! This 24 hour event features both modes in half the time of all other major contests. Get your contest fill without taking up an entire weekend!
- IARU Member Society Headquarters stations will be on from all around the world, providing the contest community with excellent multiplier opportunities. How many HQ stations can you work?
- Enter using phone, CW or a mix of the two. Hit the pileups alone, or get a group of friends together and put together a Multioperator effort.
- E-mail electronic Cabrillo-formatted logs to **iaruhf@iaru.org**. Paper logs go to IARU HF Championships, 225 Main St, Newington, CT 06111, USA. All logs must be postmarked by 1200 UTC Tuesday, August 9, 2011. No late entries will be accepted.

Complete rules and 2010 IARU results are now online at
www.arrl.org/contests

"CU in IARU!"

DAVID VEST, K8DV

Casey Morton, AA8MC, works the pileup from K8DV as part of the W1AW/8 operation in the 2010 IARU HF Championships.

W3UR

HOW'S DX?

Operating the 2011 CQ WW WPX SSB Contest from Timor Leste

David Burger, VK2CZ/VK8AA

The plan to spend a long weekend in Timor Leste (East Timor) came about after a series of short weekends away in of all places Denver and Baltimore earlier this year.

Having received a ham license in Timor Leste immediately after independence in 2003, it has turned out in the past that every attempt to plan a trip had been met with planned trips being thwarted by civil unrest and government travel restriction warnings. The recent stability of the country was a clear green light.

In early January, a special on airfares was posted for a three day period, where effectively my return airfares between Sydney and Dili were around half price, an opportunity that was literally saying "do not hold off." Combined with available leave from work, it was clear that time and cost would not be an impediment to the trip.

Looking more closely at the airline baggage, and keeping the radio equipment, antennas, computer and hand tools under the length and weight restrictions proved a good challenge. Looking to operate all bands from 160 through 10 meters and even a sked request on 6, a vertical antenna was chosen, but with the intent of making a lightweight disposable design, without compromising performance unnecessarily. With careful construction, the vertical with guying fluorescent string and ground radials came in at just 2.7 kg (6 pounds). That said, the result was also quite a fragile construction, so should worst outcome arise where it bends or collapses during erection, it was possible to re-hash it into a full size 40 or 20 meter vertical without much ado.

It was also clear from excess baggage weight limits and costs, that looking to operate above the 100 W level was not going to happen, well, not on this trip. Contact with ARCOM in Timor Leste, the 2003 license "4W3A" warranted a revalidation with the new authorities due to major changes to the regulatory conditions and government bodies in Timor Leste.

Leveraging a necessary overnight in Darwin, the opportunity to pick up my IC-7600 was made. Back in the October 2010 CQWW

COURTESY DAVID BURGER, VK2CZ/K3HZ

David Burger, 4W3A (VK2CZ/K3HZ), just before the CQ World Wide WPX SSB Contest.

event, efforts to post the radio back home in Sydney failed, with the radio being returned to Mark, VK8MS, as a return address. Must thank Mark for kindly holding the radio for the past five months.

I arrived in Dili just after dawn on Friday, and doing the honest thing declaring the radio to customs. No issues, but was very clear I was not allowed to sell or leave the radio in Timor Leste, not that I would abandon a IC-7600 anywhere!

Wanting to hire a rental car and explore the place kind of unfolded in a tad interesting experience, well at least to an average Aussie traveler. Turns out not only did I hire a 4WD, but also got a driver at my beck and call from 7 AM to 8 PM! That said, given that traffic management here is, how would I say, significantly less orderly than traffic in Sydney, Singapore and Austin, Texas, where I've driven extensively, it was kind of neat to have a driver.

Fast forward to language skills, picked up around 30 words and numbers in the hybrid Tetum/Portuguese's at the conclusion of breakfast. The close parallels to Espanola/Latin helped but still big gaps, witness the rental car twist. The real reason for fast tracking language was that traveling alone, there was a high risk of being isolated and I wasn't going to enjoy my time there. The smiles, sometimes laughter that resulted rounded out the fun part of the trip, as you can well imagine after a three hour lesson from a high school student.

The 4W3A license had been issued in 2003, days after the independence of Timor Leste, but had never been revoked or withdrawn since; checking to ensure it was still valid was an important key step based on many comments from operator forums in 2009 and 2010.

Meeting with the ARCOM regulatory staff turned into a very patient wait, and an equally patient come back at 3 PM for more advice, and learned more new words meaning "later" and "tomorrow." The director of licensing has since left Timor Leste to study overseas, and was replaced by a new acting director. The

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A simple 55 foot hight multi-band vertical was used during the inauguration of the 4W3A call from Dili, Timor Leste.

COURTESY DAVID BURGER, VK2CZ/K3HZ

Some of the locals in Dili Harbor, with the capital in the background.

eventual outcome was a meeting scheduled on Monday, about 90 minutes before my flight departed Dili. As I understand, with room for language errors here, all licenses now have to go through the Minister of Communications in Timor Leste.

The villa accommodation for the first night was very comfortable, and despite overcrowding and encroachment of buildings into public land, a suitable antenna site was eventually found. Moving into more suitable radio and antenna accommodation on Saturday morning meant that I could not get my radio powered up prior to the contest event start of 0900 Saturday local.

Once in the new room at 0930, and with the antenna erected prior, I found the 12 V dc power supply had failed. I headed into the Saturday morning computer and hardware markets in Dili, thanks to the driver Bento, who found what was probably someone else's old ham power supply with broken voltage control. USD$125 later, now with the IC-7600 radio finally alive, I discovered how well the homebrew lightweight vertical antenna matched from 80 meters through to 6 meters. No match at all on 160 meters, but no surprise there, apart from lower than expected received noise. Oddly, having never done any calculations or simulations for the antenna on 50 MHz, and certainly the balun wasn't specified for 50 MHz operation either, it was a real surprise to see a near perfect match. This actually turned into a problem later.

Having only ever run 100 W once in a past contest event, it was clear that some hard work was ahead of me. Settling for a swoop-and-pounce approach on day one, it eventually became clear the weaker DX stations that could be worked, with big signal pounding DX just not having the receive abilities for a successful contact. The local YB/DU stations as you can imagine became very obvious on the '7600 spectrum display — not quite as neat as a CW skimmer, though.

On day one, eventually getting on air about 0300Z, the bands that were open straight up were 10, 15 and 20 meters, so I switched between the three to get some variety and appreciate the locality and antenna performance. Initial highlights were Cocos (Keeling) VK9C, followed by Saudi HZ. Switching to 40 meters at 0955Z yielded all North America and little else, then to 80 meters at 1015Z showed that the antenna worked very well indeed, albeit only with a local DU station. Closed out day one with just 105 contacts — kind of what was expected, and to be honest, I was not taking things too seriously. Not forgetting, this trip was really about simply understanding how to be way more serious in the future. Past activations such as VK8AA and VK9XD will provide an idea of what this really means.

On day two I figured the antenna should be revisited. Getting the feed point of the vertical about 2 meters off the ground showed great improvements on the simulations, so I figured out a way with timber borrowed from a nearby rubbish dump. Checking that the antenna matching was unchanged — the antenna worked even better on 10 meters, and later in the afternoon, on 40 meters and 80 meters. Four of the five contacts on 80 meters were from EU and NA, but heard a lot more than one could possibly hope to work, same deal with 40 meters, but this time the real signal reports on 40 meters were clearly outstanding, and that is where the bulk of 40 meter contacts were made, with only about eight from Oceania. I even managed to hold a frequency using 100 W, something that I would never have dreamed possible.

The standout band was 10 meters, and to be honest, the vertical antenna behaved like a 6 element Yagi, only omnidirectional. The 10 meter band was open until 1200Z each day, so very similar to the nearby tropical experiences from Darwin (VK8) in previous years.

An overall summary of the stations worked per band:

4W3A	*QSOs*	*Prefixes*	*Points*
80 meters	5	5	22
40 meters	53	47	274
20 meters	37	37	90
15 meters	81	71	188
10 meters	276	153	796
Overall	***450***	***263***	***1370***

It was not possible to operate outside the contest time window after the WPS event, as the return flights were brought forward by 3 hours. Those that simply needed 4W as a country were obvious by their 001 serial exchange, but hey, it was worth it for both of us.

As hinted at earlier, and at the insistence of W7GJ at a meet-up in Austin, Texas in 2009, VK3OT and others, that the 50 button get pushed on the IC-7600 radio for the first time. Leaving the radio on 6 meters while at dinner on Saturday night, the spectrum display left traces showing something was going on. I proceeded to work around 40 stations on 6 meters, with JA, VR, DU, 9M, BA, BV, 3W and a KH2 was a neat surprise. Some of the HF stations also asked to look for them on 6 during the second night of the WPX event, too.

Transiting Darwin on Monday on the way to Sydney, and looking back to see the 4W3A trail left on the Internet, the poor behaviors observed on the 6 meter forums was nothing short of rude and abusive in relation to the 4 W [50 MHz] radio button push. Really not sure why, as I genuinely thought the feeble attempt on 6 meters may have been received more positively. I was sadly wrong.

In summary, lessons in Portuguese, bureaucracy, rental cars and keeping off 6 meters were all taken home, and all will come to the fore for the next trips. QST

W3ZZ

THE WORLD ABOVE 50 MHz

An Army of Rovers

June means the ARRL VHF contest, the one that usually features superior conditions fueled by the peak of the E-skip (E_s) season. So this year I want to give the contesters a present. I have been asked many times in the past what the secrets of winning a VHF contest are. I have always replied that there are no secrets: what you see is what you get.

I lied.

There is a secret. It isn't easy. It takes a lot of effort and a lot of money — though less money than building a competitive HF contesting station. It does take some technical skill but all in the area of station integration — essentially all of the hardware and software can be purchased. It takes a certain kind of operating skill though this can be learned rather rapidly and does not require years of practice like a winning score in an HF contest. It's not ethical, though I suspect many VHF contesters, perhaps a majority, would not take exception to its ethics.

Actually I have already described this approach in print in a small specialty contest magazine, *CQ Contest*, in 1999. It went essentially unnoticed by the VHF contesting fraternity. I thank Bob Cox, K3EST, the copyright holder, for permission to use that article. Follow along now while I bring it up to date and show you how you, too, can win a major VHF contest.

Concepts

What follows is mostly conceptual. For lack of space, a lot of details will be omitted. I will talk about an unlimited multioperator class station but the same principles are applicable to a single operator class station. Many of you will not believe that this approach will make you unbeatable, but if you follow my score analysis you will see that it will generate huge numbers of points, many more than your competitors can hope to get by any other means — except doing exactly the same thing you are doing.

The Magic of High Point Contacts

The approach is multifaceted. One might think that a competitive VHF multioperator station (multiop) would only need a superior location in a geographically advantageous area, some state-of-the-art hardware and some superb operators. But you'd be wrong. You should have decent equipment but you don't need superstars running your station — any reasonably experienced operators will do. Because of the huge point differential given to microwave contacts in all the major ARRL contests, all you need is a *big* microwave station and a large number of stations to work.

Stuffing the Log

Well, where do you get that large number of microwave contacts? To paraphrase the old Smith Barney commercial on TV — you get them the old fashioned way — you manufacture them.

Ever wonder how a multiop can work over 200 stations on 13 cm? Or well over 100 on the next three bands up? Is it a matter of lots of local activity and they are the only ones well enough equipped to work all these folks or that their competition is asleep at the switch? Not at all. If you equip a large number of rovers with multiband microwave equipment the numbers really pile up. Better yet if you are located near a four corner grid, bands like 24 GHz and above where even short distance contacts are difficult can be added to your totals.

The fixed station does all the work with large antennas and high power. You'd be surprised at how much time it takes to work all these rovers. That would leave them essentially no time to work anyone but you. But after all there is no enforceable rule that says that they have to work anyone but you, is there? You thus have this huge quantity of points all to yourself.

The bottom line is that honing your skills to work stations quickly in heavy interference is optional. You can win without doing that and save considerable money and effort, though you may choose to do so and my station design will give you the opportunity to do just that. In any case you will start with an insurmountable advantage, a huge number of points none of your competition

This Month

*June 5	Good EME conditions
June 11-13	ARRL June VHF QSO Party
June 18-19	SMIRK QSO Party
June 25-26	ARRL Field Day

*Moon data from EA6VQ

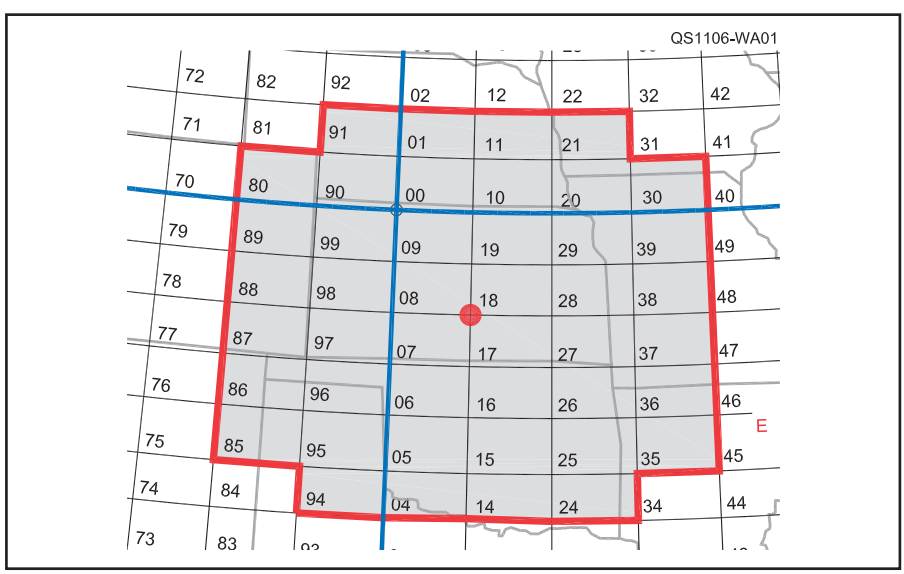

Figure 1 — Grid squares within 425 km of EM18aa. The location is at the intersection of EM 07, 08, 17 and 18.

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can get. This is the secret of success.

Toto, I Think We're in Kansas

OK, so we know what we need to do. Develop a big station and an army of rovers. Believe it or not, the most difficult job is finding operators for the rovers. The rest just takes money to buy readily available commercial equipment and time to do the integration if you don't want to build any RF equipment yourself. But if you think you understand how to work with and build microwave equipment, ham ingenuity will certainly cut the costs. There's plenty of used and commercial equipment to retrofit.

First, where will we set up our new unlimited multiop? Since we don't care very much about anything to a first order of approximation but the rovers, let's choose a location where roving is easy, traffic is light and the gas prices are likely to be more reasonable. How about EM18aa located a few km southwest of Hutchinson, Kansas. It's at the intersection of EM07, 08, 17 and 18 (see Figure 1). As a matter of fact one of the best unlimited multiops WBØDRL (now NØOY) with WAØTKJ (now (K9ZV), though sadly no longer active, used to operate not far from this location. They didn't use this approach but they did make big scores. That part of the country has several other advantages. It's flat. Roads tend to run in straight lines and follow close to grid boundaries. Land is comparatively inexpensive — we would like enough acreage to put up quite a few tall towers to increase our tropo coverage.

A quick look at the nearby grids indicates that there are 44 grids some parts of which are within 425 km of EM18aa. Many are less than 250 km away, which is ideal for microwave contacts.

Station Hardware

This is a concept column not a how-to column. The details are beyond the scope of this presentation. But a few comments are in order.

In order to take full advantage of working both all the rovers and others not associated with the rovers, the station itself ought to have a minimum of eight towers: two each for 6 and 2 meters, one each for 222 and 432 MHz, one for 903 and 1296 MHz and one for all frequencies above that. An extra tower for the microwaves might not be a bad idea, either. Given the gently rising or falling terrain, all the towers except 6 meters should be as tall as possible (~65 meters high).

Don't fool around with the station equipment. One possibility is in Table 1; you can use other equivalent hardware. Run the legal limit where possible and a substantial amount of power on the upper bands. Usable solid state amplifiers are available for surprisingly reasonable prices for the microwaves. One side of the microwave contacts has to hear the other in order to simplify pointing. So the more power the better up there.

Table 1

Main Station Equipment

Single Elecraft K3 for 902 and 1296 MHz and a single K3 for all bands above that. DEMI = Downeast Microwave, HP = High power (50-60 W), DB6NT = Kuhne Electronic. Solid state amplifiers on 902 MHz and above are often available on eBay or through other sources, or from current manufacturers — DEMI and Kuhne.

Band	*Transceiver*	*Transverter*	*Amplifier*
50	2xK3	—	Harris Platinum
144	2xK3+2 meters	—	Lunar Link
222	K3	DEMI HP	Lunar Link
432	K3	DEMI HP	Lunar Link
902	K3	DEMI 30 W	Motorola 400 W
1296	K3	DEMI 30 W	VE1ALQ 300 W
2.3G	K3	DB6NT	Spectrian 250 W
3.4G	K3	DB6NT	Toshiba 50 W
5.7G	K3	DB6NT	Avantek 10 W
10G	K3	DB6NT	DEMI 8 W
(24G)	K3	DB6NT	DB6NT
(47G)	K3	DB6NT	DB6NT

Only the 6 and 2 meter antenna systems need be elaborate and then only if you want the possibility of working lots of other stations besides your rovers. You likely can win without this but it will be a lot more fun if you have it. For example, start with three sets of small 5 element fixed stacked Yagis for 6 meters on a 30 meter high tower with a single large Yagi like an M^2 6M9KHW on the top to work the rovers on tropo.

A second smaller tower located as far away from the stacked fixed Yagi tower as possible with perhaps a pair of 9 meter boom Yagis can be used to pick off packet and *Skimmer* (**www.dxatlas.com/CwSkimmer**) spots and occasionally work a rover or two when the main tower is busy running people. Two meters should be a 65 meter high tower with three large vertical arrays (LVAs) from Directive Systems. (Each array consists of 16 five-element Yagis stacked vertically.

A pair of stacked smaller (~5.2 meter booms) rotary Yagis could sit on top of this tower to cover the rovers who are outside the fixed LVAs beamwidth. 222 and 432 MHz can be pairs of ~5.2 meter boom Yagis. You will not have time to call any CQs on either band because you will be too busy working your rovers and the occasional pass from 6 or 2 meters. The 903 and 1296 MHz tower can use pairs of stacked loop Yagis mounted on a single H frame. The microwaves ought to sit on a rotating tower and will all be substantial dishes. As previously noted a smaller microwave tower using blowtorch-loop Yagis and smaller dishes could be useful but is completely optional.

Rovers

To do this right you need 16 rovers. These travel basically three routes of ~16-19 grids: four to the west of EM18aa, eight north/south of EM18aa and four to the east of EM18aa. All rovers look to stop near grid corners to minimize travel time. Out in these flatlands essentially every grid corner is accessible, something that is not true in more mountainous areas. These rovers never get more than 425 km from the base station and often much closer. I estimate that the rovers will generate ~350 grids minimum — probably more — and each rover will produce 408 points or more (June/September scoring rules) for the home station. For 16 rovers that makes 6528 Q points and a total of 2.3 million points *without working anything but your rovers*.

There are lots of ways to build these rover stations. FT-857 or IC-7000 transceivers can be used for 6 and 2 meters, 432 MHz and as microwave IF strips. Small Yagis and small dishes make good antennas. Equipment is available off the shelf or can be readily converted from surplus commercial gear. Whatever floats your boat and fits your budget and talent. Even if you buy it all it won't cost much more than $10,000 per rover.

The key is to make the rover operators feel that they are an integral part of the home station, as indeed they are. Their job is to hit all those grids, a relatively straightforward task within the 33 contest hours if they hit four grid corners for the most part. For sure, it is impossible even to be competitive much less considering a chance to have the highest score in the country without them. As they gain experience they might even want to challenge all those pack rover records and systematically win all three rover categories. Just make sure they remember to work the home station first at each stop.

The Winning Edge

How well will a station like this work? Well, you never saw anything like this in any other kind of contest. The results mimic what you might expect in Connecticut or New Jersey or maybe even the Land of Oz. But not Kansas. First the rovers are essentially guaranteed to make 7 contacts up to 13 cm at every stop. A certain percentage of the other

stops will yield contacts above that although I haven't counted that in my hypothetical totals. Contacts are readily possible in four grids on 24-47 and even 76 GHz at the grid corner near EM18aa. All of the local operators should have laser systems to work the home station. They are fun to build and work over a 1 km line of sight path pretty well. If the home station is located close enough to the grid corner more grids might be possible on laser light.

What does this mean to the bottom line? In a September contest, 3,000,000 points ought to be readily achievable even if non-rover contacts are rather limited. In June one can expect quite a few extra contacts and an extra 100 grids or more from E_s if the conditions are reasonably favorable as they often are in Kansas. This yields more than a million extra points. Even a record score in other parts of the country would have no chance against this.

For single operators, the same kind of shot in the arm is possible. Only a few rovers will drastically boost your score, particularly for stations in the middle of the country or the southwest who do really well on 6 but not elsewhere because of lack of activity.

Who's Kidding Whom

No, it's not April. That was 2 months ago. And this column is not a joke. Everything mentioned here is perfectly legal. You will have a mortal lock on the June or September ARRL VHF contests. January is dicey because it snows in Kansas — sometimes quite a bit. But the potential is there and victory is yours for a cost less than a good HF multi-multi.

ON THE BANDS

March was another month with generally very poor activity but resurgence in Cycle 24 raised the solar flux (SFI) above 100 on a number of occasions and the higher flux led to the first solid transequatorial propagation (TEP) of the current cycle.

6 meters. It was a big month for TEP to the tier of states south of 31°N. E_s links to TEP were very rare with the exception of March 2-3, which featured contacts with PY/LU/ZP/CE to the East Coast and W8. The big winner was John, W5UWB (EL17) who worked down into South America on March 3, 11, 13, 24-26. John notes that he reached west into CE and OA on the latter days. Pat, W5OZI (EM00) worked into LU on March 3 and reports that XE2OR (DL88) and N4DG (EM20) did as well. March 12 LU was hearing the KH6HI beacon. On the 13th AC4TO (EM70) worked into LU and ZB2FK worked PY (tnx NØJK). On March 23 Dan, K3ZXL (EM87) worked into LU, CX, CE and HFer Tom, K3TW/4 (EL88) worked LU and heard the CE6B beacon with a simple three half wave dipole and 100 W.

E_s was plenty scarce in March. On March 2-3 DX Sherlock (**www.vhfdx.info**) shows a widespread east/west opening with some extensions into the Caribbean. On March 10 the opening was north/south along the east coast and into the Caribbean as well as the Rockies to the Gulf coast. Stations in southern California were working the 4A4A DXpedition to Revillagigedo Island [a group of islands 600 km west of Mexico — *Ed.*] March 25 at 0530Z. Bill, WØWOI, reports that Wade, VK4WM (QG64) worked UXØUN (KO50) immediately after working JR6EXN (PM53) in Okinawa with his beam direct path to the northwest.

2 meter TEP. Only one 2 meter TEP contact — on 2 meter FM from LU to EM32 — has ever been reported.[1] Thus it was amazing that two such heard reports were made this March. Jonathan, KI4UKF (EM96) heard Claudio, LW2ECC (GF05) at 1655Z March 2 on 148.48 MHz FM simplex. Upon further investigation it seems likely that what Jonathan may have heard was a 10 meter remote base retransmitting Claudio's signal. TEP at 1700Z is very unlikely even on 6 meters. WØWOI reports that Ken, N4TUT (EL98gk) heard a burst from PY4A?? on 144.200 SSB at 0317Z March 8. The end of the call was garbled by the type of flutter common on the late TEP opening but PY4AQA was reported by the propagation loggers to be active at that time.

Tropospheric ducting. Ron, K5LLL (EM10kf) reported the first transgulf episode this season, March 12 in the morning to Florida EM70, EL87, 86, 98 and as far east as Georgia, EM81 and 73. He also worked EM45 and 55 at that time.

Aurora. In spite of at least one X-class flare, aurora has been slow to develop. On March 11 Brandon, N8PUM (EN66) reports that his 2 meter beacon was heard by W9RM (EN52) and his 6 meter beacon by VE2XK (FN07), K9MU (EN44) and W9RM.

Meteor scatter. March 2 John, W5UWB (EL17ax) worked N3LL, (EL86tx) on 222 MHz via FSK441.

EME. Lance, W7GJ, reports the first US contact with Antarctica, VP8DMH (FC52) on March 19. March 3 Marshall, K5QE, worked Benni, TF3CY. Benni believes this may be the first Iceland EME contact.

HERE AND THERE

June ARRL VHF QSO Party. What has now become the most active VHF contest runs from 1800Z June 11 to 0259Z June 13. This contest usually has a lot of E_s. Full information is in May 2011 *QST* or at **www.arrl.org/june-vhf-qso-party**.

Two meter transatlantic tests. Joe, CT1HZE (IM57nh) will be concentrating on 2 meter transatlantic tests with high power in the upcoming 2011 summer. He is looking for North American stations to test with. The best way to communicate will be the ON4KST 2 meter North American chat room or via e-mail at **DUBUS@t-online.de**.

2011 SMIRK QSO Party. Sponsored by the Six Meter International Radio Klub (SMIRK) this contest begins 0000Z June 18 and ends 2400Z June 19. All 6 meter stations are welcome. Exchange grid square and SMIRK number (if you have one). Further details are at **www.smirk.org**.

DL88. The K5N Activation Group is planning another assault on DL88 tentatively from June 2-6, 2011. The operators will be Bill, K5YG; Danny, N5OMG; Bill, N5YA, and Marshall, K5QE. They will use 50.210 MHz for both SSB and FSK441. Power will be limited to between 100-225 W to an M^2 6M5X beam. Since generators are not allowed solar panels will be used. QSL via Joey, W5TFW, with an SASE.

K4RF SK. I regret to inform you that one of the leading VHFers in the Southeast, Steve Adams, K4RF (ex-WS4F) passed away on March 4, 2011. Steve, an attorney and municipal court judge for the City of Cornelia, Georgia, was one of the founders of the Fourlanders and a first rate VHF contester. We will miss you Steve! (Tnx N4QH, WB4SLM)

PZ5RA. WØWOI suggests 6 meter DXers wishing verification of contacts with PZ5RA dispense with mailing a self-addressed envelope and cash to PZ5RA and rely entirely that Ramon will, in due course, confirm the contact on LoTW for DXCC credit. Multiple attempts by 6 meter DXers to QSL by mail have proven useless. Ramon tells WØWOI that mail delivery to him from the USA is unreliable.

West Coast DXCC. After 53 years Russ, K6KLY, one of the leading West Coast DXers, just received his 100th QSL card for DXCC on 6 meters. This is a prime example of how difficult this award is from the San Francisco Bay Area.

Fifteenth International Earth-Moon-Earth Conference. Marc, N2UO, writes that the next EME conference will take place at Churchill College in Cambridge, England, on August 16-18, 2012 sponsored by the UK Microwave Group (in conjunction with the RSGB). The program will include an optional preconference tour and a family program. More details of the venue, lecture program, tours and partners programs will be posted to the Conference website, **www.eme2012.com**.

[1]E. Zimmerman, W3ZZ, "World Above 50 MHz," *QST*, Mar 2010, pp 88-90.

SPECIAL EVENTS

Contact these stations and help commemorate history. Many provide a special QSL card or certificate!

May 14-May 15, 0000Z-2359Z, PD6MILL, Gieterveen, Netherlands. Area amateurs. Dutch National Windmill Weekend - Eendracht Windmill.SSB 10 20 40 m digital possible 2 m. QSL. eQSL or direct to Bernard Zuidema, PD7BZ, Zetveld 45 , Schoonoord, 7848CX, Netherlands. *All QSOs answered with QSL via bureau, include SAE if you want QSL direct. See URL for list of participating Windmills.* **www.pd6mill.com**

May 21-May 23, 0100Z-1159Z, K6M, San Mateo, CA. Blackberry REACT. Maker Faire. 14.250. QSL. Phil Stripling, 301 S Grant St, San Mateo, CA 94401. *QSL via* **af6wi@arrl.net***; special event QSL card will be mailed.* **makerfaire.com**

May 27-May 30, 2100Z-2000Z, WS1SM, Gorham, ME. Wireless Society of Southern Maine. Gorham Founders Festival - 275th Anniversary. 14.270 14.260. QSL. Thom Watson, 16 Hope Dr, Gorham, ME 04038. **www.qsl.net/ws1sm/topics.html**

May 28-May 30, 1500Z-2200Z, WØFSB, Waterloo, IA. Five Sullivan Brothers Amateur Radio Club. Commemorating Memorial Day. 21.240 14.240 7.240. Certificate & QSL. Five Sullivan Brothers ARC, 4015 Independence Ave, Waterloo, IA 50704. **t-mc-nulty@msn.com**

Jun 3-Jun 4, 1600Z-2200Z, NAØPW, Pueblo, CO. Pueblo West Amateur Radio Club. Great Pueblo Flood, 90th Anniversary. 14.270 7.180. Certificate. Pueblo West Amateur Radio Club, 676 S Dante Dr, Pueblo, CO 81007. *Various HF bands and modes as conditions permit, concentrating primarily on 40 and 20 meters. Grid DM70ph. Pueblo County.* **www.qsl.net/na0pw**

Jun 4, 0200Z-1800Z, W7C, Cheyenne, WY. Local Amateur Radio Operators. Relay For Life. SSB 7.260 3.950 CW 7.125 3.680. QSL. Fred Culek, KD7LLF, 3008 Terry Rd Sp #25, Cheyenne, WY 82007.

Jun 4-Jun 5, 0000Z-2359Z, NI4BK, Wilmington, NC. Azalea Coast Amateur Radio Club. Museum Ships Weekend 2011. 14.260 7.260. Certificate. Azalea Coast Amateur Radio Club, PO Box 4044, Wilmington, NC 28406. *Operating from the battleship USS* North Carolina. **ac4rc.org**

Jun 4-Jun 5, 1224Z-1224Z, W9AB, Muskegon, MI. Michiana Amateur Radio Club. USS *Silversides* (Submarine) Museum Ship 14.260 14.039 7.260 7.039. QSL. Michiana Amateur Radio Club, 3220 E Jefferson Blvd, South Bend, IN 46615. **community.michiana.org/marcsite**

Jun 4-Jun 5, 1400Z-2000Z, VE3MIS, Mississauga, ON. Mississauga Amateur Radio Club. Streetsville Bread and Honey Festival 2011. 28.480 21.315 7.230. Certificate. Michael Brickell, VE3TKI, 2801 Bucklepost Cres, Mississauga, ON L5L 1M6, Canada. *Include $2 US for postage. Please note we cannot use US postage stamps in Canada.* **www.marc.on.ca**

Jun 4-Jun 5, 1400Z-2100Z, TM9ØLH, Etretat Beach, France. F6KOH Club SHTSF. 90th Anniversary of the Radio Club Le Havre. 14.290 7.090 3.690 14.070 PSK. QSL. SHTSF, 25 rue des Iris, Le Havre 76610, France. *Operating mobile. Event running several weekends*. **www.shtsf.com**

Jun 4-Jun 5, 1400Z-2100Z, NB9QV, Manitowoc, WI. USS *Cobia* Amateur Radio Club. WW II Submarine USS *Cobia* AGSS-245. 21.300 14.260 7.250. Certificate & QSL.* Fred Neuenfeldt, W6BSF, 4932 S 10th St, Manitowoc, WI 54220. **www.qrz.com/db/nb9qv**

Jun 4-Jun 5, 1500Z-0100Z, W6TOI, Downey, CA. Downey Amateur Radio Club. Downey Amateur Radio Club's 60th Anniversary Celebration. 14.263 21.363 7.180 145.595 simplex. Certificate & QSL. Downey Amateur Radio Club, PO Box 207, Downey, CA 90241. **darcarc.wordpress.com**

Jun 4-Jun 5, 1500Z-2130Z, N4WIS, Virginia Beach, VA. USS *Wisconsin* Radio Club. USS *Wisconsin* — Museum Ships on the Air. 14.264. Certificate. N4WIS-USS *Wisconsin* Radio Club, PO Box 6682, Virginia Beach, VA 23456. **www.n4wis.org**

Jun 4-Jun 5, 1500Z-2145Z, W5KID, Baton Rouge, LA. Baton Rouge and USS *Kidd* Amateur Radio Clubs. Museum Ships. Gen bands CW in QRP freqs 20 m SSB 40 m CW preferred, other bands possible. QSL. W5KID, 305 S River Dr, Baton Rouge, LA 70802. **www.lsu.edu/brarc/uss_kidd.htm**

Jun 4-Jun 5, 1700Z-1700Z, K3DN, Philadelphia, PA. Warminster Amateur Radio Club. Honoring the American Flag. 21.280 21.050 14.280 14.050 7.280 7.080 3.880 3.580 PSK. QSL. K3DN, PO Box 113, Warminster, PA 18971. *From Union League, Philadelphia*. **www.k3dn.org**

Jun 4-Jun 5, 1700Z-2359Z, NI6IW, San Diego, CA. USS *Midway* (CV-41) Museum Radio Operations Room. International Museum Ships Radio Weekend, D-Day Normandy 1944, Navy Hospital Corps Established 1898. 14.320 7.250 PSK31 14.070 D-STAR 012C and 2 m/70 cm SOCAL rptrs. QSL. USS *Midway* Museum Radio Room, 910 N Harbor Dr, San Diego, CA 92101. **kk6fz@arrl.net**

Jun 5-Jun 10, 1600Z-2200Z, N3M, Baltimore, MD. ARCNEM and IEEE. International Microwave Symposium. 14.260. QSL. Steve Stitzer, National Electronics Museum, Box 1693 MS 4015, Baltimore, MD 21203. *Daily HF operations June 5-10; see web page "other events" for possible VHF-UHF-microwave activities.* **ims2011.mtt.org**

Jun 10-Jun 11, 1200Z-1600Z, WØS, Jackson, MO. Bootheel Amateur Radio Club. 150th Anniversary of Stars and Stripes. 28.450 21.350 14.240 7.255 3.855 21.070 14.070 7.070 PSK31. Certificate. Bootheel ARC, PO Box 98, Jackson, MO 63755. **kb0ufl.ucoz.org**

Jun 10-Jun 11, 2200Z-1100Z, W9L, Dixon, IL. Lee County Amateur Radio Club. Relay For Life. 14.235 7.205 PSK31: 14.070 7.038 . QSL. Lee County Amateur Radio Club WX9LE, 231 S Locust Ave, Amboy, IL 61310. **www.facebook.com/pages/Lee-County-Amateur-Radio-Club-LECARC/147165711972076**

Jun 11, 1400Z-2200Z, WØKY, Kearney, NE. Midway Amateur Radio Club. 151st Anniversary of the Pony Express Reride. 14.270 7.280. Certificate. Midway ARC, PO Box 1231, Kearney, NE 68848.

Jun 11, 1500Z-2100Z, W9ABG, Fairview Heights, IL. Antenna Builder's Guild. St Louis QRP Society Day. 14.155 14.055 7.182 7.055. QSL. Antenna Builder's Guild, PO Box 932, O'Fallon, IL 62269. *Homebrew QRP transceivers, antennas, feed lines and tuners at Pleasant Ridge Park. Talk-in 146.76 p/l 141.3.* **www.antennabuilders.com**

Jun 11, 1800Z-2330Z, K7K/W7DK, Tacoma, WA. Radio Club of Tacoma. Jim Kirkreit Memorial Picnic — Radio Club of Tacoma 95th Anniversary. 14.265 14.055. QSL. Radio Club of Tacoma, W7DK, PO Box 11188, Tacoma, WA 98411.**w7dk.org**

Jun 11-Jun 12, 1500Z-2200Z daily, NY2SF, Youngville, IA. Lincoln Highway Amateur Radio Group. Celebrating 98 years of the Lincoln Highway, New York to San Francisco. 14.260 14.040 7.260 7.040. QSL. Lincoln Highway ARG NY2SF, 1212 20th St SW, Cedar Rapids, IA 52404.

Jun 12-Jun 18, 0000Z-2359Z, N8QA, Portsmouth, OH. Portsmouth Radio Club. 72nd Anniversary. All Bands PSK-31 RTTY SSTV. Certificate & QSL.* Portsmouth Radio Club, PO Box 266, Portsmouth, OH 45662.

Jun 12, 1200Z-2000Z, N8V, Mansfield, OH. 179th Airlift Wing (Ohio Air National Guard). 179th Airlift Wing Family Day. 14.250 7.250 3.940. Certificate. David A. Krutsch, 565 Overbrook Ct, Mansfield, OH 44903.

Jun 13-Jun 19, 1100Z-0000Z, W3C, Corry, PA. Radio Amateurs of Corry. Birthday of Corry, PA, home of the Climax Locomotive. 21.300 14.275 7.200 3.915. Certificate. Radio Amateurs of Corry, Special Event Station, PO Box 362, Corry, PA 16407. **www.w3yxe.org**

Jun 18, 0800Z-1400Z, NA1RL, Newington, CT. Newington Amateur Radio League. NARLFEST. 28.450 14.250 7.250 24.950. QSL. Richard Lawrence, KB1DMX, 335 Lloyd St, Newington, CT 06111. **www.narl.net**

Jun 18, 0900Z-1600Z, W6SVS, Simi Valley, CA. Simi Settlers. Simi Valley Strathearn Park History Day. CW 14.040 USB 14.255 7.260. QSL. Simi Settlers Amateur Radio Club, PO Box 2125, Simi Valley, CA 93062. **www.simihistory.com** *or* **simisettlers.org**

Jun 19, 1500Z-2300Z, WE7GV, Green Valley, AZ. Green Valley Amateur Radio Club. 30th Anniversary. 14.247 14.245 14.242. Certificate. Green Valley Amateur Radio Club, 601 N La Canada Dr (SAV), Green Valley, AZ 85614. **tlang1080@gmail.com**

Jun 21-Jun 25, 1400Z-2000Z, K3J, Lock Haven, PA. Bald Eagle Repeater Association. Sentimental Journey to Cub Haven Fly-In. 21.330 14.330 7.230 3.933. QSL. K3J Sentimental Journey, c/o Bald Eagle Repeater Assoc, PO Box 3393, Williamsport, PA 17701. **www.baldeaglerepeater.org/k3j.html**

Jun 24-Jun 26, 0800Z-2359Z, N6R, Thousand Oaks, CA. Ventura County Amateur Radio Society. Field Day/Celebrating the Lives of President Ronald & Mrs Nancy Reagan. 28.490 21.320 14.255 7.260. QSL. Peter Heins, N6ZE, 1559 Norwich Ave, Thousand Oaks, CA 91360. Operating from the grounds

Maty Weinberg, KB1EIB ♦ Special Events ♦ events@arrl.org

of the President Ronald Reagan Library & Museum, Simi Valley, CA. **www.qrz.com/db/n6r**

Jun 24-Jun 26, 1200Z-1700Z, K7C, Hardin, MT. Yellowstone Radio Club. Custer Battle Reenactment. 21.375 14.250 7.230 3.880; 15 20 40 80 m. QSL. Yellowstone Radio Club, PO Box 883, Billings, MT 59103. *From the Custer battle reenactments site.* **www.k7efa.net**

Jun 25, 1600Z-2359Z, WR7UKC, South Cle Elum, WA. Upper Kittitas County Amateur Radio Club. 102nd Anniversary of Milwaukee Road Rail Service to the Pacific Northwest. 14.268 7.268 3.880 PSK31. Certificate & QSL. Jack Williams, PO Box 603, South Cle Elum, WA 98943. **www.qsl.net/wr7ukc/specialevent.htm**

Jun 25, 1700Z-2359Z, NI6IW, San Diego, CA. USS *Midway* (CV-41) Museum Radio Operations Room. ARRL Radio Field Day. SSB 14.320 7.250 PSK31 14.070 D-STAR 012C and 2 m/70 cm SOCAL rptrs. QSL. USS *Midway* Radio Room, 910 N Harbor Dr, San Diego, CA 92101. **kk6fz@arrl.net**

Jun 25-Jun 26, 1800Z-2100Z, W2GSB, Lindenhurst, NY. Great South Bay Amateur Radio Club. Field Day. 14.275 14.070 7.185 3.850. QSL. W2GSB Field Day, PO Box 1356, West Babylon, NY 11704. *If you are in the Long Island area and would like to take part please email* ***info@gsbarc.org*** *for site information.* **www.gsbarc.org**

Jun 25-Jun 26, 1800Z-2100Z, W4BRK, Moncks Corner, SC. Berkeley County SC ARES/RACES. Berkeley County SC ARES/RACES 2011 Field Day. 3.850. QSL. Dennis Zabawa, KG4RUL, 307 Pine Cone Ct, Ladson, SC 29456. **www.w4brk.org/FieldDay2011.htm**

Jun 25-Jun 26, 1800Z-2059Z, K5R, Portales, NM. Greyhound Amateur Radio Club. 2011 ARRL Field Day. 21.290 14.245 7.180. QSL. Greyhound ARC, 52 Broadcast Ctr, Eastern New Mexico University, Portales, NM 88130. **org.enmu.edu/enmuarc**

Certificates and QSL cards: To obtain a certificate from any of the special-event stations offering them, send your QSO information along with a 9 × 12 inch self-addressed, stamped envelope to the address listed in the announcement. To receive a special event QSL card (when offered), be sure to include a self-addressed, stamped business envelope along with your QSL card and QSO information. *Note: Some clubs may ask for a nominal fee to cover the cost of the certificate or QSL. Request will be made on air during the event or on the club's Web site.

Special Events Announcements: For items to be listed in this column, use the ARRL Special Events Listing Form at **www.arrl.org/special-events-application**. 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 **Aug** *QST* would have to be received by **June 1**. In addition to being listed in *QST*, your event will be listed on the ARRL Web Special Events page. Note: All received events are acknowledged. If you do not receive an acknowledgment within a few days, please contact us.

Special Events listed in this issue include current events received through Apr 10. You can view all received Special Events at **www.arrl.org/special-event-stations**. QST

Sean's Picks

- **State QSO Parties this month:** Alabama, West Virginia. **Canada:** Maritime QSO Party
- **QRP Contests this Month:** ARS Spartan Sprint (June 7), World Wide QRP Contest (June 11-19), NAQCC Monthly Sprint (June 15), Flying Pigs Run For The Bacon (June 20), NAQCC Milliwatt Sprint (June 22), QRP ARCI Milliwatt Field Day (June 25-26)
- **Ten-Ten Open Season (June 4-5)**: With sporadic-E season in full swing, now's the time to be on 10 meters! Exchange is signal report, state or province and your Ten-Ten number. Don't have a number? This event will help you earn one quickly!
- **ARRL June VHF QSO Party (June 11-13):** 6 meters and up explodes with activity for this event. Exchange is your grid square. This is the best VHF+ contest on the planet, and hot bands make for great QSOs. Don't miss this one!
- **All-Asian DX Contest, CW June (18-19):** All-Asia is correct! Point those beams west and listen for all kinds of great DX. Exchange is a signal report and your age (female ops can send 00 if they wish).
- **SMIRK QSO Party (June 18-19):** Sponsored by the Six Meter International Radio Klub, this event is all 6 meters, all weekend long. Exchange is grid square and SMIRK member number if you have one.
- **ARRL Field Day (June 25-26):** Is Field Day a contest, public relations effort, emergency preparedness exercise, or just a fun way to get outdoors with radio gear? Yes! However you enjoy it, be sure to *enjoy* it!

ARRL VEC Volunteer Examiner Honor Roll

The ARRL VEC Honor Roll recognizes the top 25 Volunteer Examiners according to the total number of exam sessions they have participated in since their accreditations. Since each session requires an average time commitment of 2-4 hours or more, the thousands of hours these VEs have invested is extraordinary! Whether you are one of our VE Teams that test once a week, once a month or once a year, we want to express our warmest appreciation to all volunteers for their generous contribution to the ARRL VEC program.

If you are an ARRL VE, you can see your session stats online at **www.arrl.org/ve-session-counts**.

If you're not a VE, become one! See **www.arrl.org/become-an-arrl-ve**.

Call	*Examiner*	*Sessions*	*Accreditation Date*	*Call*	*Examiner*	*Sessions*	*Accreditation Date*
N5AF	Sammy Neal	509	20-Nov-84	KØIH	John Hauner	295	11-Jan-85
ABØSX	Harry Nordman	452	9-Jan-02	KB5PGY	David Fanelli	293	1-Oct-91
K6VIP	Royal Metzger	368	29-Apr-85	AA2HX	Daniel Calabrese	287	1-Nov-91
NØWDG	Kevin Naumann	365	17-Nov-02	KD7GIE	Richard Morgan	284	11-Aug-00
KAØCDN	Karen Schultz	361	6-Sep-84	AD6CD	Gary Mangels	282	30-Jul-97
ABØTO	David Bartholomew	359	22-Mar-02	AD6DC	Frankie Mangels	278	14-Oct-97
K3FL	Franz Laugermann	358	1-Dec-91	N5KBW	Michael Faucheaux	277	15-Jul-96
KK5NU	John Moore, III	339	21-May-95	ABØYX	Jeanette Nordman	276	21-Aug-03
KSØF	John Mackey, Jr	329	1-Oct-90	NØRN	Robert Hamilton	274	19-May-87
AC2T	Paul Maytan	323	6-Sep-84	KK7M	Loren Hole	272	6-Sep-84
KP4PQ	Victor Madera	311	1-Mar-92	K5VCR	Adolph Koehler	270	29-Sep-95
AIØD	William Martin	308	1-Nov-84	NI5S	Leslie Dale	269	6-Sep-84
WB5R	Gerald Grant	301	4-Jan-85	N1IKM	Roy Johnson	269	24-Jul-95

K2TQN

VINTAGE RADIO

Homebrewing

K2TQN

Radios designed and built by Bob Dennison, W2HBE.

We're going back to transmitters this month. Several years ago I received a telephone call from my friend Bob Dennison, W2HBE, who was planning to move out of state to be closer to his family. He offered to sell me several of his radios. I jumped into my car and drove to his home that very day. (An offer like that doesn't come along very often.) Most of the radios I picked up are shown in the large photograph. And as I said in my July 2005 column in *QST*, I plan to feature one of them every so often in future Vintage Radio columns. Here is the one in the center of the photograph.

We're lucky, as Bob was a prolific designer and builder. Most important, he has written for *QST*, *CQ* and *Electric Radio* (*ER*) magazines. His stories survive, as well as his radios. Collectors covet and treasure owning his radios.

Dave Ishmael, WA6VVL, is another great designer, builder and writer featured in *Electric Radio Magazine*. Just after my July 2005 column he wrote and sent me a photograph he received from Bob Dennison. He said, "Please look at the attached photo T-807.jpg. This is his transmitter in 'kit form' and a close-up of the finished unit. His attention to detail and his craftsmanship are just remarkable. These two photos that he sent me in late '93 (as a post card) were the inspiration of my own HF transmitter pictured in 1625_1 and 1625_2. My xmtr appeared in *ER*#61 May 1994 with proper credit given to Bob for his inspiration. In the last couple of years, we have traded mail regarding 1- and 2-tube regen receivers. He just keeps cranking out his projects."

K2TQN

The T-807, a Compact 50 W Rig

By Bob Dennison, W2HBE (SK) [original text lightly edited — *Ed.*]

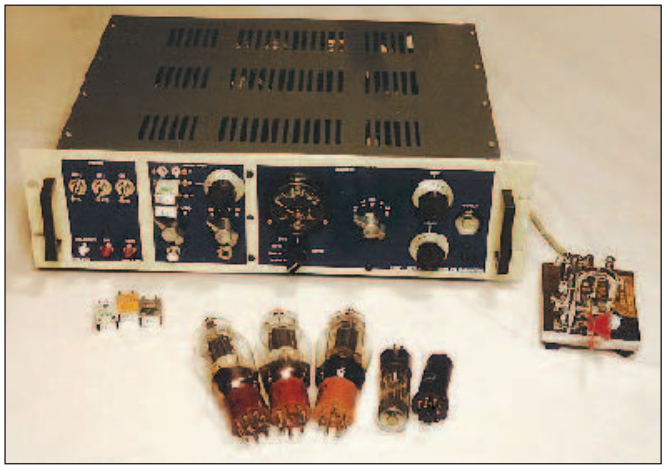
In November 1936, just two months after I became amateur radio W9YRQ, RCA introduced an exciting new beam-power transmitting tube — the 807. It was the most beautiful tube ever conceived but at $3.90 it was too expensive for a poor kid like me. I was a freshman in high school and earned $3.50 a week working after school in a radio repair shop. A few years later I bought a used RK-39 (Raytheon's version of the 807) for $1. It convinced me that "beam-power" is not just an empty sales slogan but a real breakthrough in vacuum tube technology. After WW II, surplus 807s became available at very reasonable prices and even today they continue to show up at hamfests at bargain prices.

Over the years I've built many rigs using the 807 either in the final amplifier or in the modulator. Recently, I decided to build a new transmitter for use in the Antique Wireless Association's Old Timer's Contest and it seemed only natural that

Examine W2HBE's excellent design work and part gathering.

John Dilks, K2TQN ♦ 125 Wharf Rd, Egg Harbor Township, NJ 08234-8501 ♦ k2tqn@arrl.org

DAVE ISHMAEL, WA6VVL



Dave Ishmael, WA6VVL's, transmitter from May '94 *ER*.

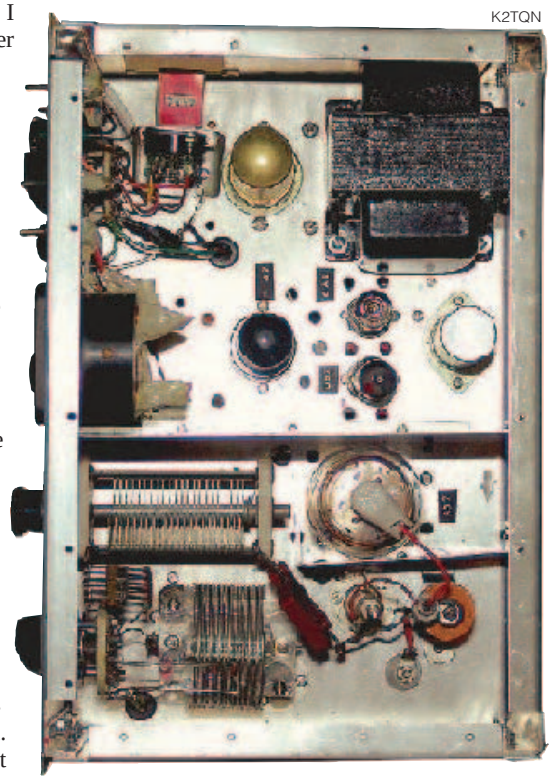
K2TQN

Bob Dennison, W2HBE

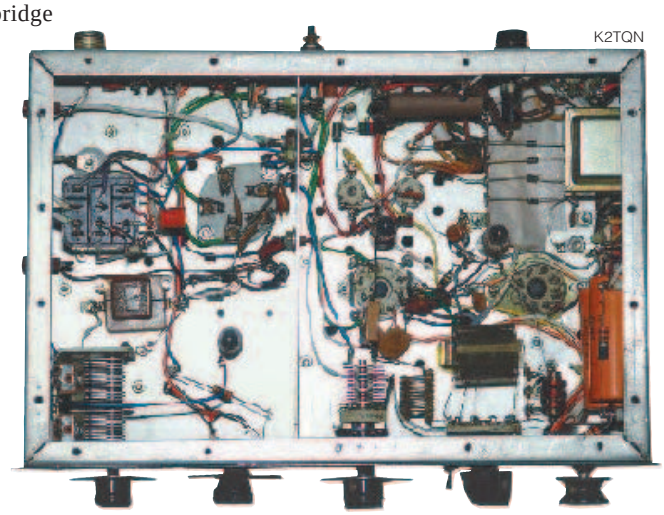
it should employ an 807 in the final. I would have liked to build the transmitter on a bread-board as was customary in the pre-war days but I knew this would result in too much TVI. So I accepted the fact that a shielded enclosure was mandatory. And once you enclose everything inside a shield you have to give up plug-in coils and resort to a band switch. Now if this were a commercial design, it would be necessary to somehow gang the oscillator and final amplifier band switches. But in an amateur rig we can use separate switches and substantially simplify the mechanical design.

Next I considered whether to use crystals or a VFO. I decided to make provision for both, using an external VFO that would be built at a later date. By omitting phone operation, size, weight and cost are minimized. While the original intent was to build a totally pre-war type rig, it seemed a shame to forego the advantages of such modern advances as the silicon diode, LED or zener diode. They offered advantages too good to resist. Then, one-by-one, I adopted other post Pearl Harbor developments — miniature VR tubes, ceramic feedthru condensers, discaps and capacitance-bridge neutralization. The final result is a compact CW transmitter measuring 12.5 × 8.87 × 8.75 inches, weighing only 14.75 pounds, exhibiting good keying with no chirp and putting out 50 watts on 80, 40 and 20; 40 watts on 15 and 20 watts on 10.

K2TQN



K2TQN



Finding Parts

Many readers have asked me "where do you buy your parts?" That's a good question and deserves an answer. I go to all the hamfests and AWA meets that are reasonably close. At each one I find a few parts that I think will come in handy for the projects I plan on doing in the future. I buy items that I may not use for several years simply because they are scarce and may not be seen again. Some items are more common and you soon will have more than you need so you might end up selling these or trading them for the items you haven't been able to find. Check your friends — they often have just what you're looking for. Don't forget the flea markets, yard sales and church or school bazaars. I avoid auctions because prices are invariably bid up too high for me.

Conclusion

During the February 1994 AWA Old Timer's Contest, I made 87 valid contacts. In this contest we don't exchange RST or QTH, yet several stations gave me a 599 report or said I had 'vy gud sigs'. Since the contest band is only 20 Kc wide, you can imagine the congestion. We also had to contend with simultaneous contests sponsored by QCWA and the QRP fellows. On top of that, there were several traffic nets and the usual RTTY signals. And not to be forgotten, the 59 plus signals from WIAW sending code practice lessons. My receiver was a two tube regenerative set using a 57 detector and a 56 audio amplifier. But the T-807 made up for any shortcomings of the receiver and did a fine job. I'm well pleased with it!

Bob's article goes on in great detail building the transmitter and describing the circuits. If you are interested in building this, the entire April 1994 back issue is available from *Electric Radio Magazine*, via their website, **www.ermag.com/**. It includes a complete schematic. It's worth reading even if you want to build a different homebrew transmitter. — *K2TQN*

WB8IMY

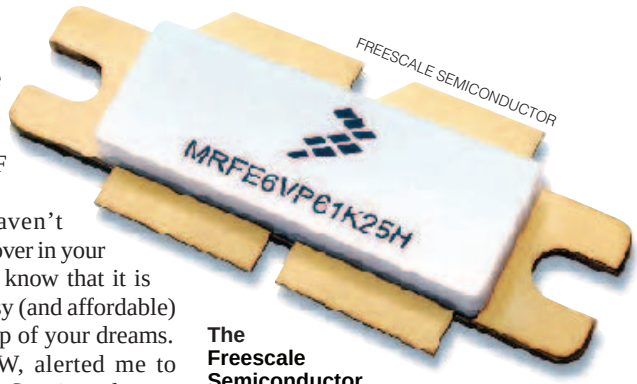
ECLECTIC TECHNOLOGY

Solid State Dreams

When was the last time you considered the idea of throwing together your own solid state kilowatt RF amplifier?

Okay, maybe you haven't turned that particular idea over in your mind yet, but you should know that it is becoming increasingly easy (and affordable) to build the solid-state amp of your dreams.

Walt DuBose, K5YFW, alerted me to the amazing Freescale Semiconductor MRFE6VP61K25H broadband RF power transistors. These are LDMOS — Laterally Diffused Metal Oxide Semiconductors — that can deliver up to 1200 W from 1.8 to 600 MHz with just a 50 V power supply. Off the shelf they sell for about $270 each, but Walt saw them going for substantially less at the last year's Austin Summerfest along with all the parts necessary to make 50 V switching power supplies. If anyone creates a kilowatt amp with one of these, be sure to write it up for *QST!* You can learn more at **www.freescale.com**.



The Freescale Semiconductor MRFE6VP61K25H broadband RF power transistor.

Easy Digital on 70 cm

Speaking of more interesting solid-state goodies, Steve Lampereur, KB9MWR, is blogging about a new module from Doodle Labs, the DLM118. This is a complete 1 W data transmitter that can operate anywhere between 380 and 520 MHz. By the time you read this, it should be available for sale (although the price was unknown at press time). Amateur data transmissions are limited to a maximum signaling rate of 56 k on the 70 cm band, which is why you find higher-speed communications, such as the D-STAR DD mode at 128 k, taking place above 1200 MHz. Still, 70 cm usually offers more reliable propagation and with certain groups casting hungry eyes on 70 cm these days, this may be one way to increase activity. See his blog at **kb9mwr.blogspot.com/2011/03/hsmm-420-430-mhz.html**.

GPS QRM

LightSquared Corporation presently offers wireless broadband via satellite using low-power signals in a frequency range from 1525 to 1559 MHz. That's close to the frequency range used by our constellation of GPS satellites (1559 to 1610 MHz). So far this has not caused interference problems, but that may change when LightSquared moves ahead with its plans to build 40,000 new high-power base stations.

Engineers Scott Burgett and Bronson Hokuf with Garmin International, a satellite navigation systems manufacturing company in Olathe, Kansas, say the stronger signals will be disastrous. They claim the signals will seriously limit GPS reception, causing widespread GPS jamming.

The engineers carried out laboratory testing and discovered that GPS receivers would begin to suffer interference when they came within about 4 miles of a LightSquared transmitter. They lost the fix altogether at a distance of 1 mile. When they tested an aviation GPS receiver, the interference started at 12 miles and total loss of fix occurred at 6 miles.

LightSquared spokesman Jeff Carlisle said the base stations are not at fault, but concedes that interference could arise because some GPS receivers lack the necessary front end filtering. The FCC has required LightSquared to submit an initial plan for working with federal agencies and GPS companies to determine how to deal with the interference. The plan was filed with the FCC on February 25 and a final report is due on June 15.

We're Running Out of Internet Addresses!

The mainstream media was all over this story earlier this year and a number of people became quite spun up as a result. (Or as veteran hams might say, "They started pulling grid current.")

The story revolves around the transition from IPv4 to IPv6. IPv4 is what we currently use for network addressing. The Internet connection at your home, for example, carries an IPv4 address that looks something like this: 38.125.90.120.

The problem is that there are only so many possible combinations available in this configuration and we've pretty much tapped them all. Without more IP addresses, we can't keep adding devices to the Internet.

The solution is iPv6, which results in longer addresses that look like this: 3ffe:1900:4545:3:200:f8ff:fe21:67cf. There are many more possible combinations with this scheme, so we'll be able to assign new IP addresses for a long time.

IPv6 works a bit differently from IPv4 and requires hardware and software support. IPv6 support is built in to most modern computer hardware, but not all. If you want to check if your hardware supports IPv6, the easiest thing to do is head for the operating system command line on your computer. In *Windows* you can run **ipconfig**. On a Mac or *Linux* machine you can run **ifconfig**. These commands should list IPv4 and IPv6 addresses for your hardware. If you see an IPv6 address listed, you're good — probably.

When it comes to software — web browsers in particular — you can't just enter an address like 3ffe:1900:4545:3:200:f8ff:fe21:67cf because your browser will probably have no idea what you're attempting to do. Help is on the way, though, in the form of software updates.

Truth is, the IPv6 change isn't likely to mean much to you for some time. In the United States, the IPv6 compatibility deadline set by the federal government is September 30, 2012. This is the date after which "webmail, domain name server (DNS), and Internet service provider (ISP) services, must operationally use native IPv6." This is soon, but not terribly soon, and for most of us, that deadline won't be cause for much concern. If you're running a popular browser, you can expect compatibility by the time you'll need it, and likewise with most hardware. QST

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

CONVENTION AND HAMFEST CALENDAR

Abbreviations
Spr = Sponsor
Tl = Talk-in frequency
Adm = Admission

Alabama (Fort Payne) — Jun 11
D F H R T V
8 AM-1 PM. *Spr:* DeKalb County ARC. VFW Fairgrounds, 18th St N. *Tl:* 147.27 (100 Hz). *Adm:* $5. Tables: $5. Clay Patrie, KG4OZW, 6101-B Mitchell Rd NE, Fort Payne, AL 35967; 256-845-5444; **fortpaynehamfest@yahoo.com**; **w4gbr.org**.

EAST BAY SECTION CONVENTION

June 4, Berkeley, CA
F Q S
The East Bay Section Convention, co-sponsored by the ARRL East Bay Section and the California Historical Radio Society, will be held at the KRE Building (Home of the California Historical Radio Society, Bay Area Radio Museum, and W6CF Memorial Station), 601 Ashby Ave. Doors are open 9 AM-1 PM. Features include swapmeet (no fee, gates open 8 AM but no selling activity until 9 AM); DXCC, WAS, WAC, and VUCC card checking; ARRL forum; speakers; EB Section ARES meeting. Talk-in on 146.52. Admission is free. Contact Jim Latham, AF6AQ, 1798 Warsaw Ave, Livermore, CA 94550; 925-447-6136; **af6aq@arrl.net**; **www.eastbaysectionarrl.org/**.

California (Santa Maria)—Jun 18
D F H R T V
6 AM-dusk. *Spr:* Satellite ARC. Newlove Picnic Grounds, Hwy 101. T-hunt. *Tl:* 146.7. *Adm:* Free. Tables: advance $10, door $15. Paul Goshay, W6WE, 1170 Osage St, Nipomo, CA 93444; 805-929-1188; **pmgoshay@charter.net**; **www.satellitearc.com**.

Connecticut (Newington) — Jun 18
D F H R S T V
8 AM-2 PM. *Spr:* Newington AR League. St Mary School, 625 Willard Ave. NARL Fest 2011. *Tl:* 145.45 (127.3 Hz). *Adm:* $5. Tables: $10. Steve Ewald, WV1X, Box 310133, Newington, CT 06111; 860-594-0265; **wv1x@arrl.org**; **www.narlhamfest.org**.

Idaho (Post Falls) — Jun 11 D F H R V
7 AM-3 PM. *Spr:* Kootenai ARS. American Legion Hall, 1138 E Poleline Ave. *Tl:* 146.52. *Adm:* $5. Tables: $10. Edward Stuckey, AI7H, 2300 W Polo Green Ave, Post Falls, ID 83854; 208-457-0354; **ai7h@arrl.net**; **k7id.org**.

Illinois (Aurora) — Jul 10 D F H R S T V
8 AM-1 PM. *Spr:* Fox River Radio League. Aurora Central Catholic High School, 1225 N Edgelawn Dr. *Tl:* 147.21 (103.5 Hz). *Adm:* advance $6, door $8. Tables: $10. Jere Yanek, KAØKPO, c/o FRRL, Box 673, Batavia, IL 60510; 630-879-3576; **hikerjere@comcast.net**; **frrl.org**.

Illinois (Granite City) — Jun 12
D F H R S T V
7 AM-2 PM. *Spr:* Egyptian RC. Moose Lodge, 2521 Maryville Rd. *Tl:* 146.76 (141.3 Hz). *Adm:* advance $5, door $7. Tables: $10. Larry Unfried, WA9KJV, 2226 Cleveland Blvd, Granite City, IL 62040; **unclefred5683@sbcglobal.net**; **w9aiu.org**.

Illinois (Wheaton) — Jun 19 D F H R T V
7 AM-2 PM. *Spr:* Six Meter Club of Chicago. DuPage County Fairgrounds, 2015 Manchester Rd. 54th Annual Hamfest. *Tl:* 146.97 (107.2 Hz). *Adm:* advance $6, door $8. Tables: $12. Michael Huedepohl, WD9GJK, 3532 Raymond Ave, Brookfield, IL 60513; 708-485-5481 (after 6 PM); **wd9gjk@arrl.net**; **k9ona.com**.

Indiana (Indianapolis) — Jul 9 D F H R S T
6 AM-3 PM. *Spr:* Indianapolis Hamfest Assn. Camp Sertoma, 2316 S German Church Rd. *Tl:* 146.76. *Adm:* advance $6, door $8. Tables: $15. Bill Akin, K9YDO Box 1672, Noblesville, IN 46060; 317-261-6658; **k9ydo@comcast.net**; **www.indyhamfest.com**.

Indiana (South Bend) — June 11 D F H R T
Set up 5-8 AM; public 8 AM-1 PM. *Spr:* Michiana ARC. Elks Lodge, 3535 E McKinley Ave. *Tl:* 147.33 (131.8 Hz). *Adm:* $5. Tables: $10 center; $15 wall. Jack Styles, N9TAG, 211 S Michigan St, Apt 608, South Bend, IN 46601; 574-287-4408; **stylesjack1@hotmail.com**; **w9ab.org**.

Massachusetts (Cambridge) — Jun 19. Nick Altenbernd, KA1MQX, 617-253-3776 (9 AM-5 PM); **w1gsl@mit.edu**; **www.swapfest.us**.

Michigan (Midland) — Jun 18
D F H Q R S T V
8 AM-noon. *Spr:* Midland ARC. Salvation Army Building, 330 Waldo Ave. *Tl:* 147.0 *Adm:* $5. Tables: $5. Keith Johnson, KB8SOE, c/o Midland Hamfest, Box 1049, Midland, MI 48641; 989-488-4337; **kb8soe@arrl.net**; **www.w8kea.org/hamfest**.

Michigan (Monroe) — Jun 19 D F H R T
7:30 AM-1 PM. *Spr:* Monroe County Radio Communications Assn. Monroe County Fairgrounds, 3775 S Custer Rd. *Tl:* 146.72. *Adm:* $6. Tables: $15. Fred VanDaele, KA8EBI, 4 Carl Dr, Monroe, MI 48162; 734-652-3843; **ka8ebi@yahoo.com**; **www.mcrca.org**.

Michigan (Newberry) — Jun 11 D F H R V
9 AM-noon. *Spr:* Luce ARS. Pentland Township Hall, Hwy M-28. *Tl:* 146.61. *Adm:* $5. Tables: $7. Dave Hopper, KA8K, 22926 Maple Dr, McMillan, MI 49853; 906-586-3928; fax 906-293-8300; **hopperd@michigan.gov**; **www.w8nby.com**.

Minnesota (Brainerd) — Jul 9 D H V
9 AM-1 PM. *Spr:* Brainerd Area ARC. Brainerd National Guard Armory, 1115 Wright St. 11th Annual Hamfest. *Tl:* 147.225. *Adm:* $6. Tables: $12. Al Doree, WØRC, 33247 E Shamineau Dr, Motley, MN 56466; 218-575-2404; **doreeaj@brainerd.net**; **www.brainerdham.org**.

New Jersey (Augusta) — Jul 10
D F H Q R T
8 AM. *Spr:* Sussex County ARC. Sussex County Fairgrounds, 37 Plains Rd. *Tl:* 147.3 (151.4 Hz). *Adm:* $7. Tables: $20. Dan Carter, N2ERH, 8 Carter Ln, Branchville, NJ 07826; 973-948-6999; **hamfest@scarcnj.org**; **www.scarcnj.org**.

New Jersey (Piscataway) — Jun 18
D H Q R T
7 AM-2 PM. *Spr:* Raritan Valley RC. Piscataway High School (Lots 11/12), 100 Behmer Rd. Demonstrations. *Tl:* 146.625, 442.25 (141.3 Hz). *Adm:* $7. E. Drew Moore, W2OU, 30 Ethel Rd, Piscataway, NJ 08854; 732-801-4654; **drumor@optonline.net**; **www.w2qw.org**.

New York (Bethpage) — Jun 5 D F H R T
Set up 7:30 AM; public 8:30 AM. *Spr:* Long Island Mobile ARC. Briarcliffe College, 1055 Stewart Ave. Outdoor Hamfest, tune-up clinic. *Tl:* 146.85 (136.5 Hz). *Adm:* $5. Tables: $10 per space (plus $5 per vendor). Richard Cetron, K2KNB, 198 Haypath Rd, Old Bethpage, NY 11804; 516-694-4937; **hamfest@limarc.org**; **limarc.org**.

New York (Chaffee) — Jun 11 D H R T
Set up 7 AM; public 8 AM-noon. *Spr:* Pioneer Radio Operators Society. Manion Park, 9990 Grove St. *Tl:* 145.39. *Adm:* $5. Tables: $5 (with 1 free admission). Roy Schwedt, KC2LEE, 57 N Main St, Franklinville, NY 14737; 716-676-3903; **rschwedt@netscape.com**; **www.pioneerradiooperatorssociety.bravehost.com**.

New York (Cortland) — Jun 11 D F H R T V
7 AM-1 PM. *Spr:* Skyline ARC. Cortland County Fairgrounds, Carroll St Extension. *Tl:* 147.18. *Adm:* $5. Tables: $10. Andrew Slaugh, KB2LUV, Box 5241, Cortland, NY 13045; 315-395-7640; fax 315-425-9072; **kb2luv@arrl.net**; **www.skylineradioclub.org**.

New York (Queens) — Jun 12
D F H Q R T V
Set up 7:30 AM; public 9 AM-2 PM. *Spr:* Hall of Science ARC. New York Hall of Science Parking Lot, 47-01 111th St (Flushing Meadow Corona Park). *Tl:* 444.2, 145.27 (both 136.5 Hz). *Adm:* buyers $5, sellers $10. Stephen Greenbaum, WB2KDG,

Coming ARRL Conventions

May 20-22
Dayton Hamvention®, Dayton, OH*

June 3-5
Northwestern Division, Seaside, OR*
Wyoming State, Cheyenne*

June 4
East Bay Section, Berkeley, CA
Georgia State, Marietta*
Atlantic Division, Rochester, NY*

June 10-11
ARRL National, Plano, TX

June 11
Tennessee State, Knoxville

July 2
Eastern Pennsylvania Section, Marysville

July 15-17
Montana State, Essex

July 23
WØDXCC, Leavenworth, KS

July 29-30
Oklahoma State, Oklahoma City
Central States VHF, Irving, TX

August 5-6
Texas State, Austin

August 5-7
Midwest Division, Cedar Rapids, IA

*See May *QST* for details.

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

85-10 34th Ave, Apt 323, Jackson Heights, NY 11372; 718-898-5599; **wb2kdg@arrl.net**; **www.hosarc.org**.

North Carolina (Kinston) — Jun 18
D F H R S T V
8 AM-3 PM. *Spr:* Down East Hamfest Assn. Lenoir Community College, 231 Hwy 58 S. 21st Annual Hamfest. *TI:* 146.685 (88.5 Hz). *Adm:* advance $5 each or 3 for $12; at the door $6 each or 3 for $15. Tables: $10 ($5 additional for electricity; tailgate space $10). Jean DuPree, KB4OHX, Box 1778, Kinston, NC 28503; 252-523-2703; **jeanhd@embarqmail.com**; **www.downeasthamfest.org**.

North Carolina (Salisbury) — Jul 9
D F H R T V
8 AM-2 PM. *Spr:* Rowan ARS. Salisbury Civic Center, 315 Martin Luther King Ave S. Homebrew Contest. *TI:* 145.41 (136.5 Hz). *Adm:* advance $4, door $5. Tables: $5. Tommie Wood, N4YZ, 310 Cruse Rd, Salisbury, NC 28146; 704-637-0024; **n4yz@arrl.net**; **www.rowanars.org**.

North Carolina (Winston-Salem) — Jun 11
D F H R T
7 AM-noon. *Spr:* Forsyth ARC. Summit School Eagles Nest, 2100 Reynolda Rd. *TI:* 146.64 (100 Hz). *Adm:* advance $4 (with coupon), door $5. Tables: $15. Henry Heidtmann, W2DZO, Box 11361, Winston-Salem, NC 27106; 336-245-5740; **classic2011@w4nc.org**; **classic2011.w4nc.org**.

Ohio (Milford) — Jun 18 D F H R S T V
Set up 6 AM; public 8 AM-2 PM. *Spr:* Milford ARC. Eastside Christian Church, 5874 Montclair Blvd. 21st Annual Hamfest. *TI:* 147.345. *Adm:* $5. Tables: $5 (inside); tailgating $1. Jim Linn, WB8RRR, 5110 Romohr Rd, Cincinnati, OH 45244; 513-831-6255; fax 513-528-7270; **wb8rrr@arrl.net**; **www.w8mrc.com**.

Pennsylvania (Dallas) — Jul 3 D F H R T
8 AM-3 PM. *Spr:* Murgas ARC. Luzerne County Fairgrounds, Rte 118. Hamfest and Computerfest. *TI:* 146.61 (82.5 Hz). *Adm:* $6. Tables: $15 (inside). Herb Krumich, K2LNS, 311 Meadow Run Rd, Wilkes-Barre, PA 18702; 570-829-2695; **wa2fgk@yahoo.com**; **qsl.net/k3ytl**.

Pennsylvania (Erie) — Jul 9 D F H R T V
7 AM-noon. *Sprs:* Wattsburg Wireless and Union City Wireless Assns. Greene Township Municipal Bldg, 9333 Tate Rd. 10th Annual Hamfest. *TI:* 146.7 (186.2 Hz). *Adm:* advance $4, door $5 (under 16 free). Tables: $5. Ron Rycek, KB3QBB, 1412 Grant Ave, Erie, PA 16505; 814-833-6829 (phone and fax); **kb3qbb@arrl.net**; **www.wattsburg-wireless.us/hamfest.htm**.

Pennsylvania (Lime Ridge) — Jun 11
D F H R T V
7 AM-1 PM. *Spr:* Columbia-Montour ARC. Lime Ridge Community Center, 6405 4th St. 21st Annual Bloomsburg Hamfest. *TI:* 147.225 (203.5 Hz). *Adm:* $5. Tables: $10. Dave Schack, WC3A, 6020 Fort Jenkins Ln, #17, Bloomsburg, PA 17815; 570-752-6851; **drs352478@verizon.net**; **www.qsl.net/cm-arc/hamfest.htm**.

EASTERN PENNSYLVANIA SECTION CONVENTION

July 2, Marysville
D F H Q R S T
The Eastern Pennsylvania Section Convention ("Firecracker Hamfest"), sponsored by the Harrisburg Radio Amateur Club, will be held at the Marysville Lion's Park, 105 Park Dr. Doors are open for setup Friday 6-9 PM, Saturday 6 AM; public 8 AM-1 PM. Features include 39th Annual Event, largest tailgate ($5 per space) and electronics flea market in central PA, 80 covered indoor commercial tables, new and refurbished equipment dealers, seminars all morning, DXCC and WAS card checking, special event station W3W in operation, breakfast and lunch, handicapped accessible. Talk-in on 146.76 (100 Hz). Admission is $5 (nonham spouses and kids free). Tables are $12 each (before Jun 1), $15 (on or after Jun 1). Contact Terry Snyder, WB3BKN, Box 355, Halifax, PA 17032-0355; 717-896-0256; **hracw3uu@gmail.com**; **www.w3uu.org**.

Pennsylvania (Pittsburgh) — Jul 10
D F H R
8 AM-2 PM. *Spr:* North Hills ARC. Westview VFW Post 2754, 386 Perry Hwy. 26th Annual Hamfest. *TI:* 147.09 (88.5 Hz). *Adm:* $5. Tables: $10. Al Smochko, K3YUB, 107 Iola St, Glenshaw, PA 15116; 412-760-7055; **k3yub@verizon.net**; **nharc.org**.

Quebec (Sorel-Tracy) — May 29.
Luc Leblanc, VE2DWE, 450-232-1888; **ve2cbs@raqi.ca**; **hamfest.qc.ca**.

TENNESSEE STATE CONVENTION

June 11, Knoxville
D H Q R S T V
The Tennessee State Convention, sponsored by the Radio Amateur Club of Knoxville, will be held at the Kerbela Temple, 315 Mimosa Ave. Doors are open for setup Friday 1-6 PM, Saturday 6:30 AM; public 8:30 AM-4 PM. Features include 45th Annual Knoxville Hamfest and Electronics Exposition; outside flea market ($5 per space plus admission; setup on Saturday only at 7 AM); inside dealers and clubs; forums; special guest from ARRL HQ Chuck Skolaut, KØBOG, MVP Field and Regulatory Correspondent; exhibits; demonstrations; on site VE sessions; QSL card checking; handicapped accessible; breakfast and lunch. Talk-in on 53.77, 147.3, 224.5, 444.575 (100 Hz). Admission is $7 (under 13 free). Table are $20 (8-ft) before Jun 3; $25 after Jun 3. Contact David Bower, K4PZT, 512 Elkmont Rd, Knoxville, TN 37922; 865-631-7553; **d.bower@ieee.org**; **www.w4bbb.org**.

ARRL NATIONAL CONVENTION

June 10-11, Plano, TX
D F H Q R S T V
The ARRL National Convention (Ham-Com 2011), co-sponsored by Ham-Com, Inc and other supporting clubs, will be held at the Plano Centre, 2000 E Spring Creek Pkwy. Doors are open Friday and Saturday 7 AM-6 PM. Features include ARRL EXPO 2011 (a special exhibit area including ARRL program representatives, activities, and a huge ARRL bookstore); indoor and outdoor flea markets; tailgate market ($8 per space per day; first-come, first-served); commercial exhibitors; equipment dealers; manufacturers; vendors; programs, forums, and presentations; transmitter hunts; ARRL Youth activities and Youth Lounge; Boy Scout "One-Day" Merit Badge Program; VE sessions (Friday 11 AM-5 PM and Saturday 9 AM-4 PM); Lone Star DX Dinner (Friday, Jun 10, 6 PM; $39); special guests including Riley Hollingsworth, K4ZDH; DXCC card checking; Wouff Hong ceremony; W1AW/5 Special Event Station; handicapped accessible. Talk-in on 147.18 (107.2 Hz). Admission is $8 in advance, $10 at the door (children 12 and under and uniformed Scouts are free). Tables are $40. Contact Barry Goldblatt, WA5KXX, Box 260721, Plano, TX 75026; 972-596-4669; fax 972-596-5078; **wa5kxx@verizon.net**; **www.hamcom.org/**.

Texas (Texas City) — Jul 9
D F H Q R S T V
8 AM-2 PM. *Spr:* Tidelands ARS. Doyle Convention Center, 2010 5th Ave N. Left foot CW contest, hidden transmitter hunt. *TI:* 147.14 (167.9 Hz). *Adm:* advance $4, door $5. Tables: $10. Joe Wileman, AA5OP, Box 73, Texas City, TX 77592; 409-945-6794; **aa5op@yahoo.com**; **www.tidelands.org**.

Virginia (Franklin) — Jun 11 H R S T V
9 AM-3 PM. *Spr:* Franklin ARC. Bronco Club, Delaware Rd. "PigPickin' Picnic and Tailgating." *TI:* 146.91 (131.8 Hz). *Adm:* $10 (includes lunch and free tailgating). Fred Weaver, KG4BKI, Box A, 21180 Sand Pit Rd, Zuni, VA 23898; 757-242-9066; **kg4bki@yahoo.com**; **www.qrz.com/db/wf4rc**.

Virginia (Manassas) — Jun 12
D F H Q R T V
7 AM-3 PM. *Spr:* Ole Virginia Hams ARC. Prince William County Fairgrounds, 10624 Dumfries Rd. 37th Annual Hamfest. *TI:* 146.97 (100 Hz). *Adm:* $7. Tables: $25. Bruce Bryant, AB8CI, 6276 Occoquan Forest Dr, Manassas, VA 20112; 703-596-5617; **ab8ci@comcast.net**; **www.w4ovh.net**.

Wisconsin (Oak Creek) — Jul 9 D F R
6:30 AM-2 PM. *Spr:* South Milwaukee ARC. American Legion Post #434, 9327 S Shepard Ave. 44th Annual Swapfest, limited free overnight camping. *TI:* 146.52. *Adm:* $5. Robert Kastelic, WB9TIK, 7410 S Clement Ave, Oak Creek, WI 53154; 414-764-3871; **wb9tik@sbcglobal.net**; **www.qsl.net/wa9txe**.

To All Event Sponsors

Before making a final decision on a date for your event, you are encouraged to check the Hamfest and Convention Database (**www.arrl.org/hamfests-and-conventions-calendar**) for events that may already be scheduled in your area on that date. You are also encouraged to register your event with HQ as far in advance as your planning permits. See **www.arrl.org/hamfest-convention-application** for an online registration form. Dates may be recorded up to two years in advance.

Events that are sanctioned by the ARRL receive special benefits, including an announcement in these listings and online. Sanctioned conventions are also listed in the *ARRL Letter*. In addition, events receive donated ARRL prize certificates and handouts.

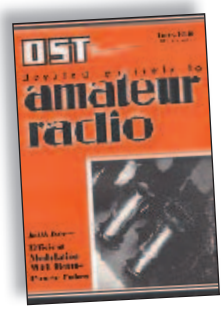
For hamfests: Once the form has been submitted, your ARRL director will decide whether to approve the date and provide ARRL sanction. *For conventions:* Approval must come from your director and the ARRL executive committee.

The deadline for receipt of items for this column is the **1st of the second month preceding publication date**. For example, your information must arrive at HQ by **June 1** to be listed in the **August** 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 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 ARRL Web banner advertising. Call the ARRL Advertising Desk at 860-594-0207, or e-mail **ads@arrl.org**.

75, 50 AND 25 YEARS AGO

June 1936



■ The cover photo shows the 50-watt audio amplifier-modulator described in this issue.

■ The editorial addresses the growing problem of hams causing interference to broadcast listeners and other radio services, resulting in ham radio's getting a bad reputation.

■ George Grammer, W1DF, describes "A 50-Watt Audio Amplifier-Modulator with Beam Power Output," which uses a pair of the new metal 6L6 tubes.

■ Then Frank Edmonds, W2DIY, discusses "The 6L6 Beam Power Tube as a High-Output Crystal Oscillator." With 425 volts on the plate, Frank gets 36 watts output!

■ The "Dixie Jones' Owl Juice" column, by W4IR of the "Dixie Squinch Owl," laments the long-winded business meetings at ham clubs that keep him from in-person eyeball QSOs with his ham buddies.

■ By Goodman, W1JPE, presents "A High-Performance Three-Stage Transmitter with Improved Tri-Tet Exciter." The rig provides 100 to 200 watts of output on four bands with a single crystal.

■ Clinton B. DeSoto declares that "Hams Carry on," in providing much-needed emergency communication following the recent floods and tornados. Bravo, OMs and YLs!

■ George Grammer, W1DF, writes about modernizing older receivers, in "Adding A.V.C. to the Ham Super."

June 1961

■ The cover photo shows the version of the popular HBR-15 receiver built by Alex Stewart, described in this issue.

■ Floyd Peck, K6SNO, describes "A Compact High-Power Linear," a Class B linear amplifier that uses four 811As in parallel to provide about a kilowatt output.

■ James McLaughlin, W8TBZ, and Robert Hobbs, W8PIL, provide an excellent discussion of the various "Noise Factors Affecting V.H.F. Communication."

■ Alex Stewart, ex-4HP, tells about building "The HBR-16 with an Eddystone Dial."

■ John Lange, K9ARA, discusses building a "Low-Pass Filter for 6-Meter Operation."

■ "Coaxial Transformer for Voltage-Fed Antennas," by Pete Czerwinski, W2ITI, describes simple matching devices for coax feed.

■ John Nelson, W6EAR, describes his automatic tape-operated send-receive switching system, in "Keyboard-Controlled C.W. Station."

■ John Troster, W6ISQ, once again brings wry (and perhaps embarrassed) smiles to our faces with his tale of "Short QSO, Anyone?"

■ In "The World Above 50 Mc," Sam Harris, W1FZJ, discusses the yet-small but growing community of moonbounce hams.

June 1986

■ The cover cartoon by N2EST/4, shows bears and other forest animals examining a Field Day station, while the hams hide out in the trees above them!

■ The editorial discusses the lure of "Field Day!" — and its appeal to so many hams for so many reasons.

■ Michael Owen, W9IP/2, gives us "VHF Meteor Scatter — An Astronomical Perspective."

■ Warren Bruene, W5OLY, tells us about an impedance-transforming network that operates over a wide symmetrical bandpass, in "Introducing the Series-Parallel Network."

■ Doug DeMaw, W1FB, describes how to build "A Remote Antenna Switcher for HF."

■ Part 3 of "Adventures in Satellite DXing," by Dick Jansson, WD4FAB, discusses how to assemble an effective satellite station.

■ Ted Hart, W5QJR, gives us the lowdown on "Small, High-Efficiency Loop Antennas."

■ Jerry Hall, K1TD, presents "Antennas: From the Ground Up," reconciling theoretical concepts with real-world antennas.

■ Hal Feinstein, WB3KDU, explains spread-spectrum communication to us, in "Spread-Spectrum: Frequency Hopping, Direct Sequence and You."

■ Phil Sager, WB4FDT, HQ's Regulatory Information Branch Manager, discusses the news that "FCC Issues Novice Enhancement NPRM."

■ Bill Tynan, W3XO, in "The World Above 50 MHz," reports on the "Best Sporadic-E Season Ever, Down Under."

■ In the "Amateur Satellite Communications" column, "Rip" Riportella, WA2LQQ, reports on Japanese Amateur Satellite Number One (JAS-1).

Al Brogdon, W1AB ♦ Contributing Editor

Field Organization Reports

MARCH 2011

Public Service Honor Roll

This listing recognizes radio amateurs whose public service performance during the month indicated 70 or more points in six categories. Details on the program are at this Web page: **www.arrl.org/public-service-honor-roll**.

1015 W7TVA
460 KØIBS
440 W5KAV
405 KI4KWR
403 W4CAC
386 WB8RCR
371 WB9FHP
355 K8OLY
350 KA2ZNZ
340 KT2D
325 W5DY K2DYB
315 KB2ETO
290 WB9YBI
274 KT5SR AC8AL
245 W2MTA
225 WB9JSR
224 WD8BCS
220 KB5SDU K8RDN
217 W4LHQ
215 KB2KOJ
203 W7JSW K2HAT
200 K2HJ K7OAH AK2Z
195 W8ERV KB8RCR
180 NC4VA
178 KD8KWG
177 WA2BSS
175 KC2SFU
166 WA4UJC
162 N4HUB
160 KGØGG WA9FLJ N7CM
157 KA8ZGY K2ABX
155 KE5HYW K7EAJ WB6UZX
153 W3CB
150 KK3F N8CJS K4GK N1QLN N1UMJ NX8A
145 KW1U
144 WD8USA
147 KØLQB
141 KØOTZ
140 W7ARC K6HTN KO6V N9VC
135 K9LGU W3YVQ WM2C
134 KK5NU
130 WB2FTX KB5PGY K6JT W7FQQ K4IWW W4DNA
128 W2SFD
129 AC6C
125 KØVTT NN7H N2GJ KF7GC KD8NWE
120 KB5KKT WA9LFO AG9G K3CSX KA4FZI N8IO WB8HHZ WØLAW W1GMF WB8WKQ
118 WS6P
116 N2VC N8OSL
115 KB1RGQ KD1LE WK4P
112 NA9L N7IE
110 W7QM NX9K N3RB N2GS KE4CB KA3OCS N9MN K1REV KC5OZT W8UL K3RC K7BDU W7QM N7XG N7YSS K4BG WA5LOU KB1NMO N1IQI N1LKJ WI2G W2EAG WE2G N5NVP
107 KF5CRX
103 N9WLW NA7G
102 K4BEH
101 KC2SYM
100 N7EIE W6WW KJ6HWL WØCLS NIØI NØMEA WAØVKC W4KLB AA3SB
N1JX K4SCL NR2F N5OUJ N8OD WD8Q WG8Z WA3EZN N3SW W3TWV W4WNE WB6OTS NM1K W8CPG KC2YDT W4TTO N2YJZ K5MC N5ASU K8VFZ K8AE
99 KB9KEG
98 KK7DEB
95 KI4AAN N4ELI W8IM K4JGA
94 AD4BL W5GKH
93 N9DVL
92 W2CC
91 KC5MMH
90 WØSJS N3KB N4MEH N3ZOC KB3LNM K3IN K4MSG N9VT W3GQJ KA1G K1JPG NU8K KZ8Q KT4YA KE5YTA KF5IOU N8DD WB8SIQ N4EJF W4QAT WB4BIK W9MBT K1YCQ KI4YV KD8CYK
89 WDØGUF
KØBXF
86 W7ELI N2JBA
85 KK7TN
84 KJ7NO
83 K2WRC KA2EJD
82 AL7N
81 N2DW KD4FUN
80 K7MQF KCØZDA WS4P KJ4HGH K8KV KB8HJJ W8DJG N5EEO KC2PSN
78 KA3NZR W9WXN
77 WB4GHU KD8LZB
76 KC4PZA
75 W1PLK KK1X
73 N2VQA N8SY
72 W4AVD KD7OED W4BKG KC2OOY
70 K6RAU KØDEU KØDLK NØDUW NØDUX NUØF WØFUI KBØJKO N3NTV KØPTK KØOR KØRXC NØUKO KD7ZUP W5XX KBØDTI WB8WJZ KD8AAD

The following station qualified for PSHR in previous months, but was not properly recognized in this column: (Feb) N2YJZ 100.

Section Traffic Manager Reports

The following Section Traffic Managers reported: AK, AL, AR, AZ, CT, CO, EB, EMA, ENY, EPA, EWA, GA, IL, IN, KS, LA, LAX, MDC, ME, MI, MN, MO, MS, NC, NFL, NLI, NNJ, NNY, NTX, OH, OK, OR, SC, TN, UT, SD, SFL, SJV, STX, VA, WCF, WI, WNY, WPA, WV, WY.

Section Emergency Coordinator Reports

The following ARRL Section Emergency Coordinators reported: AZ, EWA, GA, IA, IN, KS, MDC, MI, MO, NLI, NTX, SFL, SV, SJV, STX, TN, WV.

Brass Pounders League

The BPL is open to all amateurs in the US, Canada and US possessions who report to their SMs a total of 500 or more points or a sum of 100 or more origination and delivery points for any calendar month. Messages must be handled on amateur radio frequencies within 48 hours of receipt in standard ARRL radiogram format. Call signs of qualifiers and their monthly BPL total points follow.

N1IQI 2256, KK3F 2042, W1GMF 2010, WB5NKD 1846, WB9FHP 1461, W8UL 1436, WB2FTX 1426, KW1U 1005, W6WW 1000, WB5NKC 867, KZ8Q 851, N1UMJ 833, N8IXF 819, W4WNE 762, WB9JSR 756, NX9K 729, WB8WKQ 728, N9VC 695, N1JX 684, WK4P 662, W7FQQ 635, WD8Q 596, K4IWW 572, W1KX 521, K1JPG 516, K6JT 515.

Stations earning BPL by Originations plus Deliveries: NM1K 105, K8LJG 103.

SILENT KEYS

It is with deep regret that we record the passing of these amateurs:

KA1EF **Caldwell**, William Jr, Nahant, MA
W1EHY **Arnold**, Peter K., Olathe, KS
KD1EMT **Herring**, Michael V., Brookhaven, MS
W1HWO **Tillson**, Benjamin F. Jr, Brewster, MA
W1KB **Bowen**, Daniel F., Portland, ME
KA1PHI **Lamagna**, Pasquale M., Springfield, MA
K1UFG **Miller**, Judith, Kingman, AZ
WA1VDX **Reluga**, Henry G., West Granby, CT
ex-W1QUY **Torosian**, Eprem, Amesbury, MA
W1WDG **Gifford**, Wright D. Jr, Vernon, CT
NE1Y **Arcuri**, Raynold A. Sr, Conroe, TX
♦WA2AIV **Partis**, Donald C., Batavia, NY
KC2AWC **Labarge**, David B., Central Square, NY
W2CT **Wilcox**, Forrest S., Montrose, NY
W2EQV **Klapp**, Matthias H., Schenectady, NY
WB2FNF **Robinson**, Wilda R., Churchville, NY
WA2FZU **Coon**, John M., Fairport, NY
WA2GXE **Adam**, John C. Jr, Syracuse, NY
W2INE **Hunsworth**, Herbert C., Cape May Court House, NJ
WA2JQI **Herz**, James S., Binghamton, NY
♦K2LGJ **Gaye**, Robert S., Buffalo, NY
W2LVK **Carpenter**, Stanley E. Jr, East Syracuse, NY
WB2QDT **Kearney**, James F., Summit, NY
WB2RTV **Fiedler**, Michael J., Lockport, NY
♦K2SKV **Hirsch**, Alfred E. Jr, Westfield, NJ
W2VCI **Dexheimer**, Milton A., Tonawanda, NY
KA3CSR **Crynack**, Robert, Glenshaw, PA
W3EYP **Kraft**, Clinton J., Newport, NC
WA3TNQ **Caron**, Armand L., Rockville, MD
K4ACL **Howell**, Arnie V., Fayette, AL
W4ACM **Gray**, Carleton H., Fredericksburg, VA
KD4AD **Robin**, Alvin R., Tampa, FL
N4ALE **Riddle**, Edmund E., Athens, GA
Ex-WR4B **La Pointe**, Joseph, Orlando, FL
KD4FN **Jackson**, James L. III, Smithfield, VA
KI4FUS **Jennings**, Curtis W., Auburn, AL
ex-K4RPK **Foster**, B. L., Roswell, GA
W4MMQ **Bigbie**, Edgar F., Richmond Hill, GA
W4MXI **Henson**, Edgar C., Daphne, AL
N4ODB **Snapp**, Karen J., Glade Spring, VA
N4OGS **Kelly**, Claude J., Ocean Ridge, FL
AA4IQ **Prast**, William, St Petersburg, FL
WA4OHM **Rinker**, Elmer, Cedar Bluff, AL
K4ORX **White**, Melvin W., Tuscaloosa, AL
KN4QH **Brousseau**, James R., Marion, IA
♦K4RF **Adams**, Steven C., Cornelia, GA
KO4SU **Burns**, James F., Chattanooga, TN
W4VHZ **Hinnant**, Harold L., St Simons Island, GA
N4WN **Nyberg**, Wilbur C., Annandale, VA
N4XIM **Watts,** Jim, Calhoun, GA
W4WTV **Valentine**, William T., Crystal River, FL
K4YNZ **McDavid**, Charles Jr, Trussville, AL
♦WB4YRB **Spurr**, Frank A. Jr, Winchester, VA
AF4YT **Collins**, Martin, Denver, KY
WA4ZIT **Zetekoff**, Zelda B., Boca Raton, FL
KC5ABI **Kennedy**, Louis J., Norman, OK
KC5ATY **Smith**, Spurgeon E., Elgin, TX
NB5C **Arbon**, Alden T., Pleasant Grove, UT
♦W5CKP **Slay**, David W., Lake Charles, LA
N5CNG **Burran**, Jerry D., Weir, TX
KB5CQR **Grisham**, James L., Florence, AL
W5HFL **Howe**, Gary L., Sandia Park, NM
KA5KDB **Cook**, Joe C., Springfield, TN
WB5MRB **Nietmann**, M. L. "Tiger," Deming, NM
N5NVY **Freeman**, Kenneth A., Saraland, AL
W5PD **Gibson**, John D., Dallas, TX
K5RLL **Ricks**, Bill H., Brady, TX
WB5SRY **Tatge**, George J., Fayetteville, AR
KC5YXX **O'Connor**, Donald L., Sherman, IL
K6BCT **Guthleben**, F. L., Inyokern, CA
K6BII **Purviance**, Warren C., Modesto, CA
WA6BM **McCormack**, William J., Fallbrook, CA
W6CDO **Beasley**, William E., San Fernando, CA
KD6DHM **Hollen**, Dave, Gold Beach, OR
KB6FI **Hansen**, David R., Pleasanton, CA
W6GNB **Mc Claflin**, Frank L., Napa, CA
♦KQ6HS **Hayes**, Glenn L., Sunnyvale, CA
N6JNF **Bertacchi**, Phyllis M., Sacramento, CA
N6JR **Renfroe**, John T., St George, UT
KK6KK **Mann**, Robert W. Jr, Fresno, CA
W6KXB **Peek**, George E., Escondido, CA
W6NFV **Silk**, Nathan R., Woodland Hills, CA
♦K6OB **Casteen**, William F., Bakersfield, CA
W6PFR **Shinn**, Harold L., Pasadena, CA
K6TNT **Perkins**, Roger A., Oakhurst, CA
ex-W6WWF **Meek**, Pamela, New Braunfels, TX
K7CSY **Knapp**, Robert W., Lynden, WA
KC7FFG **Marzi**, Kathlyn C., Renton, WA
KB7HEA **Kokenge**, Albert L., Yakima, WA
W7ITG **Rockne**, Robert B., Kennewick, WA
K7JBZ **Middlekauff**, John E., Lynden, WA
AA7NT **Van Sickler**, Robert, Gold Beach, OR
W7PCP **Moser**, Gerry D., Boise, ID
N7RGE **Aller**, Norman D., Bend, OR
WB7SZM **Morse**, John W., Medford, OR
KC7UZD **Ott**, Cecil, La Pine, OR
KD7VK **Newman**, Harold, Apache Junction, AZ
WA7XL **Marzi**, Edward W., Renton, WA
KE7XU **Emerson**, Richard M., American Fork, UT
N7YCD **Kuehn**, Karl J., Milwaukie, OR
KF7YZ **Allen**, Keith R., Las Vegas, NV
♦K8EC **Camery**, Donald, Felicity, OH
NO8F **Apple**, Carl D., Marietta, OH
KG8HI **Butler**, Jeane J., Middletown, OH
N8JUH **Richards**, Robert G., Ypsilanti, MI
ex-KV8T **Wallenmaier**, Thomas E., Royal Oak, MI
K8RZN **Tracy**, Robert M., Wauchula, FL
W8SEM **Crow**, Maurice H., Centerville, OH
W8UPR **Roth**, Nelles H., Wauseon, OH
ex-W8AUE **Walker**, Charles H. Jr, Cortland, OH
WA8YJW **Bobel**, Kenneth W., Lorain, OH
K9AWT **Hinshaw**, David E., Mishawaka, IN
K9CSE **Haubenreiser**, Rodney S., Westmont, IL
W9EFG **Owen**, Robert R., Hawkins, TX
KA9EKG **Warrenburg**, Tom, Delavan, WI
W9EYK **Wilger**, Norbert J., Altoona, WI
NQ9F **Sieth**, Harlan P., New London, WI
W9GSD **Griffin**, Steven G., Milwaukee, WI
KC9JIE **Remington**, Wayne, Mitchell, IN
♦WD9JKZ **Janczak**, Sylvester P., Milwaukee, WI
W9KRP **Hougland**, Michael W., Scottsburg, IN
KA9OVY **Gillam**, Philip, Elwood, IN
W9WQS **Thomas**, Rex E., West Lafayette, IN
KE9XG **Duzan**, Ayrel, Marshall, IL
W9XX **Howlett**, Gordon P., Greentown, IN
♦WDØBRT **Buckhaults**, Joe, La Junta, CO
KIØD **Kroes**, Richard G., Rapid City, SD
WBØFMM **Oscarson**, Ella A., Wahpeton, ND
WBØGTQ **Curtis**, Clement E., Muscatine, IA
WØJFO **Korinek**, Donald J., Omaha, NE
WBØMSE **Clark**, Ralph, Clinton, CT
WAØNRC **Juehring**, Donald H., Iowa Falls, IA
WØSXM **Lindberg**, Lloyd F., Virginia, MN
WØWNX **Ryburn**, John D., Basehor, KS
NØWQB **Fox**, David, Grand Rapids, MN
NØWWB **Yost**, Leroy V., Osborne, KS
VA3FTL **Dent**, Michael J., Waterloo, ON, Canada
VE6NA **Rhyason**, Bryan, Calgary, AB, Canada
HS1CKC **Kongprasert**, Winit, Nonthaburi, Thailand
OZ8T **Otzen**, Boerge, Kalvehave, Denmark

♦ Life Member, ARRL

Note: Silent Key reports must confirm the death by one of the following means: a letter or note from a family member, a copy of a newspaper obituary notice, a copy of the death certificate, or a letter from the family lawyer or the executor. Please be sure to include the amateur's name, address and call sign. Allow several months for the listing to appear in this column.

Many hams remember a Silent Key with a memorial contribution to the ARRL Foundation or to ARRL. If you wish to make a contribution in a friend or relative's memory, you can designate it for an existing youth scholarship, the Jesse A. Bieberman Meritorious Membership Fund, the Victor C. Clark Youth Incentive Program Fund, or the General Fund. Contributions to the Foundation are tax-deductible to the extent permitted under current tax law. Our address is: The ARRL Foundation Inc, 225 Main St, Newington, CT 06111. QST

Gail Iannone ♦ Silent Keys Administrator ♦ sk@arrl.org

Strays

QST congratulates...

◊ Wayne C. Long, K9YNF, of Cascade, Wisconsin, whose book of short stories, *Stories from the Edges*, was published in March. It is available at **www.smashwords.com** and **Amazon.com**. Wayne's *QST* articles, "The Christmas Tree" and "Jimmy's Wish," won the *QST* Cover Plaque Award.

◊ Melissa C. Lott, W5MCL, of Austin, Texas, who has been selected as a 2011 Presidential Management Fellow, one of only four engineers selected nationally. An Engineering Research Associate at UT Austin, she is the daughter of Mary Christenberry Lott, K5MCL, and Dr Gus K. Lott, KR4K. Her brother is Dr Gus Lott, KF6JDC.

◊ Dr Gus Lott, KF6JDC, who was featured in "Dream Jobs 2011: Insect Imagineer" in the *IEEE Spectrum*

I would like to get in touch with...

◊ anyone who may have contacted my father, Hugh Barkley, first licensed as 9BIK back in the late 1920s or early 1930s. I'm looking for QSL cards, log entries, etc. At the time he was living in Hinsdale, Illinois. He was my Elmer, but passed away when I was 15. — *Chuck Barkley, W9BIK*, **w9bik@arrl.net**

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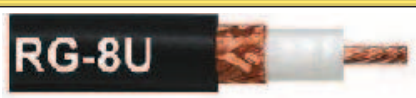

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DXE-4030VA-1	THUNDERBOLT™ 40/30 Meter Dual Band	$199.95

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DXE-7580VA-1	THUNDERBOLT™ Design 75/80 Meter Monoband 55 ft.	$549.95
DXE-80VA-3	THUNDERBOLT™ Design 75/80 Meter Vertical	$349.95
DXE-60VA-1P	THUNDERBOLT™ Design 60 Meter 43 ft. Vertical	$259.50
DXE-30VE-1	Fast Taper High Performance 30 Meter	$229.50
DXE-40VA-1	40 or 30 Meter High Performance 1/4 Wave	$249.50
DXE-40VA-1TB	Foldover 24 ft. High Performance Freestanding, Low Profile	$179.95
DXE-40VE-1	Fast Taper, High Performance 40 Meter	$179.95
DXE-40VE-1TB	Foldover 40 Meter 1/4 Wave Freestanding, Heavy Duty ***SPECIAL***	$179.95
DXE-60VE-1P	Fast Taper High Performance 60 Meter	$229.50

Accessories

DXE-VRW-1	Manual Winch Add-on Raising Kit for 7580 and 8040	$169.99
DXE-8040-30AOK	30 Meter Add-on Kit for 8040VA-1	$129.95
DXE-7580-THK	CW Optimizer Capacity Hat Kit for 75/80 and 80/40 Antennas	$59.95
DXE-MBV-ATU-1	Multi-Band 43 ft. Vertical Automatic Tuner Add-on Kit	$399.00
DXE-UN-43-R	UNUN Complete Add-on Kit for 43 ft. Vertical Antennas	$129.95

We Have First Rate Products, Reliable Performance, & Great Prices—

NEW - UNSLIT TUBING— OR SLIT ONE END EXACT TELESCOPING SIZES!

6063-T832 Aluminum Tubing

- Smoothly telescoping sections
- Drawn - not extruded tubing
- Better than the other guys - guaranteed lowest price
- Custom made just for DX Engineering
- Use DXE Stainless Steel Element Clamps to assemble slit lengths

New!

.058" wall x 36" long

	DXE-AT#	Unslit	DXE-AT#	Slit one end
0.375" O.D.	1240	$1.45		NA
0.500" O.D.	1494	$2.05	1241	$3.75
0.625" O.D.	1495	$2.35	1242	$4.05
0.750" O.D.	1496	$2.65	1243	$4.35
0.875" O.D.	1497	$2.75	1244	$4.45
1.000" O.D.	1498	$2.95	1245	$4.65
1.125" O.D.	1499	$3.25	1246	$4.95
1.250" O.D.	1500	$4.15	1247	$5.85
1.375" O.D.	1501	$4.45	1248	$6.15
1.500" O.D.	1502	$5.25	1249	$6.95
1.625" O.D.	1503	$6.05	1250	$7.75
1.750" O.D.	1504	$6.85	1251	$8.55
1.875" O.D.	1505	$7.65	1252	$9.35
2.000" O.D.	1506	$8.45	1253	$10.15
2.125" O.D.	1507	$9.25	1254	$10.95

.058" wall x 72" long

0.375" O.D.	1189	$2.95		NA
0.500" O.D.	1480	$4.15	1205	$6.05
0.625" O.D.	1481	$4.75	1206	$6.65
0.750" O.D.	1482	$5.35	1207	$7.25
0.875" O.D.	1483	$5.65	1208	$7.55
1.000" O.D.	1484	$5.95	1209	$7.85
1.125" O.D.	1485	$6.55	1210	$8.45
1.250" O.D.	1486	$7.75	1211	$9.65
1.375" O.D.	1487	$8.45	1212	$10.35
1.500" O.D.	1488	$8.95	1213	$10.85
1.625" O.D.	1489	$9.75	1214	$11.65
1.750" O.D.	1490	$10.65	1215	$12.55
1.875" O.D.	1491	$11.55	1216	$13.45
2.000" O.D.	1492	$12.45	1217	$14.35
2.125" O.D.	1493	$13.35	1218	$15.25

Also available 6061-T8 .120 wall - 1.5" to 3" O.D.
Unslit for booms and HD element designs!

DXE-AT1311	6' x 1.5" O.D.	$23.85
DXE-AT1312	6' x 1.75" O.D.	$28.20
DXE-AT1313	6' x 2.0" O.D.	$33.00
DXE-AT1314	6' x 2.25"O.D.	$37.45
DXE-AT1315	6' x 2.5" O.D.,	$42.50
DXE-AT1316	6' x 2.75" O.D.	$46.95
DXE-AT1317	6' x 3.0" O.D.	$51.40
DXE-AT1325	12' x 3.0"O.D.	$103.95

See DXEngineering.com for specs and additional tubing.DX Engineering Has All-Stainless Steel Element Clamps That Fit Exact Tubing Sizes!

65 Ft. Telescoping Antenna Kit

- Eleven telescoping sections from 2" to 7/8" O.D.
- Stainless steel element clamps

DXE-ATK65	Telescoping Antenna Kit	$194.50
DXE-VE-BASE	Fixed Vertical Insulated Base Kit	$99.50
DXE-VA-BASE	HD Vertical Insulated Tilt Base Kit	$159.50

High Quality Performance Grade Cables

- Heat shrink weatherproofing/strain relief
- All assemblies Hi-Pot high voltage tested
- Silver/Teflon® crimped and soldered connectors

RG-213/U JSC-3780 Cable Assemblies with PL-259 Connectors

DXE-CBC-213JU003	3 ft.	$12.88
DXE-CBC-213JU006	6 ft.	$15.88
DXE-CBC-213JU012	12 ft.	$20.88
DXE-CBC-213JU025	25 ft.	$29.88
DXE-CBC-213JU050	50 ft.	$52.88
DXE-CBC-213JU075	75 ft.	$71.88
DXE-CBC-213JU100	100 ft.	$91.88
DXE-CBC-213JU125	125 ft.	$112.88
DXE-CBC-213JU150	150 ft.	$133.88

RG-8/U JSC-3030 Cable Assemblies with PL-259 Connectors

DXE-CBC-008JU002	2 ft.	$12.88
DXE-CBC-008JU003	3 ft.	$13.88
DXE-CBC-008JU006	6 ft.	$16.88
DXE-CBC-008JU012	12 ft.	$24.88
DXE-CBC-008JU025	25 ft.	$39.88
DXE-CBC-008JU050	50 ft.	$61.88
DXE-CBC-008JU075	75 ft.	$85.88
DXE-CBC-008JU100	100 ft.	$108.88
DXE-CBC-008JU125	125 ft.	$139.88

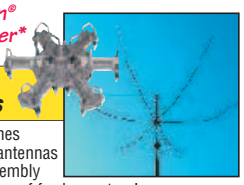
RG-8X JSC-3060 Cable Assemblies with PL-259 Connectors

DXE-CBC-8XJU002	2 ft.	$10.88
DXE-CBC-8XJU003	3 ft.	$11.88
DXE-CBC-8XJU006	6 ft.	$13.88
DXE-CBC-8XJU012	12 ft.	$16.88
DXE-CBC-8XJU025	25 ft.	$23.88
DXE-CBC-8XJU050	50 ft.	$32.88
DXE-CBC-8XJU075	75 ft.	$40.88
DXE-CBC-8XJU100	100 ft.	$47.88

FREE SHIPPING on $50.00 or more Coax order!

Custom Lengths Available—Contact Us
See DXEngineering.com for complete information!

*Complete 5-Band Kit with NEW Stainless/Teflon® Balanced RIGID Feeder**



MARK II Hexx 5-Band HF Beam Antenna Kits

- Low noise results—approaches performance of closed loop antennas
- Pre-slit fiberglass—easy assembly
- Patented, balanced weather-proof feeder system!
- Small 11 ft. turning radius, weighs less than 25 pounds
- Full gain on 20, 17, 15, 12, 10 meter bands
- Can be turned with a light duty rotor—save money
- Has full length elements—no lossy coils or traps
- Requires no matching network—direct single 50 Ω coax feed
- Good results at 20 to 30 feet above ground

New!

DXE-HEXX-1HBP	Hub and Hardware Package	$99.95
DXE-HEXX-1SCP-2	Spreader and Center Post Package	$199.95
DXE-HEXX-1WRP-2	1-Band Element & Wire Guide Package	$75.95
DXE-HEXX-5WRP-2	5-Band Element & Wire Guide Package	$149.95
DXE-HEXX-5FFP	5-Band Rigid Feeder* Package	$194.95
DXE-HEXX-1TAP-2	1-Band Total Antenna Package	$359.95
DXE-HEXX-5TAP-2	5-Band Total Antenna Package	$599.95

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Current Baluns and Feedline Current Chokes

- 5, 10 and 10 kW+ Baluns and Current Chokes
- High efficiency, low loss—W8JI design
- All standard ratios available

Starting at just $84.95 for FCC050-H05-A
See April 2009 QST Short Takes!

We Will Beat Any Competitor's Prices—Call Us For Details!

$50.00 or more COAX ORDER!

- 97% Bare Copper Braid Shield
- 66% Velocity Factor
- Polyethylene Dielectric .285" O.D.
- .405" O.D. Non-Contaminating Black Vinyl Jacket
- Center Conductor 13 AWG
  7 Strands of 21 AWG Bare Copper

All cable assemblies are built with silver plated (Teflon®) connectors, sealed with adhesive lined shrink tubing for a weather-resistant bond between the connector body and the coax and then 100% hi-pot high voltage tested to guarantee a quality brand name cable assembly you can count on.

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8 Circle Super Receiving Array!

New!

160-80-40 Meters
8 Switchable Directions

The latest version of DX Engineering's sophisticated receiving systems with time delay phasing. Use with your own eight identical antennas for monoband operation. Use DX Engineering's Active Receive verticals for easier installation.

- Directivity equal to phased Beverage antennas
- Switchable in eight 45 degree spaced directions
- Excellent directivity for better signal-to-noise ratio
- Includes 8 AVA Active Voltage Amplifiers with relay
- Much less area than an equivalent Beverage system
- Rugged stainless steel enclosure
- Described as "best performing" in ON4UN's Low Band Dxing
- See website for various package configurations

DXE-RCA8-SYS-2P	Controller and Switch Only	**$449.95**
DXE-RCA8-SYS-3P	Full Electronics Package	**$1,375.00**
ARR-8560	ARRL ON4UN's Low Band DXing, 5th Ed.	**$44.95**

Four Square Receiving Array!

100 kHZ - 30 MHz
4 Switchable Directions

A sophisticated receiving system with time delay phasing for broadband performance. Optimized to produce wider and deeper rear nulls and a narrower main lobe. Noise and undesirable signals are greatly reduced by a superior front-to-rear ratio (F/R). Better control of phase and currents provides a cleaner pattern than found on available TX four square arrays.

- Less susceptible to high angle signals compared to EWE, Flag, Pennant, and K9AY antennas
- Excellent directivity with better signal-to-noise ratio
- Switchable in four 90 degree-spaced directions
- Usable over a very wide frequency range with DXE-ARAV3 active elements
- Much less area than an equivalent Beverage system
- Active elements require minimal ground system
- Enhanced relay contact reliability
- Incudes 4 AVA Voltage Amplifiers with relay
- See website for various package configurations

DXE-RFS-SYS-2P	Controller and Switch only	**$389.95**
DXE-RFS-SYS-3P	160/80/40m Electronics	**$799.00**

Limited Time Offer—
FREE Shipping on Comtek Baluns!

COM-BAL-11130T

New!

COM-BAL-11130E

Better Performance,
Lower Prices—from just $49.95

COMTEK W2FMI Series Baluns

Design inspired by Jerry Sevick W2FMI and perfected by DX Engineering's balun R&D department.

- High voltage compensating capacitors for unequalled low SWR—a DX Engineering innovation!
- Large fender washers distribute fastener loading to prevent case deformation
- Special coated toroid core handles close coupling without extra stress
- High, consistent common mode impedance across specified bandwidth—provides isolation where most needed
- Special wire sizing and Teflon-insulated wire sleeves for exact impedance matching and better isolation than Thermaleze wire
- Typical insertion loss: less than 0.2 dB
- Power handling: 3 kW continuous to 5 kW+ intermittent depending on model
- Silver-plated gasketed SO-239 connectors, stainless hardware, weatherproof NEMA box

1:1 Dual Wire/Single Core, 1.8 to 54 MHz		
COM-BAL-11130E	3 kW, side eyebolts	**$49.95**
COM-BAL-11130ET	3 kW, side and top eyebolts	**$49.95**
COM-BAL-11130S	3 kW, side studs/wingnuts	**$49.95**
COM-BAL-11130T	3 kW, top studs/wingnuts	**$49.95**
1:1 Coax/Single Core		
COM-BAL-11150E	5 kW, side eyebolts	**$49.95**
COM-BAL-11150ET	5 kW, side and top eyebolts	**$49.95**
COM-BAL-11150S	5 kW, side studs/wingnuts	**$49.95**
COM-BAL-11150T	5 kW, top studs/wingnuts	**$49.95**
1:1 Dual Wire/Dual Core		
COM-BAL-11140T	5 kW, top studs/wingnuts	**$69.95**
COM-BAL-11140S	5 kW, side studs/wingnuts	**$69.95**
1:1 Coax/Dual Core		
COM-BAL-11150DS	5 kW, side studs/wingnuts	**$69.95**
COM-BAL-11150DT	5 kW, top studs/wingnuts	**$69.95**
4:1 Dual Wire/Single Core		
COM-BAL-41130E	3 kW, side eyebolts	**$59.95**
COM-BAL-41130ET	3 kW, side and top eyebolts	**$59.95**
COM-BAL-41130T	3 kW, top studs/wingnuts	**$59.95**
COM-BAL-41130S	3 kW, side studs/wingnuts	**$59.95**
4:1 Dual Wire/Dual Core		
COM-BAL-41150T	5 kW, top studs/wingnuts	**$89.95**
COM-BAL-41150S	5 kW, side studs/wingnuts	**$89.95**
COM-BAL-41150E	5 kW, side eyebolts	**$89.95**

Contact DX Engineering Customer Support for recommendations for your application.

ONE MAN TILT OVER

Thick, Laser Cut Stainless Steel Tilt Base

- Patented cam action allows you to easily raise or lower DX Engineering, Hustler, Hy-Gain, or Butternut for tuning, weather or CC&R accommodation.

DXE-TB-3P	For Hustler BTV verticals	**$62.50**
DXE-TB-4P	For DX Engineering 40VA-1, Butternut, most Hy-Gain 1/4-wave verticals	**$87.50**
DXE-TB-6P	For Hy-Gain 14AVQ	**$87.50**

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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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**except the special Elecraft K3 cable*

- Easiest installation and setup—Macintosh or PC
- Software CD ROM included
- Built-in low noise sound card
- USB port powered
- Works with ALL radios
- Supports all sound card digital and voice modes
- Requires radio interface cable

Green Heron Digital Rotor Controller

Replaces your existing rotor control system. Preprogrammed for Hy-Gain HAM series and T2X rotors. Solderless setup for other rotor types (with jumpers) and field programmable. Fully user-programmable including reversal and brake delay, maximum/minimum speed, limits, ramps, etc.

- RS-232 and USB interface for computer control
- Master/slave for stacked arrays—turn together or separately
- PWM variable speed control
- FREE Software for easy setup
- Precision heading accuracy up to 720° of travel
- Fully supports side-mounted antennas
- Offset control for multiple directions on one mast
- High visibility display with adjustable backlight

GHE-RT-21	Green Heron Rotor Controller	**$559.00**
HYG-HAM-IVRLC	HAM-IV rotor only	**$499.95**
HYG-T-2XRLC	T2X rotor only	**$599.95**

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We're #1

Our customers have always known we're #1. But did you know that LDG was the first company with a "no questions asked" two-year transferable warranty on ALL our products? LDG autotuners also have the highest resale value of any autotuner on the market. Our customers feel good about owning LDG products and so will you!

Call us or log-on today!

- ***RF Sensing***
- ***Tunes Automatically***
- ***No Interface Cables Needed***

NEW! AT-200ProII

The AT-200ProII 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 now includes LEDs for the antenna position and if the tuner is in bypass. A function key on the front panel allows you to access data such as mode and status. Includes six foot DC power cable. ***Suggested Price $259.99***

Z-11ProII

Meet the Z-11ProII, everything you always wanted in a small, portable tuner. Designed from the ground up for battery operation. Only 5" x 7.7" x 1.5", and weighing only 1.5 pounds, it handles 0.1 to 125 watts, making it ideal for both QRP and standard 100 watt transceivers from 160 - 6 meters. The Z-11ProII uses LDG's state-of-the-art processor-controlled Switched-L tuning network. It will match dipoles, verticals, inverted-Vs or virtually any coax-fed antenna. With an optional LDG balun, it will also match longwires or antennas fed with ladder-line. Includes six foot DC power cable.
Suggested Price $179.99

radio not included

Z-817

The ultimate autotuner for QRP radios including the Yaesu FT-817(D). Tuning is simple; one button push on the tuner is all that is needed - the Z-817 takes care of the rest. It will switch to PKT mode, transmit a carrier, tune the tuner, then restore the radio to the previous mode! 2000 memories cover 160 through 6 meters. The Z-817 will also function as a general purpose antenna tuner with other QRP radios. Just transmit a carrier and press the tune button on the tuner. Powered by four AA internal Alkaline batteries (not included), so there are no additional cables required.
Suggested Price $129.99.

We have a tuner that will work for you!

We make tuners that will work with any transceiver. Don't know which one is right for you? Give us a call or see the Tuner Comparison Chart on our web site for more selection help!

radio not included

AT-897Plus for the Yaesu FT-897

If you own a Yaesu FT-897 and want a broad range automatic antenna tuner, look no further! The AT-897Plus Autotuner mounts on the side of your FT-897 just like the original equipment and takes power directly from the CAT port of the FT-897 and provides a second CAT port on the back of the tuner so hooking up another CAT device couldn't be easier. ***Suggested Price$199.99***

AT-600Pro

The AT-600Pro handles up to 600 watts SSB and CW, 300 on RTTY (1.8 – 30 MHz), and 250 watts on 54 MHz. Matches virtually any kind of coax-fed antenna and will typically match a 10:1 SWR down to 1.5:1 in just a few seconds. You can also use it with longwires, random wires and antennas fed with ladder line just by adding a balun. Two antenna ports with a front-panel indicator, and separate memory banks for each antenna. LED bar-graph meters shows RF power, SWR and tuner status, tactile feedback control buttons and an LED bypass indicator. Operates from 11 – 16 volts DC at 750 mA. Includes six foot DC power cable.
Suggested Price $359.99

Z-100Plus

Small and simple to use, the Z-100Plus sports 2000 memories that store both frequency and tuning parameters. It will run on any voltage source from 7 to 18 volts; six AA batteries will run it for a year of normal use. Current draw while tuning is less than 100ma. The Z-100Plus now includes an internal frequency counter so the operating frequency is stored with tuning parameters to make memory tunes a blazingly fast 0.1 seconds; full tunes take an average of only 6 seconds. Includes six foot DC power cable.***Suggested Price $159.99***

LDG Electronics, Inc. 1445 Parran Road, St. Leonard, MD 20685 ***Phone 410-586-2177 • Fax 410-586-8475***

The #1 Line of Autotuners!

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

- ***RF Sensing***
- ***Tunes Automatically***
- ***No Interface Cables Needed***

AT-100ProII

This desktop tuner covers all frequencies from 1.8 – 54 MHz (including 6 meters), and will automatically match your antenna in no time. It features a two-position antenna switch with LEDs, allowing you to switch instantly between two antennas. The AT-100ProII requires just 1 watt for operation, but will handle up to 125 watts. Includes six foot DC power cable.
Suggested Price $229.99

AT-1000Pro

The AT-1000Pro has an Automode that automatically starts a tuning cycle when the SWR exceeds a limit you set. Operates at any power level between 5 and 1,000 watts peak. RF Relay protection software prevents tuning at greater than 125 watts. Tunes from 1.8 to 54.0 MHz (inc. 6 meters), with tuning time usually under 4 seconds, transmitting near a frequency with stored tuning parameters, under 0.2 seconds. 2000 memories. 2 Antenna connections. Includes six foot DC power cable.
Suggested Price $599

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

YT-450

LDG's newest tuner is specially designed for Yaesu's newest 100 watt radios. The YT-450 interfaces directly with the Yaesu FT-450 and FT-950 radios, making integration easier than ever. Simply connect the tuner to the radio with the customer supplied cables and you are ready to operate. DC power and all control is done through the interface cable. Just press the tune button on the tuner and the rest happens automatically: mode and power are set, a tune cycle runs and the radio is returned to its original settings. It will quickly match nearly any kind of coax fed antenna with an SWR of up to 10:1. 2000 memories recall settings in an instant! An extra CAT port on the back allows seamless connection to a PC. You have the newest radio, now get the newest tuner to go with it!
Suggested Price $249.99

KT-100

LDG's first dedicated autotuner for Kenwood Amateur transceivers. Easy to use - just right for an AT-300 compatible Kenwood transceiver (except TS-480HX). The KT-100 actually allows you to use the Tune button on the radio. The LEDs on the front panel indicate tuning status, and will show a match in seconds, or even less of you've tuned on or near that frequency before. Has 2,000 memories for instant recall of the tuning parameters for your favorite bands and frequencies. If you have an AT-300 compatible Kenwood radio, you can simply plug the KT-100 into your transceiver with the provided cable; the interface powers the tuner, and the Tune button on the radio begins a tuning cycle. The supplied interface cable makes the KT-100 a dedicated tuner for most modern Kenwood transceivers.
Suggested Price $199.99

YT-847

YT-847 Autotuner is an integrated tuner for the Yaesu FT-847. An included CAT/Power cable interfaces with your FT-847. Just press the tune button on the tuner and everything else happens automatically! The mode is set to carrier and the RF power is reduced, a tune cycle runs and the radio is returned to the original settings.
Suggested Price $249.99

Designed to handle the higher power of the Tokyo Hi Power HL-45B.

NEW! Z-817H

The ultimate autotuner for QRP radios including the Yaesu FT-817(D) with addition of the Tokyo High Power HL-45B. The Z-817H interfaces to the CAT port (ACC) on the back of the radio with the provided cable. Tuning could not be simpler; one button push on the tuner and the Z-817H takes care of the rest. Switch to PKT mode, transmit a carrier, tune the tuner, then restore the radio to the previous mode! The CAT thru port on the back allows connection to the THP HL-45B for automatic band selection on the amp. The Z-817H will also function as a general purpose antenna tuner with other QRP radios or QRP radios with up to 75 watt HF amps. Powered by four AA internal Alkaline batteries (not included), so there are no additional cables required. 2000 memories cover 160 through 6 meters. Latching relays, so power consumption is Zero when not tuning. ***Suggested Price $159.99***

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LDG

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.**

HAM-V

HAM-V $1099.95 with DCU-1

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

ROTATOR OPTIONS

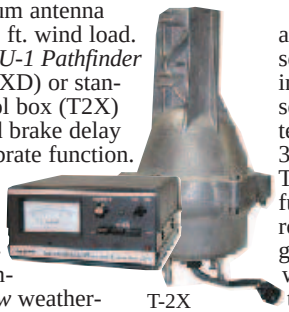
MSHD, $109.95. Heavy duty mast support for T2X, HAM-IV and HAM-V.
MSLD, $49.95. Light duty mast support for CD-45II and AR-40.
TSP-1, $34.95. Lower spacer plate for HAM-IV and HAM-V.

Digital Automatic Controller

DCU-1 $749.95

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

TAILTWISTER SERIES II



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

T-2X $799.95

T-2XD $1229.95 with DCU-1

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

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.**

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.

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.**

HDR-300A

HDR-300A $1499.95

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

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

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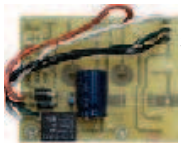
NEW! Automatic Rotator Brake Delay



RBD-5 $29.95

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

hy-gain®

Antennas, Rotators & Towers

308 Industrial Park Road,Starkville, MS 39759, USA

FT-270R FT-60R VX-8GR

FT-270R 2M FM HT

• TX: 144-148 • RX: 136-174 • Power: 5/2/0.5W
• Memories: 200 • Extra large LCD display & speaker

FT-60R 2M/440 FM HT

• TX: 144-148, 430-450 MHz • RX: 108-520, 700-999 MHz (cell blkd) • Power: 5/2/0.5W • Memories: 1000

VX-8GR 2M/440 FM HT w/Built-in GPS

• TX: 144-148, 430-450 MHz • RX: 108-999 MHz (cell blocked) • Memories: 1200+ • Power: 5/2.5/1/0.05W
• GPS unit and antenna is built-in for APRS® data

FT-2900R 2M FM Mobile

• TX: 144-148 MHz • RX: 136-174 MHz
• Power: 75/30/10/5W • Memories: 221

FTM-350AR 2M/440 FM Mobile

• TX: 144-148, 430-450 at 50/20/5W and 222-225 at 1W
• RX: 0.5-1.8, 76-250 & 300-1000 MHz (cell blocked)
• Memories: 500 + 500 • Optional internal GPS FGPS-1 or external FGPS-2 & CT-136 adds GPS and APRS® features
• Same as the older FTM-350R but includes a new suction cup bracket for the control head and new APRS® features with the installed V1.2 firmware

FT-817ND

HF/VHF/UHF All Mode Backpack QRP

• TX: HF/VHF/UHF • RX: 0.1-56, 76-154, 420-470 MHz
• Power: 0.7-5W (AM 1.5W) • Memories: 200
• Field operation with AA batteries or Ni-MH pack
• Works great with the Yaesu ATAS-25 portable antenna

FT-857D 100W HF/VHF/UHF Mobile

• TX: HF/VHF/UHF • RX: 0.1-56, 76-108, 118-164, 420-470 MHz • Power: 5-100W (HF/6M), 5-50W (2M), 5-20W (440 MHz) • Memories: 200 • YSK-857 included!

FT-897D 100W HF/VHF/UHF Portable

• Similar to the FT-857D but can also operate using optional FNB-78 13.2V @ 4.5 Ah NiMH battery packs

FT-950 HF/6M Transceiver

• TX: HF/6M • RX: 0.03-56 MHz • Power: 10-100W
• Memories: 100 • Auto Antenna Tuner
• 32-bit Floating Point DSP • Built-in high stability TCXO

FT-2000 HF/6M Transceiver

• TX: HF/6M • RX: 0.03-60 MHz • Power: 10-100W
• Memories: 99 • Auto Antenna Tuner • 32-bit Floating Point DSP • Dual In-Band Receive • Internal Power Supply
• Optional DMU-2000 Data Management Unit displays various operational conditions
• Optional MTU tune units for 160M, 80/40M and 30/20M bands allowing you to pull through weak signals

FT-2000D RF output is 200W, PS is external

FTDX-5000MP

FTDX-5000 Series – Covers HF and 6M;

Three different configurations all running 10-200W on CW, SSB, FM, RTTY & PKT and 5-50W on AM • RX: 0.03-60 MHz • Memories: 99 • The "D" and "MP" model comes with SM-5000 Station Monitor that features an excellent bandscope • The "MP" also comes with high stability ±0.05ppm OCXO & 300 Hz roofing filter

FTDX-5000 Basic Model & ±0.5ppm TCXO
FTDX-5000D With Station Monitor & ±0.5ppm TCXO
FTDX-5000MP With Station Monitor, ±0.05ppm OCXO & 300 Hz Roofing Filter

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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
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Family	$8	$16	$24	Reside at the same address as the primary member, no additional *QST*. Membership dates must correspond with primary member.

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Source Code: QST 6/2011

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, 430-450 MHz
- RX: 0.1-1300 MHz (cell blkd) • Dual band RX
- FM Wide/Narrow, AM, SSB and CW receive modes
- Power: 5/0.5/0.05W • Memories: 435

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

TH-D72A

2M/440 FM HT w/Built-in GPS

- TX: 144-148, 430-450 MHz
- RX: 118-174, 320-524 MHz
- Power: 5/0.5/0.05W
- Memories: 1000 • USB Port
- 1200/9600 bps packet TNC
- SkyCommand and APRS
- Stand-alone Digipeater
- Built-in High Performance GPS
- GPS logging - memory for up to 5,000 points of track data
- Echolink® ready
- KISS mode protocol
- Can function as an iGate (Internet Gateway)

TS-480HX 200W HF/6M Mobile

- 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 with auto antenna tuner.

TS-2000 100W HF/VHF/UHF Transceiver

- TX: HF/6M/2M/440 MHz • RX: 0.03-60, 142-152, 420-450 MHz • Power: 10-100W (10-50W on 440 MHz)
- Memories: 99 • HF/6M Auto Antenna Tuner
- IF/stage DSP on main band, AF/stage DSP on sub-band

TS-B2000 Same as the TS-2000 with no front panel controls. Includes PC control software.

TS-2000X The TS-2000 with 1.2 GHz @ 10W.

TS-590S 100W HF/6M Transceiver

- TX: HF/6M • RX: 0.03-60 MHz
- Power: 5-100W (5-25W on AM)
- Memories: 110 + 10 Quick Channels
- HF/6M Auto Antenna Tuner
- Full/semi break-in CW • 10 Hz Dual VFO Display
- USB connectivity for PC and remote control
- Down conversion receiver, narrow first roofing filter and dedicated first mixer, which gives it the best dynamic range in its class when handling unwanted adjacent off-frequency signals

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IC-V80/SPORT IC-80AD RX-7-05

IC-V80 2M FM Handheld

- TX: 144-148 MHz • RX: 136-174 MHz
- Power: 5.5/2.5/0.5W • Memories: 207
- Comes with NiMH Battery and Wall Charger

IC-V80 SPORT 2M FM Handheld

- No NiMH Battery and Charger • Has AA Battery Case

IC-80AD 2M/440 D-Star & FM HT

- TX: 144-148, 420-450 MHz
- RX: 0.495-999.990 MHz (cell blkd)
- Power: 5/2.5/0.5/0.1W • Improved User Interface
- Optional HM-189GPS Speaker Mic adds GPS capabilities

RX-7-05 Wideband Receiver

- RX: 150 kHz - 1300 MHz (cell blkd) • Memories: 1650
- AM, FM Narrow & Wide Mode • Scans 100 Channels per second • 1100mAh Lith-Ion Battery & Charger

ID-880H 2M/440 FM Analog & D-Star Digital Dual Bander Mobile

- TX: 144-148, 430-450 • RX: 118-173.995, 230-549.995, 810-999.99 MHz (cell blkd) • Power: 50/15/5W
- Memories: 1052 • D-Star Digital Ready

ID-1 1.2 GHz D-Star & FM Mobile

- TX: 1240-1300 MHz • RX: 1240-1300 MHz
- Power: 10/1W • Memories: 105
- D-Star 128 kbps Data & 4.8 kbps Voice

IC-7000 Multimode HF/VHF/UHF Mobile

- TX: HF/6M/2M/440 MHz • RX: 0.03-199, 400-470 MHz
- Power: 2-100W (HF/6M), 2-50W (2M), 2-35W (440)
- Memories: 503 • 41 band-widths with sharp or soft filter shape • RMK-7000 included!

IC-718 HF Transceiver

- TX: HF (except 60M) • RX: 0.03-30 MHz
- Power: 5-100W • Memories: 101 • DSP built-in
- SSB, CW, RTTY and AM (2-40W)

IC-7200 HF/6M Portable Transceiver

- TX: HF/6M • RX: 0.03-60 MHz • Power: 2-100W
- Memories: 201 • Rugged design for outdoor use
- 32-bit IF-DSPs + 24-bit AD/DA Converters
- USB Port for CI-V Format PC Control and Audio In/Out

IC-7410 HF/6M Transceiver

- TX: HF/6M • RX: 0.03-60 MHz • Power: 2-100W
- 15kHz 1st IF Filter and optional 3kHz & 6kHz filters to protect against strong unwanted adjacent signals
- Much faster DSP unit compared to the IC-746PRO
- Automatic antenna tuner • USB connector for PC control

IC-7600 HF/6M Transceiver

- TX: HF/6M • RX: 0.03-60 MHz • Power: 2-100W
- Memories: 101 • 5.8 inch color screen
- High-resolution real time spectrum scope using a dedicated DSP unit • Automatic antenna tuner

IC-7700 Multimode HF/6M Transceiver

- TX: HF/6M • RX: 0.03-60 MHz • Power: 5-200W
- Memories: 101 • 7 inch color screen
- Two 32-bit floating DSPs • Power supply built-in
- Three roofing filters • External VGA connector
- Automatic antenna tuner • USB memory drive socket
- Real time spectrum scope

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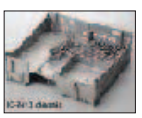
It's that time again—get your antennas, coax, generators and headsets out for one of the most fun weekends of the year. Break through field day pile-ups with the latest in Icom's HF technology, the IC-7410. A high grade DSP unit and double conversion super-heterodyne system developed for our higher grade IC-7800/7700/7600 series are used. In addition, the IC-7410 comes with a built-in 15kHz 1st IF Filter and can accept up to two optional filters (3kHz/6kHz). This is the all-mode rig of choice for hopping through the bands for any field day enthusiast.

Features:

Double Conversion Superheterodyne System
Built-in 15kHz 1st IF Filter (Optional 3kHz/6kHz)
±0.5ppm Frequency Stability
Large Monochrome LCD Display
Built-in Automatic Antenna Tuner
Optional RS-BA1 for IP Remote Control

AD/DA Converter
ADC Signal (Noise+Distortion): 100dB
ADC Dynamic Range, S/N: 113dB
DAC Signal (Noise+Distortion): 97dB
DAC Dynamic Range, S/N: 115dB

DSP Unit
ADSP-21369
Internal Clock Speed: 333MHz
32-bit Floating Point DSP
Max. Performance: 2000MFLOPS



Large Heat Sink
Even during long hours of heavy duty use, the IC-7410 provides stable output power.

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Control Audio

USB Connector for PC Control
A standard type B USB connector is located on the back panel. Use it to control your IC-7410 via PC.

For the love of ham radio.

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MFJ-259B *World's* most popular Antenna Analyzer is super easy-to-use!

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The MFJ-259B is the world's most popular Antenna Analyzer and the easiest to use! Just select a band and mode. Set frequency. Your measurements are instantly displayed!

Handheld Antenna Lab

Owning the MFJ-259B is like having an entire antenna lab in the palm of your hand!

Measure SWR quickly or make sophisticated measurements such as Return Loss, Reflection Coefficient, Resonance, Complex Impedance (R+jX), Impedance Magnitude (Z) plus Phase in degrees. Covers 1.8 to 170 MHz -- no gaps.

Coax Analyzer

Determine coax cable velocity factor (Vf), loss in dB, coax length, distance to open or short plus detect wrong coax impedance.

Frequency Counter

Measure frequency of external signals using the separate BNC counter input.

Signal Generator

Use as a signal source 1.8-170 MHz with digital dial accuracy for testing and alignment.

Inductance and Capacitance

Measure Inductance (uH) and Capacitance (pF) at RF frequencies not at audio frequencies used by most L/C meters.

Digital and *Analog* Meters

A high-contrast backlit LCD gives precision readings and *two* side-by-side *analog meters* make antenna adjustments intuitive.

Smooth, Stable Tuning

Velvet-smooth reduction drive tuning and precision *air-variable capacitor* makes setting frequency easy and stable.

Battery Saver & More

Battery-saver, low-battery warning, battery voltage meter and charger are all built in. Use ten Alkaline, NiCad or NiMH AA batteries (not included) or 110 VAC with MFJ-1312D, $15.95. 4Wx6¾Hx2D inches.

Here's What You Can Do

Find true antenna resonant frequency
Tune *antenna quickly for minimum SWR*
Match complex loads to your feedline
Adjust *mobile whips without stressing finals*
Determine safe 2:1-SWR operating windows
Adjust *tuners without generating QRM*
Find exact location of shorts and opens
Cut *stubs and phasing lines accurately*
Check cable for loss and contamination
Find *value of unknown coils and caps*
Test RF transformers and baluns
Troubleshoot *filters and networks*
Find self-resonance and relative Q
Check *patterns and compare gain*
MFJ-259B does all this and more!

MFJ Analyzer Accessories

MFJ-29C, $24.95. Tote your MFJ-259B anywhere with this *genuine* MFJ custom carrying case. Special foam-filled fabric cushions blows, deflects scrapes and protects knobs and meters from harm. **MFJ-39C, $24.95.** Like MFJ-29C, but for MFJ-269.

MFJ-66, $24.95. Plug-in coils turns any MFJ Antenna Analyzer into a sensitive and accurate *band switched* dip meter. 2 coils.

MFJ-92AA10, $29.95. Ten MFJ *SuperCell*™ Ni-MH AA rechargeable batteries.

MFJ-99B, $88.90. ***Save $7!*** MFJ-259B Deluxe Accessory Pack: MFJ-29C Pouch, 10 Ni-MH batteries, dip coils, AC adapter. **MFJ-98B, $88.90.** Like MFJ-99B but for MFJ-269.

MFJ-99, $60.85. ***Save $5!*** Like MFJ-99B, less batteries, for MFJ-259B. **MFJ-98, $60.85.** Like MFJ-99 but for MFJ-269.

MFJ-99C, $40.90. ***Save $5!*** AC Adapter and 10 Ni-MH batteries for MFJ-259B/269.

MFJ-917, $29.95. Current balun lets you make balanced line antenna measurements on HF with your MFJ Analyzer. **MFJ-7702, $3.95.** MFJ-917 to MFJ Analyzer adapter.

MFJ-731, $99.95. Tunable RF filter allows accurate Antenna Analyzer measurements in presence of strong RF fields. 1.8-30 MHz.

MFJ-5510, $9.95. Cigarette lighter cord.

MFJ-269 ...1.8-170 MHz and 415-470 MHz plus 12-bit A/D!

The MFJ-269 does everything the MFJ-259B does - and much more!

Expanded Frequency Coverage

MFJ-269 adds UHF coverage from 415 to 470 MHz -- right up into the commercial band. With it, you can adjust UHF dipoles, verticals, Yagis, quads and repeater collinear arrays with ease -- plus construct accurate phasing harnesses and timed cables. Also use it as a signal source to check UHF duplexers, diplexers, IMD filters and antenna patterns.

Much Better Accuracy

New *12-bit* A/D converter gives much better accuracy and resolution than common 8-bit A/D converters -- *an MFJ-269 exclusive!*

Complex Impedance Analyzer

Read Complex Impedance (1.8 to 170 MHz)as series equivalent resistance and reactance (Rs+jXs) or as magnitude (Z) and phase (degrees). Also reads *parallel* equivalent resistance and reactance (Rp+jXp) -- *an MFJ-269 exclusive!*

MFJ-269
$389.95

CoxCalculator™

Lets you calculate coax line length in feet given electrical degrees and vice versa for any frequency and any velocity factor -- *an MFJ-269 exclusive!*

Use any Characteristic Impedance

You can measure SWR and coax loss with *any* characteristic impedance (1.8 to 170 MHz) from 10 to over 600 Ohms, including 50, 51, 52, 53, 73, 75, 93, 95, 300, 450 Ohms -- *an MFJ-269 exclusive!*

Logarithmic Bar Graph

Has easy-to-read LCD *logarithmic* SWR bargraph and SWR meter for quick tuning.

Uses instrumentation grade N-connector to ensure minimum mismatch on all frequencies. Includes N to SO-239 adapter.

MFJ-269*PRO*™ *Analyzer*

Like MFJ-269, but has extended commercial frequency coverage in UHF range ***(430 to 520 MHz)*** and *ruggedized* cabinet that protects LCD display, knobs, meters and connectors from damage in the field/lab.

MFJ-269PRO
$419.95

MFJ-266 ...Wide range 1.5-185 MHz and 300-490 MHz!

New!

MFJ-266
$349.95

The compact MFJ-266 covers HF (1.5-65 MHz) in 6 bands, plus VHF (85-185 MHz) and UHF (300-490 MHz).

In *Antenna Analyzer* mode, you get Frequency, SWR, Complex Impedance (R+jX), and Impedance Magnitude (Z) *all displayed simultaneously* on a high-contrast backlighted LCD (SWR only on UHF).

In *Frequency-Counter* mode, the MFJ-266 functions as a 500-MHz counter with up to 100 Hz resolution and measures relative field strength of a signal and its frequency and can be used for tracking measurement interference.

MFJ-266 also functions as a 10 dBm signal source with digital-frequency readout. It can also measure inductance and capacitance at RF frequencies.

Features include solid-state band switching and electronic varicap tuning with a smooth 10:1 lockable vernier tuning drive.

Use eight AA *alkaline* batteries or 110 VAC with MFJ-1312D, $15.95. Includes N-to-SO-239 adapter. 3¾Wx6½Hx2¾D inches. 1.3 lbs.

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

MFJ ENTERPRISES, INC.
300 Industrial Pk Rd, Starkville, MS 39759 **PH:** (662) 323-5869
Tech Help: (662) 323-0549
FAX:(662)323-6551 8-4:30 CST, Mon.-Fri. ***Add shipping.***

MFJ . . . The World Leader in Amateur Radio!

MFJ TUNERS

New, Improved MFJ-989D 1500 Watt *legal limit* Antenna Tuner

World's most popular 1500 Watt Legal Limit Tuner just got better -- much better -- gives you more for your money!

New, improved MFJ-989D *legal limit* antenna tuner gives you better efficiency, lower losses and a new *true* peak reading meter. It easily handles *full* 1500 Watts SSB/CW, 1.8 to 30 MHz, including MARS/WARC bands.

New dual 500 pF *air variable capacitors* give you twice the capacitance for more efficient operation on 160 and 80 Meters.

New, improved *AirCore*™ *Roller Inductor* gives you lower losses, higher Q and handles more power more efficiently.

New *TrueActive*™ peak reading Cross-Needle *SWR/Wattmeter* lets you read *true* peak power on all modes.

MFJ-989D $389.95

New high voltage *current balun* lets you tune balanced lines at high power with no worries.

New *crank knob* lets you reset your roller inductor quickly, smoothly and accurately.

New larger 2-inch diameter *capacitor knobs* with easy-to-see dials make tuning much easier.

New cabinet maintains components' high-Q. Generous air vents keep components cool. $12^{7}/_{8}$Wx6Hx$11^{5}/_{8}$D inches.

Includes six position ceramic antenna switch, 50 Ohm dummy load, indestructible multi-color Lexan front panel with detailed logging scales and legends.

The MFJ-989D uses the superb time-tested T-Network. It has the widest matching range and is the easiest to use of all matching networks. Now with MFJ's new 500 pF air variable capacitors and new low loss roller inductor, it easily handles higher power much more efficiently.

***No Matter What*™ Warranty**

Every MFJ tuner is protected by MFJ's famous one year *No Matter What*™ limited warranty. We will repair or replace your MFJ tuner (at our option) for a full year.

More hams use MFJ tuners than all other tuners in the world!

MFJ-986 Two knob ***Differential-T***™

MFJ-986 $349.95

Two knob tuning (differential capacitor and *AirCore*™ roller inductor) makes tuning foolproof and easier than ever. Gives minimum SWR at only one setting. Handles 3 KW PEP SSB amplifier input power (1.5 KW output). Gear-driven turns counter, lighted peak/average Cross-Needle SWR/Wattmeter, antenna switch, balun. 1.8 to 30 MHz. $10^{3}/_{4}$Wx$4^{1}/_{2}$Hx15 in.

MFJ-962D ***compact*** kW Tuner

MFJ-962D $299.95

A few more dollars steps you up to a KW tuner for an amp later. Handles 1.5 KW PEP SSB amplifier input power (800W output). Ideal for Ameritron's AL-811H! *AirCore*™ roller inductor, gear-driven turns counter, pk/avg lighted Cross-Needle SWR/Wattmeter, antenna switch, balun, Lexan front, 1.8-30MHz. $10^{3}/_{4}$x$4^{1}/_{2}$x$10^{7}/_{8}$ in.

MFJ-969 300W ***Roller Inductor*** Tuner

MFJ-969 $219.95

Superb *AirCore*™ Roller Inductor tuning. Covers *6 Meters* thru 160 Meters! 300 Watts PEP SSB. *Active* true peak reading lighted Cross-Needle SWR Wattmeter, *QRM-Free PreTune*™, antenna switch, dummy load, 4:1 balun, Lexan front panel. $3^{1}/_{2}$Hx$10^{1}/_{2}$Wx$9^{1}/_{2}$D inches.

MFJ-949E ***deluxe*** 300 Watt Tuner

MFJ-949E $179.95

More *hams use MFJ-949s than any other antenna tuner in the world!* Handles 300 Watts. Full 1.8 to 30 MHz coverage, custom inductor switch, 1000 Volt tuning capacitors, *full size* peak/average lighted Cross-Needle SWR/Wattmeter, 8 position antenna switch, dummy load, *QRM-Free PreTune*™, scratch proof Lexan front panel. $3^{1}/_{2}$Hx$10^{5}/_{8}$Wx7D inches. **MFJ-948, $139.95.** Economy version of MFJ-949E, less dummy load, Lexan front panel.

MFJ-941E ***super value*** Tuner

MFJ-941E $139.95

The *most for your money!* Handles 300 Watts PEP, covers 1.8-30 MHz, *lighted* Cross-Needle SWR/Wattmeter, 8 position antenna switch, 4:1 balun, 1000 volt capacitors, Lexan front panel. Sleek $10^{1}/_{2}$Wx$2^{1}/_{2}$Hx7D in.

MFJ-945E HF/6M ***mobile*** Tuner

MFJ-945E $129.95

Extends your mobile antenna bandwidth so you don't have to stop, go outside and adjust your antenna. Tiny 8x2x6 in. *Lighted* Cross-Needle SWR/Wattmeter. Lamp and bypass switches. Covers 1.8-30 MHz *and* 6 Meters. 300 Watts PEP. **MFJ-20, $6.95,** mobile mount.

MFJ-971 ***portable/QRP*** Tuner

MFJ-971 $119.95

Tunes coax, balanced lines, random wire 1.8-30 MHz. Cross-Needle Meter. SWR, 30/300 or 6 Watt QRP ranges. Matches popular MFJ transceivers. Tiny 6x$6^{1}/_{2}$x$2^{1}/_{2}$ in.

MFJ-901B ***smallest*** Versa Tuner

MFJ-901B $99.95

MFJ's smallest (5x2x6 in.) and most affordable wide range 200 Watt PEP Versa tuner. Covers 1.8 to 30 MHz. Great for matching solid state rigs to linear amps.

MFJ-902 ***Tiny Travel*** Tuner

MFJ-902 $99.95

Tiny $4^{1}/_{2}$x$2^{1}/_{4}$x3 inches, full 150 Watts, 80-10 Meters, has tuner bypass switch, for coax/random wire.

MFJ-904H, $149.95. Same but adds Cross-needle SWR/Wattmeter and 4:1 balun for balanced lines. $7^{1}/_{4}$x$2^{1}/_{4}$x$2^{3}/_{4}$ inches.

MFJ-16010 ***random wire*** Tuner

MFJ-16010 $69.95

Operate all bands anywhere with MFJ's reversible L-network. Turns random wire into powerful transmitting antenna. 1.8-30 MHz. 200 Watts PEP. Tiny 2x3x4 in.

MFJ-906/903 ***6 Meter*** Tuners

MFJ-906 $99.95

MFJ-906 has lighted Cross-Needle SWR/Wattmeter, bypass switch. Handles 100 W FM, 200W SSB. **MFJ-903, $69.95**, Like MFJ-906, less SWR/Wattmeter, bypass switch.

MFJ-921/924 ***VHF/UHF*** Tuners

MFJ-921/924 $89.95

MFJ-921 covers 2 Meters/220 MHz. **MFJ-924** covers 440 MHz. SWR/Wattmeter. 8x$2^{1}/_{2}$x3 in.

MFJ-931 ***artificial*** RF Ground

MFJ-931 $109.95

Eliminates RF hot spots, RF feedback, TVI/RFI, weak signals caused by poor RF grounding. Creates artificial RF ground or electrically places far away RF ground directly at rig. **MFJ-934, $209.95**, Artificial ground/300 Watt Tuner/Cross-Needle SWR/Wattmeter.

Dealer/Catalog/Manuals

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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

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.

MFJ-1778 $44.95

200W...Weather-sealed

for Remote/Outdoor/Marine

Fully *weather-sealed for remote Outdoor/Marine use*! Tough, durable, built-to-last the elements for years.

MFJ-926B $399.95

200 Watt...Remote

Coax/Wire Ant, No pwr cable needed

Weather protected fully automatic *remote* auto tuner for wire ***and*** *coax* antennas -- an MFJ exclusive. Powers through coax -- No separate power cable needed.

MFJ-927 $259.95

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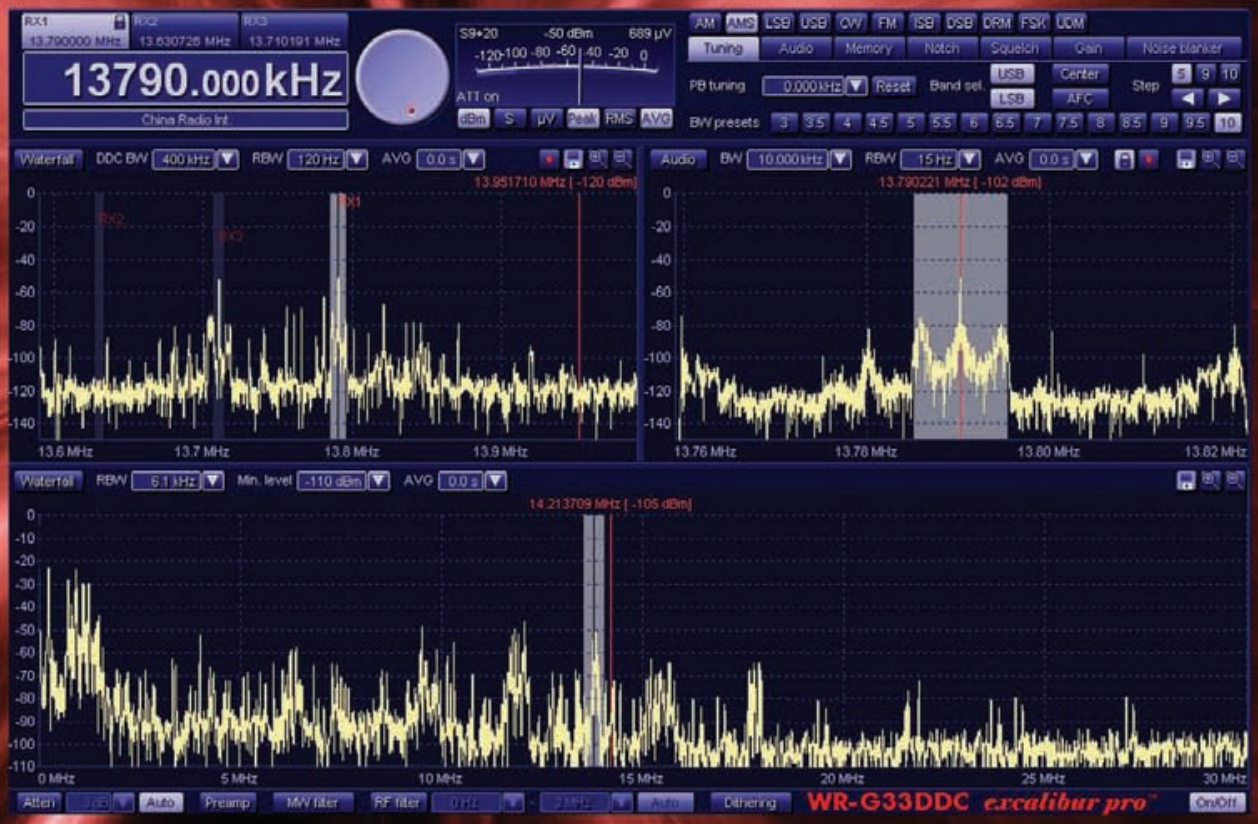
The blade just got sharper
with EXCALIBUR Pro™



- 9 kHz to 49.995 MHz frequency range
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- 16-bit 100 MSPS A/D converter
- 50 MHz-wide, real-time spectrum analyzer
- 4 MHz recording and processing bandwidth
- Three parallel demodulator channels
- Waterfall display functions
- Audio spectrum analyzer
- Audio and IF recording and playback
- Recording with pre-buffering
- EIBI, HFCC and user frequency databases
- Very high IP3 (+31 dBm)
- Excellent sensitivity (0.20 µV SSB)
- Excellent dynamic range (107 dB)
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- Affordable, easy to install and use

Just when you thought the bar was raised high enough with our award-winning Excalibur receiver, here comes a serious competitor - the Excalibur Pro. With its unparalleled 4 MHz processing and recording bandwidth, laboratory-grade measurement facilities and many other new features, this is a receiver that will surely be making waves - not just receiving them! For more details, see:

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WiNRADiO® by RADIXON®: Great receivers ahead of their time.℠

MFJ All-Band G5RV Antennas

Operate all bands through 10 Meters, even 160 Meters, with a single wire antenna!

MFJ-1778
$44.95

***The** famous G5RV antenna is the most popular ham radio antenna in the world!* You hear strong signals from G5RVs day and night, 24/7.

And it's no wonder . . . it's an efficient, *all band* antenna that's only 102 feet long -- shorter than an 80 Meter dipole. Has 32.5 foot ladder line matching section ending in SO-239 connector for your coax feedline.

Use as Inverted Vee or Sloper, and it's even more compact and needs just one support.

With an antenna tuner, you can operate all bands 80 Meters through 10 Meters and even 160 Meters with an antenna tuner and a ground.

MFJ's fully assembled G5RV handles 1500 Watts. *Hang and Play™* -- add coax, some rope to hang and you're on the air!

MFJ-1778M, $39.95. *Half-size*, 52 foot *G5RV JUNIOR* covers 40-10 Meters with tuner. Handles full 1500 Watts.

MFJ All Band Doublet

MFJ-1777 is a 102 foot *all band* doublet antenna that covers 160 through 6 Meters with a balanced line tuner. Super strong custom fiberglass center insulator provides stress relief for ladder line (100 ft. included). Authentic *glazed ceramic* end insulators. Handles full 1500 Watts.

MFJ-1777
$59.95

MFJ *Dual Band* 80/40 *or* 40/20M Dipoles

MFJ-17758
$89.95
80/40 Meters

MFJ-17758 is a short 85 foot long *dual band* 80/40 Meter dipole antenna. It's *full-size* on 40 Meters and has ultra-efficient end-loading on 80 Meters. Handles full 1500 Watts. Super-strong injection-molded center insulator with built-in SO-239 connector and hang hole. Solderless, crimped construction. 7-strand, #14 gauge hard copper wire. Connect your coax feedline directly, no tuner needed.

MFJ-17754, $59.95. Short coax fed 42 foot long *dual band* 40/20 Meter dipole antenna. *Full-size* on 20 Meters, ultra-efficient end-loading on 40 Meters. Same construction as MFJ-17758.

MFJ *Single Band* Dipole Antennas

Ultra high quality center fed dipoles will give you trouble-free operation for years. Custom injection-molded UV-resistant center insulator has built-in coax connector and hanging hole. Heavy duty 7-strand, 14-gauge hard copper antenna wire. Extremely strong solderless crimped construction. Authentic *glazed ceramic* end insulators. Use as horizontal or sloping dipole or inverted vee. Handles full 1500 Watts. Simply cut to length for your favorite frequency with cutting chart provided.

MFJ-1779A
$69.95
160M, 265 ft.

MFJ-1779B
$49.95
80-40M, 135 ft.

MFJ-1779C
$29.95
20-6M, 35 ft.

True 1:1 Current *Balun & Center Insulator*

MFJ-918
$24.95

True *1:1 Current Balun/ Center Insulator* forces equal antenna currents in dipoles for superior performance. Reduces coax feedline radiation and field pattern distortion -- your signal goes where *you* want it. Reduces TVI, RFI and RF hot spots in your shack. *Don't build a dipole without one!* 50 hi-permeability ferrite beads on high quality RG-303 *Teflon*® coax and *Teflon*® coax connector. Handles full 1.5kW 1.8-30 MHz. Stainless steel hardware with *direct* 14 gauge stranded copper wire connection to antenna. 5x2 inches. Heavy duty weather housing.

RF Isolator

MFJ-915
$29.95

MFJ-915 *RF Isolator* prevents unwanted RF from traveling on the outside of your coax shield into your transceiver. This unwanted stray RF can cause painful RF "bites" when you touch your microphone or volume control, cause your display or settings to go crazy, lock up your transceiver or turn off your power supply. In mobile installations, stray RF could cause your car to do funny things even blow your car computer. Clear up these problems, plug an MFJ-915 between your antenna and transceiver. 5x2 in. Handles full 1500 Watts. Covers 1.8-30 MHz.

MFJ-919, $59.95. 4:1 current balun,1.5 kW.

MFJ-913, $29.95. 4:1 balun, 300 Watts.

Antenna Switches

MFJ-1704
$79.95
4-Positions

MFJ-1704 heavy duty *antenna switch* lets you select 4 antennas or ground them for static and lightning protection. Unused antennas automatically grounded. Replaceable lightning surge protection. Good to 500 MHz. 60 dB isolation at 30 MHz. 2.5 kW PEP. Less than .2 dB insertion loss, SWR below 1.2:1. SO-239 connectors. Handy mounting holes. 6¼Wx4¼Hx1¼D in.

MFJ-1702C
$39.95
2-Positions

MFJ-1702C Like MFJ-1704, but for 2 antennas. 3Wx2Hx2D"

MFJ-1700C
$99.95

MFJ-1700C *Antenna/ Transceiver Switch* lets you select one of six antennas and one of six transceivers in any combination. Plug in an antenna tuner or SWR wattmeter and it's always in-line for any antenna/transceiver combination. Has lightning surge protection. Handles 2 kW PEP SSB, 1 kW CW, 50-75 Ohm loads. Unused terminals are automatically grounded. 1.8 to 30 MHz. SO-239 connectors. 4¾W6½Hx3D inches.

MFJ-1701
$69.95

MFJ-1701 *Antenna Switch* like MFJ-1700C but lets you select one of six antennas only. 10Wx3Hx1½D inches.

33 ft. Telescoping fiberglass Mast

3.8 feet collapsed, 3.3 lbs.

MFJ-1910
$79.95

Super strong fiberglass mast has huge 1¾ inch bottom section. Flexes to resist breaking. Resists UV. Put up *full size* inverted Vee dipole/vertical antenna in minutes and get *full size performance!*

Make your own antennas

Dipoles, G5RV, Random Wire, Doublets, Beverage Antennas, etc.

MFJ-16C06, $4.56. 6-pack authentic *glazed ceramic* end/center antenna insulators.

MFJ-16B01, $19.95. Custom injection-molded UV-resistant center insulator has built-in coax connector and hanging hole.

MFJ-18G100, $24.95. 100 ft. of flexible, 7-strand, 14-gauge solid copper antenna wire.

MFJ-58100X, $49.95. 100 ft. 50-Ohm RG-8X with PL-259s on each end.

MFJ-18H100, $34.95. 100 feet, 450 Ohm ladder line, 18 gauge copper covered steel.

Lightning Surge Protectors

Ultra-fast gas discharge tube shunts 5000 amps peak. Less than 0.1 dB loss. Up to 1000 MHz. SO-239s. **MFJ-270, $29.95.** 400W PEP. **MFJ-272, $39.95.** 1500W PEP.

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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-464 $199.95 *(Keyboard, paddle not included.)*

MFJ-551, $39.95. RFI suppressed keyboard, a must to avoid RFI problems.

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.

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/dashes, jam- proof spacing, sidetone, built-in speaker, type A /B keying. RF proof. Solid state keying. 7x2x6 inches.

MFJ-407D $79.95

MFJ-401D, $69.95. Econo Keyer II has front-panel volume/speed controls (8-50 wpm), tune switch. Internal adjust weight, tone. Solid state keying. Tiny 4x2x3½ inches.

Keyer/Paddle Combo

MFJ-422D $189.95

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.

MFJ-422DX, $99.95.

MFJ *Curtis*™ Keyer only, fits on your Bencher paddle or MFJ-564 (chrome) or MFJ-564B (black) paddles above.

MFJ*Pocket* Morse Tutor

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.

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MFJ . . . the world leader in ham radio accessories!

MFJ *Switching* Power Supplies

Power your HF transceiver, 2 meter/440 MHz mobile/base and accessories with these highly reliable 15, 22, 30, 40 or 75 Amp MFJ Switching Power Supplies!

No RF hash . . . Super lightweight . . . Super small . . . Volt/Amp Meters . . .

MFJ's adjustable voltage switching power supplies do it all! Power your HF or 2M/440 MHz radio and accessories.

MFJ's *MightyLites*™ are so light and small you can carry them with one hand! Take them with you anywhere.

No more picking up and hauling around heavy, bulky supplies that can give you a painful backache, pulled muscle or hernia.

These babies are clean . . . Your buddies won't hear *any* RF hash on your signal! *None* in your receiver either! These super clean *MightyLites*™ meet all FCC Class B regulations.

Less than 35 mV peak-to-peak ripple under 25 or 45 amp full load. Load regulation is better than 1.5% under full load.

You won't burn up our power supplies! MFJ Power supplies are *fully protected* with Over Voltage, Over-temperature and Over Current protection circuits.

MFJ *MightyLites*™ can be used anywhere in the world! They have switchable AC input voltage and work from 85 to 135 VAC or 170 to 260 VAC. Replaceable fuse.

A whisper quiet internal fan efficiently cools your power supply for long life.

22 Amp Continuous

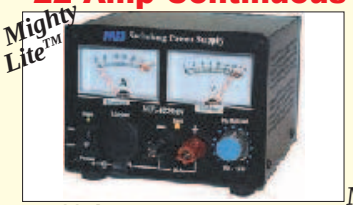
Ham Radio's smallest and lightest 22 Amp continuous power supply is also its best selling!

MFJ-4125 **$84.95**

22 Amps continuous/25 Amps max at 13.8VDC. 5-way binding posts on front, 5A quick connects on back. 85-135/170-260 VAC input. 2.9 lbs. 5¾Wx3Hx5¾D".

MFJ-4125P, $94.95. Adds 2-pairs *Anderson PowerPoles*™.

22 Amp Continuous



22 Amps continuous, 25 Amps maximum. Like MFJ-4125 but adds Volt/Amp meters, cigarette lighter plug. Adjustable 9-15 VDC Output. 5¼Wx 4½Hx6D in. Weighs 3.7 lbs. Use 85-135 VAC or 170-260 VAC input. Replaceable fuse.

MFJ-4225MV **$99.95**

40 Amp Continuous

40 Amps continuous, 45 Amps max. Adjustable 9-15 VDC output. Volt/Amp meters, cigarette lighter plug, front 5-way binding posts, two rear quick connects. 5.5 lbs. 7½Wx 4¾Hx9D inches. Use 85-135 VAC or 170-260 VAC input. Replaceable fuse.

MFJ-4245MV **$149.95**

70 Amp Continuous

75 Amps maximum and 70 Amps continuously. Adjustable voltage 4.0-16 VDC. Short circuit, overload and over-temperature protection, 10.5 lbs. 9¾Wx5½Hx9½D". Great for Ameritron's ALS-500M mobile amplifier!

MFJ-4275MV **$249.95**

High Current Multiple DC Power Outlets

Power multiple Transceivers/accessories from a single DC power supply . . . Keeps you neat, organized and safe . . .Prevents fire hazard . . . Keeps wires from tangling up and shorting . . . Fused and RF bypassed . . . 6 foot, 8 gauge color coded cable . . .

Versatile 5-Way Binding Posts

MFJ-1118, $84.95. Power two HF and/or VHF rigs and six accessories from your main 12 VDC supply. *Built-in 0-25 VDC voltmeter*. Two pairs 35 amp 5-way binding posts, fused and RF bypassed for transceivers. Six pairs RF bypassed binding posts provide 15 Amps for accessories. Master fuse, ON/OFF switch,"ON" LED. 12½x2¾x2½ in.

MFJ-1118 **$84.95**

MFJ-1116, $59.95. 8 pairs binding posts, 15A total.Voltmeter, on/off switch.

MFJ-1116 **$59.95**

MFJ-1112, $44.95. 6 pairs binding posts, 15 Amps total.

MFJ-1112 **$44.95**

MFJ-1117, $64.95. Powers *four* transceivers simultaneously (two at 35 Amps each and two at 35 Amps combined). 8x2x3 inches.

MFJ-1117 **$64.95**

All PowerPoles™

MFJ-1128, $104.95. 3 high-current outlets for transceivers. 9 *switched* outlets for accessories. Mix & match included fuses as needed (one-40A, one-25A, four-10A, four-5A, three-1A fuses installed). 0-25 VDC *Voltmeter*. Extra contacts, fuses. 12Wx1¼Hx2¾D".

MFJ-1128 **$104.95**

MFJ-1126, $84.95. 8 outlets, each fused, 40 Amps total. Factory installed fuses: two 1A, three 5A, two 10A, one 25A, one 40A. *0-25 VDC Voltmeter*. Includes *extra PowerPoles®, extra* fuses -- *no extra cost*. 9Wx1¼Hx2¾ inches.

MFJ-1126 **$84.95**

PowerPoles™ AND 5-Way Binding Posts

MFJ-1129, $114.95. 10 outlets each fused, 40 Amp total. 3 high-current outlets for rigs -- 2 *PowerPoles®* and one 5-way binding post. 7 *switched* outlets for accessories (20A max) -- 5 *PowerPoles®* and 2 binding posts. Fuses include (1- 40A, 2-25A, 3-10A, 3-5A, 2-1A installed). *0-25 VDC Voltmeter*. Includes extra *PowerPoles®* and fuses, 12½Wx1¼Hx2¾D inches.

MFJ-1129 **$114.95**

MFJ-1124, $64.95. 6 outlets each fused, 40 Amps total. 4 *PowerPoles®*, 2 high-current binding posts, Installed fuses: 1-40A, 2-25A, 2-10A, 1-5A, 1-1A. Includes extra *PowerPoles®* & fuses -- *no extra cost.*

MFJ-1124 **$64.95**

15 Amp Continuous

15 Amps continuous, 17 Amps max at 13.8 VDC. Over-voltage, over-current protection. 5-way binding posts. Load fault indicator and automatic shutdown. 90-130 VAC input. 1½ lbs. Tiny 3¾Wx2¼Hx3¾D inches fits easily in an overnight bag.

MFJ-4115 **$59.95**

30 Amps Continuous

Linear with 19.2 lb.Transformer

This heavy-duty linearly regulated MFJ-4035MV has *abolutely no RF Hash*. It delivers 30 Amps continuous, 35 Amps maximum from its massive 19.2 lb. transformer. Front panel adjustable 1-14 VDC output with convenient detent at 13.8 VDC. Volt/Amp Meters. 1% load regulation, 30 mV ripple. Over-voltage/current/temperature protection, 5-way binding posts, 2 pairs of quick-connects and a covered cigarette lighter socket for mobile accessories. Front panel replaceable fuse. 110 VAC input. 9½Wx6Hx9¾D in.

MFJ-4035MV **$149.95**

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MFJ *giant* 6.5 inch SWR/Wattmeter

World's *largest HF SWR/Wattmeter has giant 6½ inch meter!*

This one you can SEE! Extra-long scales gives you highly accurate SWR and power measurements. Huge numbers makes reading easy across your shack.

Like your analog watch, one glance at the meter needle gives you fast and accurate readings without actually reading the scale.

MFJ's exclusive *TrueActive*™ peak reading circuit captures *true* peak or average forward and reflected power readings.

Has 20/200/2000 Watt ranges for accurate QRP or QRO operation.

MFJ-868
$149.95

Exclusive MFJ Wattmeter *Power Saver*™ circuit turns on meter only when RF power is being measured.

Covers 1.8-30 MHz. Use 9 volt battery or 12 VDC or 110 VAC with MFJ-1312D, $15.95. 7Wx5¹/2Hx5D in. SO-239 connectors.

Giant 144/220/440 MHz SWR/Wattmeter

MFJ-867, $159.95. Like MFJ-868 giant SWR/Wattmeter, but covers 144/220/440 MHz.

MFJ peak-reading *giant* 4.5 inch *Cross-Needle* SWR/Wattmeter

New!

See it all at once on giant Cross-Needle SWR/Wattmeter! MFJ-891 simultaneously displays forward/reflected power and SWR on easy-to-read three-color scale. 20, 200, 2000 Watt ranges have individual scales. *True*™*Active peak-reading circuit* reads forward and reverse *true peak* power in all modes. New directional coupler gives increased accuracy over entire 1.6 to 60 MHz frequency range. Low bias Schottky diode detectors increase linearity at low power -- great for QRP. Super-bright LED backlight with on/off switch provides smooth even illumination. DC grounded antenna connections prevent electrostatic build up. Quality SO-239 connectors. Designer-styled molded front panel and rugged metal housing looks great. 7¹/4Wx4¹/2Hx4¹/2D in.

MFJ-891
$109.95

MFJ *high-accuracy* Digital SWR/Wattmeter

MFJ-826B has a large high-contrast, high-accuracy *backlit* LCD display. Auto-ranging selects optimum full-scale range from 25W, 250W and 1500W ranges with full 10-bit resolution on each range. Covers entire amateur power spectrum. Built-in frequency counter selects frequency compensated data set to insure highest accuracy for each band. Displays frequency, provides digital read-out for older rigs and QRP rigs. *True* peak/average and forward/reflected power, SWR and frequency are *simultaneously* displayed. Select bargraphs to display forward/reflected power *or* forward /SWR *or* SWR only. MFJ's *PeakHold*™ freezes highest forward power displayed 1, 2 or 3 seconds. When SWR is greater than 1.5 to 3 (selectable) an alarm LED lights and buzzer sounds. Use 12 VDC or 110 VAC with MFJ-1312D, $15.95. 6¹/2Wx2⁵/8Hx6D inches.

MFJ-826B
$179.95

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MFJ-822
$59.95

Lighted 3" Cross-Needle Meter, SWR/Watts, 1.8-200 MHz, Fwd/Ref pwr, 30/300W. Compact.

MFJ-862
$69.95

Lighted Cross-Needle Meter, SWR/Watts, 144/220/440 MHz, 30/300 Watts Fwd, 60/6 W Ref.

MFJ-864
$99.95

Lighted Cross-Needle,SWR/Watts, 1.8-60/144/440 MHz, 30/300W Fwd, 6/60W Ref. Hook up HF&VHF/UHF rigs.

MFJ-815C
$89.95

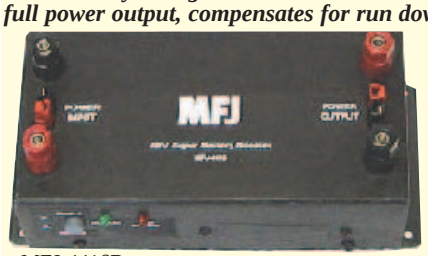
Lighted 3" C/N Meter, SWR/Watts, 1.8-30 MHz, 300/3000W Fwd, 60/600W Ref. True Peak.

MFJ-812B
$39.95

VHF SWR Wattmeter, 2M/220 MHz, built-in field strength meter, Fwd/Ref, Pwr in 2 30/300W ranges.

MFJ-4416B *Super* Battery Booster

Boost battery voltage as low as 9 Volts back up to 13.8 VDC! Keeps your transceiver at full power output, compensates for run down battery, wiring voltage drop, car off . . .



MFJ-4416B
$149.95

Boost battery voltage as low as 9 Volts back up to 13.8 VDC! Keeps your transceiver at full power output, provides full performance/efficiency, prevents output signal distortion and transceiver shutdown. Compensates for run-down battery, wiring voltage drop or when car is off. Provides up to 25 Amps peak with 90% efficiency. Selectable 9/10/11 Volts minimum input voltage prevents battery damage from over-discharging. RF sense turns MFJ-4416B off during receive to save power and increase efficiency. Adjustable 12 to 13.8 VDC output pass-through voltage improves efficiency and lets transceiver run cooler. Has output over-voltage crowbar protection. *Anderson PowerPoles*® and high-current 5-way binding posts for DC input, regulated output. 7³/4Wx4Hx2¹/8D inches.

100 Watts SSB from cigarette lighter socket!

MFJ-4403
$119.95

4-Farad capacitors supply 25 Amps needed for 100 Watts SSB peaks and replenished by 10 Amps average from cigarette lighter socket. Protects against reverse/over voltage, voltage transients, short circuits. Provides super noise/ripple filtering.

MFJ AC Line RFI Filter

Eliminate obnoxious power line and computer hash and noise by 6 S-units!

Filters and reduces AC power line RFI, hash, noise, transients, surges generated by computers, motors, RF transmitters, static/lightning by 30 db and up to 60-80 dB with a good earth ground. Super fast, *nano-second* overvoltage protection. Four 3-wire 15A, 120VAC outlets.

MFJ-1164B
$79.95

Transceiver Surge Protector

MFJ-1163, $69.95. Protects your expensive transceiver from damaging power surges. Capacitive decoupling and *ultra-fast* MOVs protection. 4 AC outlets.

MFJ all-in-one *Transmit Audio Console*

MFJ-655B
$219.95

MFJ all-in-one *Transmit Audio Console* gives you an *8-Band Equalizer* for full quality ragchewing audio *or* powerful, pileup penetrating speech . . . Adjustable *Noise Gate* gives you transparent, back-ground noise reduction . . . Clean low-distortion *Compressor* gives you more powerful, richer, fuller sounding speech and higher average power SSB . . . Smooth *Limiter* keeps audio peaks from over-driving your transmitter, prevents SSB distortion and splatter. *Universal Mic-Interface* lets you use any microphone with any transceiver. Has low-noise preamp, mic voltages, PTT jack, impedance matching, level controls, RF/audio isolation, VU meter, headphone monitor, auxiliary input.

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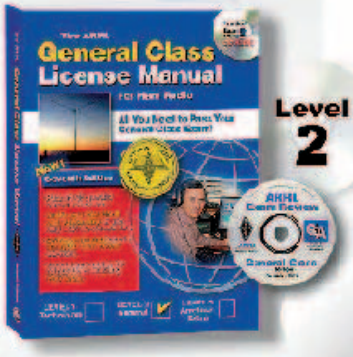

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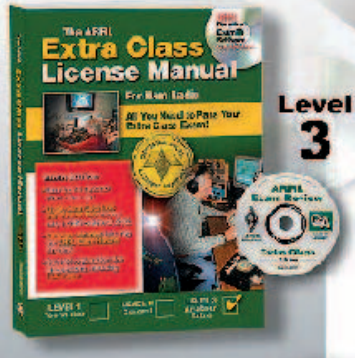

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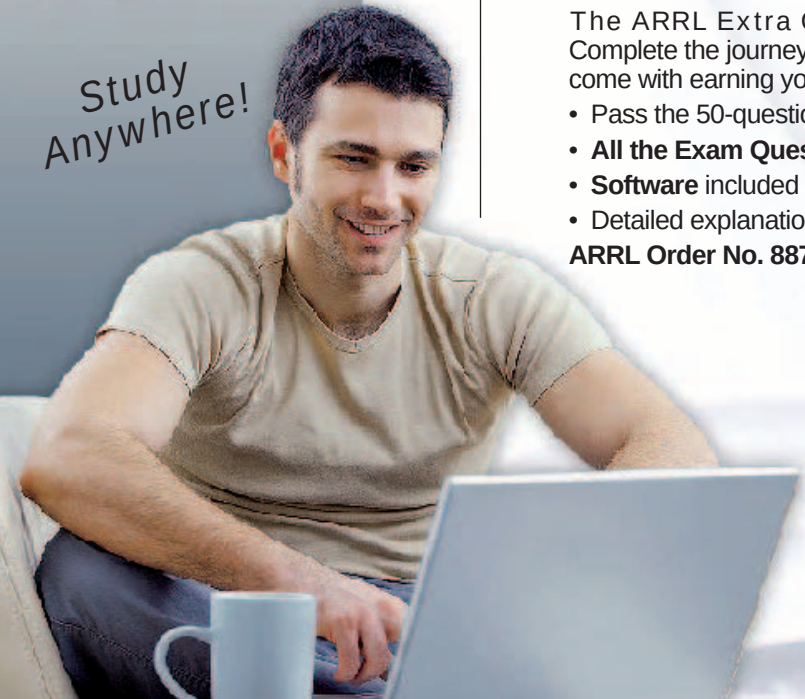

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VECTRONICS RF Accessories

300 Watt Antenna Tuner

VC-300DLP
$179.95

VECTRONICS uses the finest components available to build the highest quality 300 Watt antenna tuner ever made.

You can tune any *real* antenna 1.8-30 MHz. Custom 48 position switched inductor and 1000 Volt variable capacitors provide arc-free operation. Handles 300 Watts PEP SSB, (150 Watts on 1.8 MHz).

8 position antenna switch, 50 Ohm dummy load, peak reading backlit Cross-Needle SWR Power meter, 4:1 balun for balanced lines. Scratch-proof Lexan front panel. 10.2x9.4x3.5 inches. 3.4 pounds.

300 Watt Mobile Tuner

VC-300M
$129.95

The VC-300M *Mobile* Antenna Tuner is compact, lightweight, easy-to-operate and is our most economical tuner.

It's compatible with *any* mobile antenna, any HF transceiver and fits in the smallest car. It can also be used at home with any coax fed antennas -- dipoles, vees, verticals, beams or quads.

Backlit Cross-Needle meter simultaneously monitors Forward/Reflected power and SWR. Covers 1.8 to 30 MHz.

Handles 300 Watts SSB PEP, 200 Watts continuous, (150 Watts on 1.8 MHz). 7.25x8.75x3.6 inches. 3.4 pounds.

SWR/Power Meters

PM-30
$89.95
PM-30UV
$99.95

PM-30, $89.95, for 1.8 to 60 MHz.
Displays forward/reflected power, SWR simultaneously on Cross-Needle meter. True shielded directional coupler assures accuracy. Backlit meter displays peak or average power in 300/3000 Watt ranges. First-rate construction, scratch-proof case, durable paint, Lexan front panel. Lamp switch. SO-239 connectors. 5.3x5.75x3.5 in.

144/220/440 MHz, 30/300 SWR/Wattmeters
PM-30UV, $99.95, SO-239 connectors.
PM-30UVN, $99.95, N connectors.
PM-30UVB, $99.95, BNC connectors.

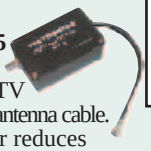
1.5 kW *dry* Dummy Load

DL-650M, $79.95
100 Watts continuous
1500 W/10 seconds
to 650 MHz. *Ceramic* resistor. SWR less than 1.3. SO-239s. **DL-650MN, $84.95** has N connectors.

Low Pass TVI Filter

LP-30, $89.95
Eliminates TVI by attenuating harmonics at the source. Plugs between transmitter and antenna or tuner. Handles 1.5 kW.

High Pass TVI Filter



HPF-2, $34.95
Installs between VCR/TV and cable TV/antenna cable. Eliminates or reduces interference caused by nearby HF transmitters.

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MIRAGE. . .160 Watts on 2 Meters!

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 in.

B-5018-G
$329

B-1018-G, $409. MIRAGE's most popular *dual purpose* HT/mobile/base amp. 160 Watts out/10W in. For 0.25-10W rigs.

B-2518-G, $329. Like B-5018-G but for 10-25 Watt mobile/base. 160W out/25W in.

RC-2, $49. Remote Control. On/Off, preamp On/Off, selects SSB/FM. 25 ft. 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

FCC Type Accepted

6 Meter Amplifier

A-1015-G, $389, *world's most popular* all mode FM/SSB/CW 6 Meter amplifier. 150 Watts out/10W in. For 1-15 W transceivers. 20 dB GaAsFET preamp.

300 Watts on 2-Meters, $739

3 models: 300 Watts out for 10, 25, or 50 Watts in. FM/SSB/CW. 15/20 dB gain, *GaAsFET* preamp.

Repeater Amps

11 models: *continuous* duty FM/SSB/CW *Repeater* Amps for 6, 2, 1¼ Meters, 70 cm, 450 MHz, ATV.

Commercial Amps, $159 to $429

Commercial Amps for 150-174, 450-470 MHz, VHF marine bands, 70-130 Watts out.

70 cm Amplifiers (420-450 MHz)

D-3010-N, $389 -- 100 W out/30W in. For 5-45 Watt *mobile/base*. **D-1010-N, $419**, 100W out/10W in. *Dual purpose* -- for handhelds or mobile/ base. **D-26-N, $299**, 60W out/2W in, for *handhelds*.

Low Noise GaAsFET preamps

High gain ultra low noise *GaAsFET* preamps for receiving weak signals. Selectable 15-22 dB gain prevents intermod. < 0.8 dB noise figure, auto RF switching to 160W.

In-shack or Mast-Mount models.

Frequency, MHz	*In Shack, $149.95*	*MastMount,$199.95*
28-30	KP-1/10M	KP-2/10M
50-54	KP-1/6M	KP-2/6M
144-148	KP-1/2M	KP-2/2M
220-225	KP-1/220	KP-2/220
430-450	KP-1/440	KP-2/440

Accurate SWR/Wattmeters

Read SWR directly and Forward/ Reflected, Peak/Average power. Remote coupler. 1.8-30, 50-200, 420-450, 1260-1300 MHz band models.

Amateur TV Amps

Industry standard ATV amps: **D-1010-ATVN, $439**, 82 W PEP out/10W in. **D-100-ATVN, $449**, 82W PEP out/2W in. (without sync compression).

1¼ Meter Amps (223-225 MHz)

10 models -- 20-220 Watts out for 2-50W in, $169-$739.

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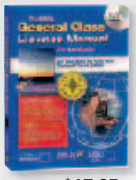

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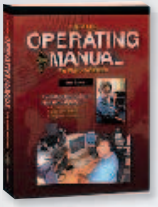

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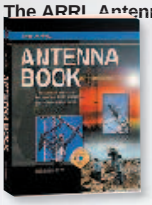

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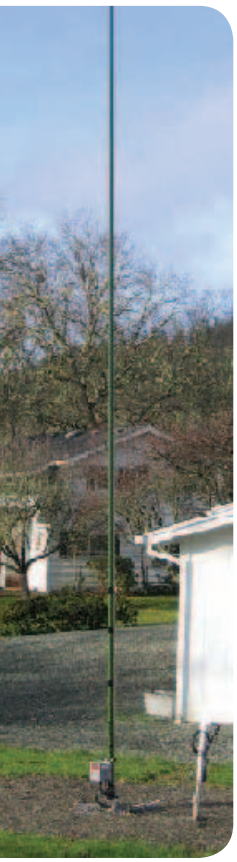

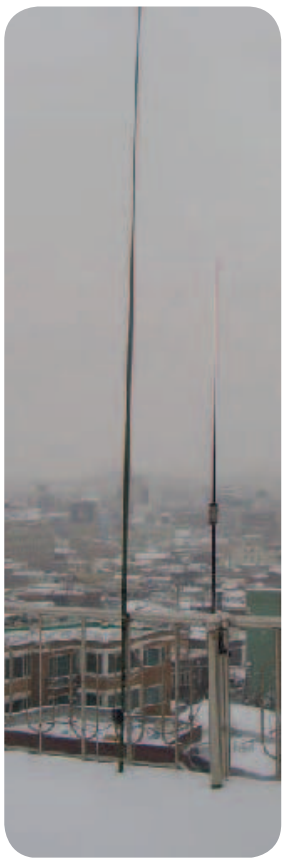

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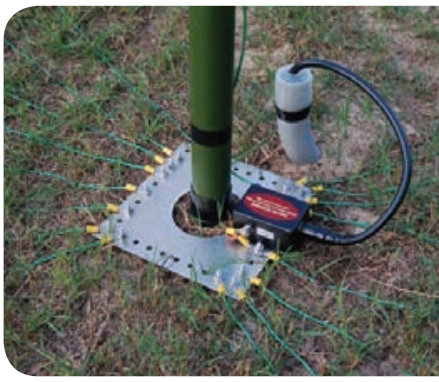

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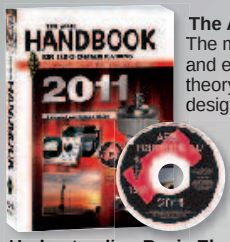

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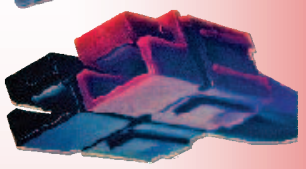

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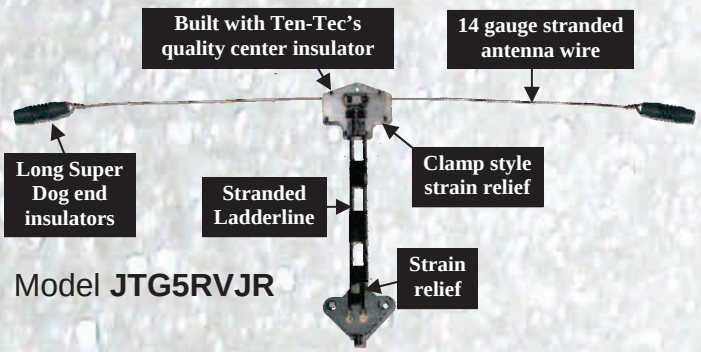

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- No, but I used to – 28%
- No, never – 51%

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- Section online registration form – 9%
- Paper form – 30%
- I didn't join ARES – 53%
- What is ARES? – 1%

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- Within the last couple of months – 4%
- Within the last year – 7%
- A few years ago – 15%
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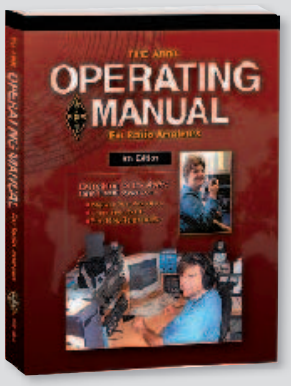

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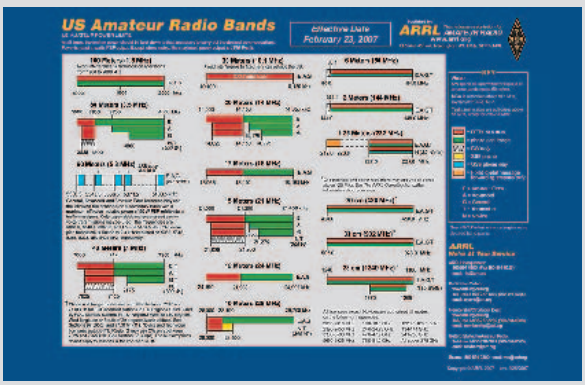

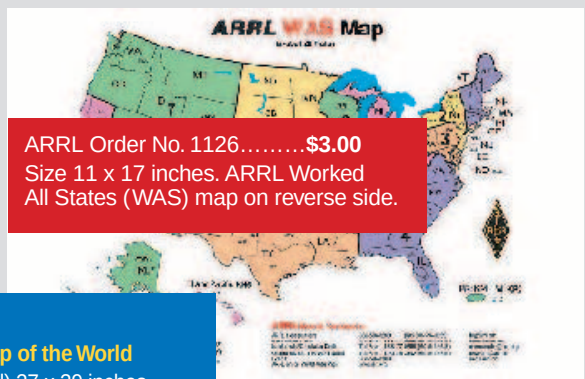

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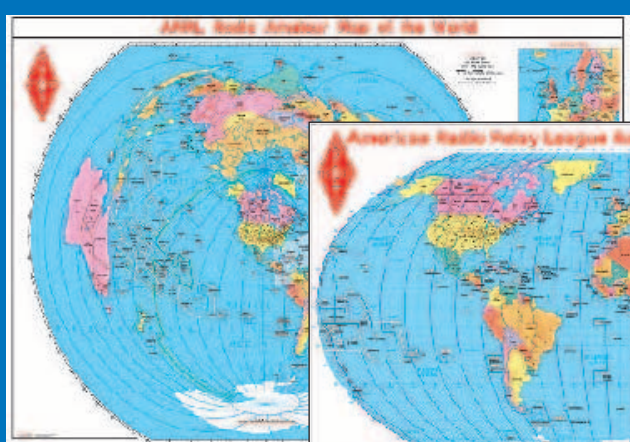

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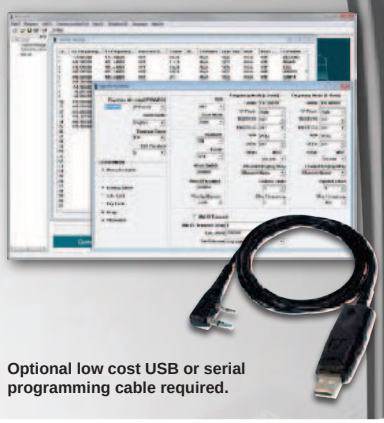

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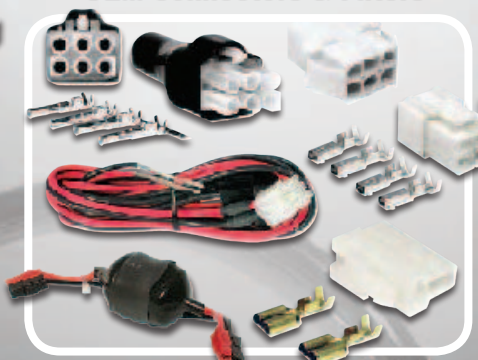

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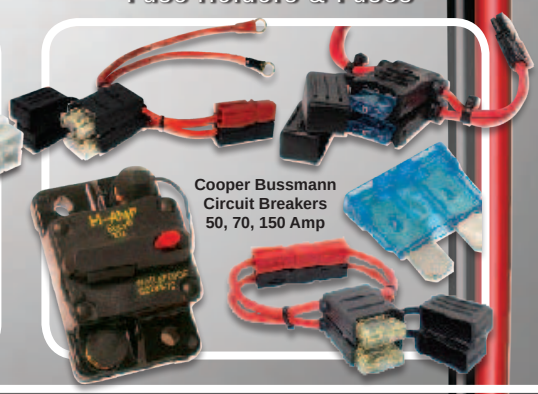

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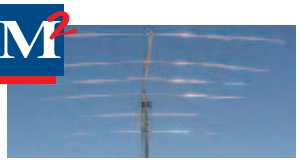

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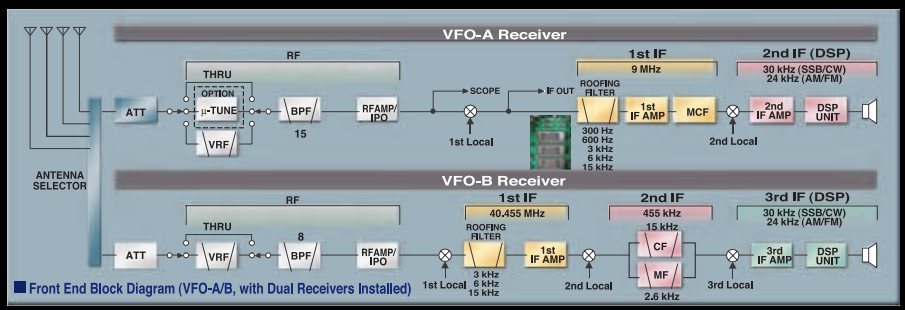
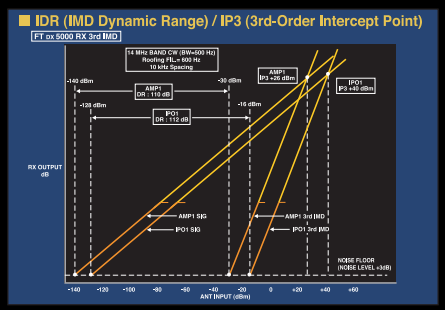


Front End Block Diagram (VFO-A/B, with Dual Receivers Installed)



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