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August 2011 WWW.ARRL.ORG

Troop 6 Enjoys the Serious Competition of a GeoFox Radiosport Rally

QST reviews:

Inside:

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Official Journal of ARRL The national association for AMATEUR RADIO

Field Gear That Goes The Distance!

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

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-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

YAESU
Choice of the World's top DX'ers℠
Vertex Standard US Headquarters
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http://www.vertexstandard.com

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

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

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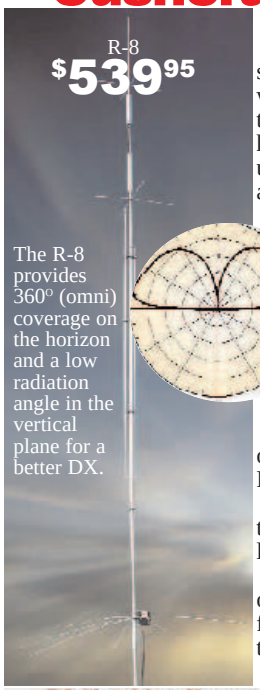
Cypress, CA 90630 (714) 827-7600

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!

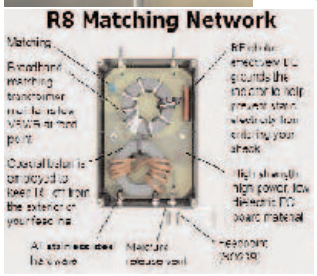
Rugged Construction: Thick fiberglass insulators, all-stainless hardware, and 6063 aircraft-aluminum tubing that is double or triple walled at key stress points handle anything Mother Nature can dish out.

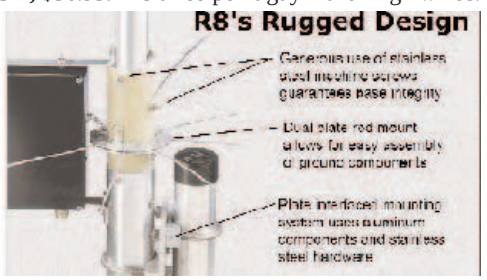
Compact Footprint: Installs in an area about the size of a child's sandbox -- no ground radials to bury and all RF-energized surfaces safely out of reach.

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.





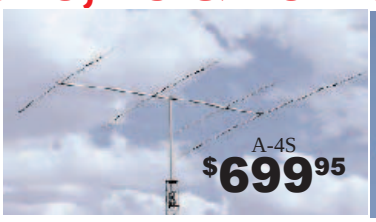
MA-5B *5-Band* Beam

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.

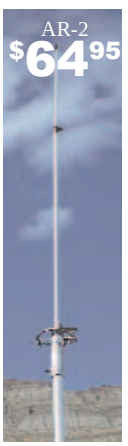
The 3-element A3S/A3WS and 4-element A4S are world-famous for powerhouse gain and super performance. **A-3WS**, **$499.95,** 12/17 M. **30/40 Meter** *add-on kits* available.

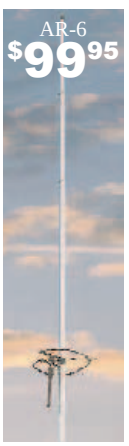
Cushcraft Dual Band Yagis

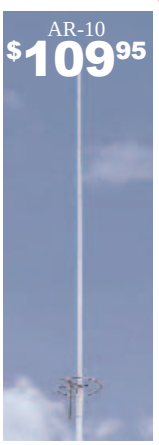
One Yagi for Dual-Band FM Radios

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 *Ringos* 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**
and Nearest Dealer . . . 662-323-5803
Call your dealer for your best price!

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Life is a JOURNEY. Enjoy the ride!

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

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

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

For Small Antennas & Limited Space

MODEL / ANT CONN / COAX CONN

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

For Medium Size Antennas

MODEL / ANT CONN / COAX CONN

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

For Tall or Multi-band HF Antennas

MODEL / ANT CONN / COAX CONN

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

COMET and Maldol Mobile

For a complete catalog, call or visit your local dealer.
Or contact NCG Company. 15036 Sierra Bonita Lane, Chino, CA 91710
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This Month in QST

August 2011 ■ Volume 95 Number 8

Technical

News and Features

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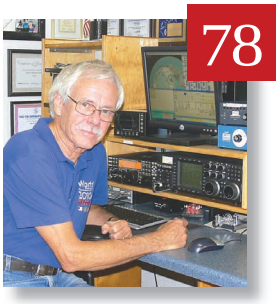
Radiosport



Our Cover
Boy Scouting and adventure go hand-in-hand, so it's no wonder that these Colorado Scouts had a blast GeoFoxing in the Rocky Mountains. GeoFoxing combines Amateur Radio Direction Finding — also called foxhunting — with geocaching. Through GeoFoxing, Assistant Scoutmaster Stu Turner, WØSTU, found a terrific way to involve youth in Amateur Radio. The article begins on page 58. Photos by Stu Turner, WØSTU.

Departments

August 2011 ■ Volume 95 Number 8

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

HF/50 MHz 100 W Transceiver

FT-950

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

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

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

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

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

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

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

DMU-2000
Data Management Unit (option)

"The Best of the Best Just Got Better"

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

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http://www.vertexstandard.com

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The radio... YAESU
Choice of the World's top DX'ers

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

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

DMU-2000
Data Management Unit

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

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

Options

SP-2000
External Speaker
with Audio filters

RF μ-Tune Kits

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

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

"The Best of the Best Just Got Better"

Introducing the new FT-2000 Series with PEP-2000 (Performance Enhancement Program)
Contact Dennis Motschenbacher K7BV at k7bv@vxstdusa.com for details

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http://www.vertexstandard.com

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

Vertex Standard
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Cypress, CA 90630 (714)827-7600

Advanced Dual Band Mobile Radio
5.2” x 1.6” Large dot matrix (264 x 64 dots) LCD display
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.

2. Expanded APRS® functions

- Uses the worldwide-accepted GPS NMEA data format
- Navigation to another APRS® BEACON station is possible, even if the beacon station is moving.
- Waypoint data (Data in/out) is available from the ACC connector on the rear of the main unit.
- Sub-Band APRS® operation may be active in the background, even when operating in Mono-Band Display mode.
- Newly added Voice Alert function
- Re-allocated often used keys to more convenient positions for easier operation
- Programmable keys on the DTMF Microphone provide direct access to APRS® functions

*APRS® is a registered trademark of Bob Bruninga WB4APR
*SmartBeaconing™ from HamHUD Nichetronix

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"It Seems to Us"

How Many Hams?

"A question we are often asked is, 'How many licensed radio amateurs are there in the world?' Answering the question is not as easy as you might think."

For the United States it is possible to derive good statistics from the FCC's Universal Licensing System database. Joe Speroni, AHØA, has been doing this for years as a labor of love and makes the results available on his website, **www.ah0a.org**. According to Joe's analysis, as of the end of May 2011 there were 698,410 unexpired amateur operator licenses in the FCC database. This figure is somewhat overstated — by exactly how much cannot be determined — because it includes Silent Keys who have died since their license or most recent renewal was issued, which may have been as much as 10 years earlier.

Even in other countries where good statistics are available, the answer may depend on exactly what is meant by "licensed radio amateur." The extreme example is Japan, which has either the largest or the second largest number of licensees depending on whether they are operator or station licenses. While the FCC treats the operator and station license as one and the same (except of course for club stations), in a number of other countries the operator and the station license are separate. Japan has issued lifetime amateur operator licenses to more than three million individuals, so by this measure Japan has the largest population of radio amateurs by far (although how many are no longer living is unknown). On the other hand, station licenses in Japan have a five-year term and require the payment of a license fee. According to the Japan Amateur Radio League there were 452,348 amateur station licenses in Japan as of the end of April 2011. While this is a smaller number than in the US and is down significantly from its peak in the mid-'90s, on a per capita basis Japan still has more amateur stations than the US.

The country with the third largest Amateur Radio population may surprise you. According to the Radio Amateur Society of Thailand, as of mid-2003 about 250,000 Thais had earned a novice class operator's certificate and more than 160,000 of them had been assigned a call sign for VHF-only operation. Licenses for HF operation are still relatively rare, but the number of HS and E2 call signs heard on the DX bands is growing.

Elsewhere in the Asia-Pacific area the countries with the largest numbers of amateur stations as of 2009 included South Korea (46,000), Indonesia (20,000), China (19,000) and Australia (15,000), with the latter two — especially China — trending upward. (China is licensing more than 10,000 new amateurs per year, but with a two-year license term there is considerable turnover.) A reasonable estimate of the amateur stations in ITU Region 3 would be about 750,000, with the number of licensed operators considerably higher.

For ITU Region 2 (the Americas) it is somewhat easier to come up with a good estimate, because more than 80% of Region 2 amateurs are in the US and because there is not much difference between operator and station licenses. Canada has about 45,000, Brazil 34,000, Argentina 18,000, and Venezuela 11,000, according to data compiled last year by IARU Region 2. In all there are approximately 830,000 licensed amateurs in the Americas.

Europe is a hotbed of on-the-air activity on all amateur bands, but in terms of licensing Region 1 (which also includes Africa, the Middle East, the former Soviet Union and Mongolia) is the smallest of the three. This may be because license renewal fees discourage inactive amateurs from maintaining their licenses, which is not the case in the US where renewal is free except for holders of vanity call signs. In all there are about 400,000 licensed amateurs in Region 1, with the largest numbers in Germany and Great Britain. In 2008 Germany reported 77,000 amateurs. Great Britain reported 66,000 although that figure included multiple licenses to an unknown number of individuals. Other countries in which the numbers of licensees significantly exceed 10,000 include Russia, Spain, Italy, France and Ukraine, more or less in that order although recent figures are not available in all cases. Historically, individuals in the Soviet Union and Eastern Europe who were able to operate club stations but did not have a station license of their own may not have been included in licensing figures; that is less of a factor today.

So, what's the answer to the question? The number of licensed Amateur Radio stations, worldwide, is on the order of two million with the number of licensed operators quite a bit higher — perhaps double that. Unfortunately, as time goes on it will become even more difficult to cite reliable figures, especially for those countries that issue lifetime operator's licenses.

It is interesting to consider trends on a country-by-country basis. Amateur Radio is growing rapidly in China and has enormous potential there if China's middle class continues to expand. India also has great potential if licensing delays can be reduced. On the other hand, countries in which Amateur Radio was attractive primarily as a personal communications medium are seeing declines in licensing as public telecommunications systems improve and become more affordable. Amateur Radio organizations in these countries face the challenge of educating a new generation about the enrichment opportunities that still abound in our avocation. We in the ARRL will do our best to set a good example.

David Sumner, K1ZZ
ARRL Chief Executive Officer

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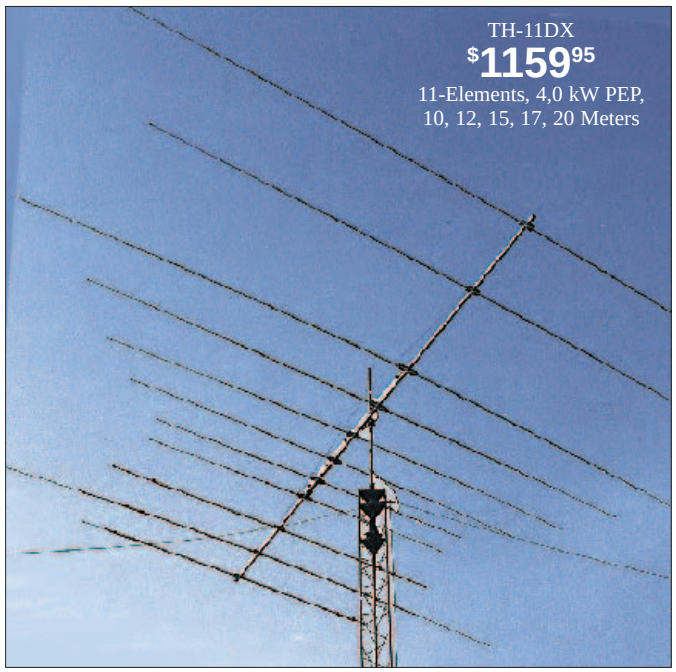

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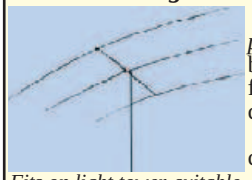

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TH-11DX	11	*For Gain and F/B ratio--See…*		4000	10,12,15,17,20	12.5	100	24	37	22	88	1.9-2.5	T2X	$1159.95
TH-7DX	**7**			**1500**	**10, 15, 20**	**9.4**	**100**	**24**	**31**	**20**	**75**	**1.5-2.5**	**HAM-IV**	**$869.95**
TH-5MK2	5	• www.hy-gain.com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

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FT-857D
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FTM-10R
144/440MHz 50/40W

FT-8800R
2M/440MHz

FT-8900R
10M/6M/2M/440MHz

FT-1900R
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FT-2900R
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FT-250R
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FT-270R
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This Just In

Joel P. Kleinman, N1BKE
jkleinman@arrl.org

In Brief

- The ARRL National Convention at Ham-Com drew thousands to the heart of Texas June 10-11. You'll find more on Hamvention 2011 and the ARRL National Convention in the article that starts on page 62 of this issue.
- Following the devastating tornado that struck Joplin, Missouri in May, the Salvation Army Team Emergency Radio Network — through the ARRL — requested volunteers to help support their mission to supply logistical and communications support, and more than 50 hams responded.
- After two tornadoes touched down in Central Massachusetts on June 1, hams in Western Massachusetts volunteered their time and radios to the American Red Cross and the National Weather Service.
- The FCC's Consumer & Governmental Affairs Bureau is seeking comments on whether it should terminate approximately 800 docketed proceedings, including many relating to Amateur Radio.
- In late May, ARRL General Counsel Chris Imlay, W3KD, testified before the Subcommittee on Communications and Technology of the US House of Representatives. The hearing involved "Creating an Interoperable Public Safety Network."
- The June 2011 VKØKEV DXpedition to Macquarie Island has been approved for DXCC credit.
- The winner of the *QST* Cover Plaque Award for June 2011 is Kazimierz "Kai" Siwiak, KE4PT, for his article "Is There an Optimum Height for an HF Antenna?"

Media Hits

Allen Pitts, W1AGP
Media & Public Relations Manager

- It seemed like the skies were filled with balloons in May 2011. It started with the MSU students' launch and "Balloon into the Stratosphere" in the *Morehead State University News* (KY). Then "Clarkson students and alum launch weather balloon that reaches 80000 feet" was a New York group that got double hits for K2CC in *Your News Now* and the *Watertown Daily Times*. Not to be outdone, the cadets from their Amateur Radio Club participated in the second West Point Balloon Satellite Launch and were written up in "To edge of space, back: West Point balloon satellite a success" on the US Army's own news website. *The Norwich Bulletin* (CT) reported "NFA students aim high with weather balloon project" with members of the Norwich Free Academy Ham Radio Club, and WHAM-TV13 showed the Rochester Institute of Technology finalizing their high altitude balloon. "Three Unusual Astronauts Await Rescue in Louisiana Swamp" made it into *PC Magazine* when a balloon carrying ham radio gear went astray. But the oddest balloon hit of all had to be from "When Aliens Attack" for the The National Geographic Channel as WB8ELK and others flew a balloon in Alabama as part of a show about defending Earth against alien attack.
- The tragedy in Joplin made news as "Ham Operators stationed at the Springfield National Weather Service [provided] communication between hospitals and assessment teams," said Ron Kittleman, KØADI, for the Joplin (MO) *News-Leader*. Meanwhile, SATERN, the *Salvation Army Team Emergency Radio Network*, had their publicity people working well with daily media updates, blogs on their own national website, articles in the *Kansas City Star* and other local papers, and on KNXV-TV15.
- The repeated role of Amateur Radio in this spring's series of tornadoes did not go unnoticed. ABC 33/40 TV (AL) did a special story, "Helpers Amid the Chaos" that pointed out: "This group has done its work to help others so many times in the past — mostly in the shadows, so to speak — that I can't count them all. Because it's not exciting to watch, media attention is typically infrequent. But what these people do helps protect us all before the danger. And they are extremely valuable when it comes to help with recovering afterward. So, who are these folks? They are amateur radio operators, men and women of all ages and backgrounds."
- Media itself made some news as "TWiT to Add Ham Radio Show" was announced in *Radio World*. The new show called "HamNation," hosted by Bob Heil, K9EID, launched May 24. KWAM 990 radio in Memphis ran our emergency communications PSA a *lot* in May. Thanks to Howard Price, KA2QPJ, "The voice of the broadcasting industry," RBR.com, published "Commercial radio supports amateur radio with PSAs" and included the newest audio from Johnny Donovan. Meanwhile the PSA done by Don Carlson was running on Washington's all-news leader, WTOP, and the 60 second PSA was running on "Quinn in the Morning" syndicated show and XM Satellite Radio.

Atlanta RC Celebrates Its First Century

In conjunction with Coca-Cola's 125th Anniversary celebration, the Atlanta Radio Club made more than 500 contacts in over 20 countries as we celebrated our 100th anniversary. Special event station KØK was on the air from May 6-8. The club, in continuous operation since March 1911, has more than 150 members and sponsors 10 local repeaters.
— *tnx Jim Reed, N4BFR*

JIM REED, N4BFR

Happy anniversary! **Harold Hawkins, KD8DVY (left) and Steve Vogel, W4PSV, make one of the more than 500 contacts at the KØK special event station from the World of Coke in downtown Atlanta. KØK was a joint celebration of the Atlanta Radio Club's 100th Anniversary and the 125th Anniversary of the invention of Coca-Cola.**

Hamvention Reunion

Back in 1981, Cindy, KD8OUS (ex-KA8OQH) and I found ourselves taking a Novice class sponsored by the Dayton Amateur Radio Association. Over the next year or two, I became a trainer at DARA's club station, W8BI, and Cindy learned the finer points of operating the club's Drake TR7 Novice station. Our paths diverged as happens in life, but last September, Cindy (who had let her license expire) took a friend to a DARA meeting, where lo and behold we became reacquainted. With her interest in ham radio revived, we have been getting some of Cindy's dad's (W8FPA SK) gear back up and running, and she has upgraded to General. *— Charlie Cotterman, KA8OQF*

STEVE FORD, WB8IMY

Reunited after almost 30 years, Cindy, KD8OUS, and Charlie, KA8OQF, worked the prize booth at the 2011 Dayton Hamvention.

MICHAEL STEVEN LENHERT

We have liftoff: **In late May, 16 year old Brenden Geary, KJ6HVP, of Upland, California launched a high altitude balloon from Red Hill Park in Rancho Cucamonga. The payload included two still cameras plus a live video camera ATV downlink as well as an APRS tracker. The balloon reached an altitude of 96,424 feet MSL and traveled close to 150 miles before it burst and the payload parachuted safely back to Earth. Preparations and liftoff were recorded for use in the ARRL's upcoming video "The DIY* Magic of Amateur Radio." *— Bill Pasternak, WA6ITF***

Inside HQ

A Cure for the Summertime Blues

There are many fun and challenging operating awards available to ARRL members. Many of us know about DXCC, the premier operating award in Amateur Radio. Here's a rundown on some of our other operating awards. If you are not familiar with DXCC, learn more here: **www.arrl.org/dxcc**.

The ARRL Worked All States (WAS) Award has existed for more than 70 years, although there were fewer States to work back then! It is earned by confirming QSOs with all 50 States. Confirmations can be submitted on paper cards, electronically via Logbook of the World (**www.arrl.org/logbook-of-the-world**) or a combination of the two. I remember how thrilled I was to receive my WAS certificate. Nevada was the last state that I needed.

Even if you already have attained the basic WAS there are many different categories and endorsements. These include endorsement for individual HF and VHF bands, QRP and even EME (Earth-Moon-Earth). We now offer newly redesigned 5 band WAS (5BWAS) certificates and plaques for confirming all 50 states on five specific HF bands. The WAS program is supported in Logbook of the World and WAS cards can be checked in the field.

In 2010, we awarded about 700 WAS certificates along with an additional 140 awards for our newest WAS variation, The Triple Play Award. Triple Play is awarded when you confirm all 50 states on phone, CW and digital modes using only Logbook of the World contacts. The Triple Play, while a rarity in baseball, has already been completed by about 700 amateurs since its introduction two years ago. For more info: **www.arrl.org/was**.

With its distinctive propagation characteristics, summer, is an exciting time for VHF and UHF operators who want to pursue the VUCC (VHF/UHF Century Club) Award. VUCC is presented to amateurs who confirm contacts with 100 Maidenhead grid squares on the VHF and UHF bands. If you are not familiar with the grid system, a Maidenhead grid square is assigned to a two degree longitude by one degree latitude area that measures approximately 70 × 100 miles. Every section of the Earth has an assigned grid square that is identified by two letters and two numbers. For example, FN31 is the grid square where ARRL HQ is located. We added the VUCC Award to Logbook of the World this year making it easier to confirm VUCC QSOs. VUCC contacts can still be confirmed on paper, Logbook of the World or both. Learn more about VUCC here: **www.arrl.org/vucc**.

A recent addition to the VUCC program is The Fred Fish Memorial Award. This award was created in honor of Fred Fish, W5FF (SK), who was the first amateur to have confirmed all 488 Maidenhead grid squares in the 48 contiguous United States on 6 meters. More info: **www.arrl.org/ffma**.

I'll be covering more of our Awards programs next month. In the meantime, have fun this summer pursuing your favorite operating awards, and good luck.

73,

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

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- **E-Mail Forwarding Service**
  E-mail sent to your **arrl.net** address will be forwarded to any e-mail account you specify.
- **Customized ARRL.org home page**
  Customize your home page to see local ham radio events, clubs and news.
- **ARRL Member Directory**
  Connect with other ARRL members via a searchable online Member Directory. Share profiles, photos and more with members who have similar interests.

ARRL Technical Information Service — www.arrl.org/tis

Get answers on a variety of technical and operating topics through ARRL's Technical Information Service. ARRL Lab experts and technical volunteers can help you overcome hurdles and answer all your questions.

ARRL as an Advocate — www.arrl.org/regulatory-advocacy

ARRL supports legislation and regulatory measures that preserve and protect access to Amateur Radio Service frequencies. Members may contact the **ARRL Regulatory Information Branch** for information on FCC rules; problems with antenna, tower and zoning restrictions; and reciprocal licensing procedures for international travelers.

ARRL Group Benefit Programs* — www.arrl.org/benefits

- **ARRL "Special Risk" Ham Radio Equipment Insurance Plan**
  Insurance is available to protect you from loss or damage to your station, antennas and mobile equipment by lightning, theft, accident, fire, flood, tornado, and other natural disasters.
- **The ARRL Visa Signature® Card**
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- **MetLife® Auto, Home, Renters, Boaters, Fire Insurance and Banking Products**
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* ARRL Group Benefit Programs are offered by third parties through contractual arrangements with ARRL. The programs and coverage are available in the US only. Other restrictions may apply.

ARRL Programs

Public Service — www.arrl.org/public-service

Amateur Radio Emergency Service® – **www.arrl.org/ares**
Emergency Communications Training – **www.arrl.org/emcomm-training**

Radiosport

Awards – **www.arrl.org/awards**
Contests – **www.arrl.org/contests**
QSL Service – **www.arrl.org/qsl**
Logbook of the World – **www.arrl.org/lotw**

Community

Radio Clubs (ARRL-affiliated clubs) – **www.arrl.org/clubs**
Hamfests and Conventions – **www.arrl.org/hamfests**
ARRL Field Organization – **www.arrl.org/field-organization**

Licensing, Education and Training

Find a License Exam Session – **www.arrl.org/exam**
Find a Licensing Class – **www.arrl.org/class**
ARRL Continuing Education Program – **www.arrl.org/courses-training**
Books, Software and Operating Resources – **www.arrl.org/shop**

Quick Links and Resources

QST – ARRL members' journal – **www.arrl.org/qst**
QEX – *A Forum for Communications Experimenters* – **www.arrl.org/qex**
NCJ – *National Contest Journal* – **www.arrl.org/ncj**
Support for Instructors – **www.arrl.org/instructors**
Support for Teachers – **www.arrl.org/teachers**
ARRL Volunteer Examiner Coordinator (ARRL VEC) – **www.arrl.org/vec**
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It Pays to Cooperate

John Smale, K2IZ, **k2iz@arrl.net**

This is a story that I've been meaning to write for over 34 years. It's a story of cooperation between Amateur Radio operators. As hard as it may be to believe, the photo has not been touched up in any way. It shows two houses with towers and HF Yagis side by side. They are 315 Kensington Ct, my home, and 317 Kensington Ct, the home of Bob, K2TV, and his spouse, Margaret, KA2NIE, in Copiague, Long Island, New York.

What you don't see is that across the street is the home of Jerome, W2MFW, and Myra, WA2FIW, who operate mostly VHF FM, and about 600 feet away is the home of Frank, K2LI, who operates all bands. Add to that another very active ham Walter, KA2CAQ, who lives about six blocks south of us, and it all adds up to a lot of hams living in one area. If you drew a half-mile circle around our houses you would find well over 50 hams.

JOHN SMALE, K2IZ

John's and Bob's side-by-side homes. The one on the right belongs to K2TV and the one on the left is the author's.

Bob and I have both been very active over the years and use 2 meter FM to coordinate who is going to be on what frequency and mode at any given time. To complicate matters we are avid CW operators and love contesting. Coordination is vital to our on-the-air activities — not to mention the front ends of our rigs.

When I first moved in I was the Section Manager for the New York City-Long Island (NLI) section and very active in traffic handling. Bob was, and still is, an active DXer and from time to time handled NTS traffic. I would be running the NLI CW traffic net on 3630 kHz (at that time). Bob would check in using his dummy load as the antenna, and others in the net would always ask how I could hear him when they couldn't. We always got quite a laugh when we'd tell people about this at clubs and hamfests.

Multi-Multi

We've done measurements and found that our shacks are about 40 feet apart. We kid each other saying we could legally operate "multi-multi" in a contest, as our stations are closer than the stations our club sets up for Field Day.

I'm using a Cushcraft A3 with a Ringo Ranger on top of it. Below it, hanging off the tower, is my "dipole," with the coax going into a W2AU balun. The dipole goes out in a V to each end of my yard and both ends are bent back along the edge of my property. Does it work? Sure does. I use it on 80, 75, 40 and 30. The V faces almost north. I can work into Eastern Europe on CW.

K2TV is using a Mosley beam, a 6 meter beam and a dipole running to a telephone pole. All of our antennas are well below the trees in the area.

Bob and his spouse retired a couple of years ago, and I retired about a year ago. Who knows how much longer we'll stay in our home, but for now I just wanted to write the story so that years from now, when hams gather and someone says, "Hey, did you hear about the two active hams who lived right next to each other?" someone can say "Yep, true story — HF beam and wire antennas were 40 feet apart and they worked the world."

Cooperation!

MIKE ROONEY, W7ANA

Caffeinated antenna: **Mike Rooney, W7ANA, of El Paso, Texas adapted an idea he had seen in an old issue of *QST* to a friend's antenna farm — substituting two 3-pound coffee cans for the radial portion of his 2 meter vertical dipole. The original author used copper pipe. "One has to be aware of the winds in their specific area and mount the antenna accordingly," he cautions.**

Porcine DDS Enclosure

Just after getting back from Dayton I read the DDS article by Joe Lunsford in the June issue. I built my DDS from **kitsandparts.com** and use it to feed my 600 meter (500 kHz) commercial transmitter via WD2XSH/42, the ARRL-sponsored experimental group.

My former marine reserve transmitter type 2017A by ITT Mackay Marine is a crystal-controlled, solid-state, battery-operated unit. I use it on 509.2 kHz. I needed a suitable enclosure and being a ham for 50 plus years thought a typical box would not do. — *Mike Shaw, WD2XSH/42, K2LRE*

MIKE SHAW, WD2XSH/42

Mike Shaw, K2LRE, provided an eye-catching enclosure for his Direct Digital Synthesis project.

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CORRESPONDENCE

AMATEUR RADIO HELPS BEHIND THE SCENES

♦ I just read the news item on the ARRL website about the support ARES® volunteers provided to the American Red Cross following the June tornadoes in Central and Western Massachusetts. I was home on a vacation day Wednesday, June 1 when I heard the forecast for severe weather. I began monitoring the Paxton, Massachusetts 146.970 repeater to see what reports I might hear, should the dangerous weather materialize. I also began watching radar images on the Internet and paying attention to other media, including Twitter, EchoLink and broadcast stations. The reports and alerts became increasingly severe. I was listening when an Amateur Radio operator and experienced SKYWARN observer reported a tornado on the ground and debris in the air in Springfield. My family and I even made a brief visit to our cellar after we heard of another unconfirmed report of a tornado in nearby Worcester.

Within a couple of hours, I was at the headquarters of the American Red Cross of Central Massachusetts where I serve (in a volunteer capacity) as a Disaster Assessment Supervisor. I had brought my portable Amateur Radio with me to continue to monitor reports as they came in. I immediately began preparing a report known as an Impact Assessment, which serves as a preliminary notification to others in the ARC about the scope of the disaster. The Impact Assessment related many of the facts obtained by monitoring the Amateur Radio SKYWARN net and other sources, painting a picture of a very significant disaster requiring a major Red Cross response.

Few people were aware of my monitoring because I had little to add to the net. But it is important for those Amateur Radio operators who witnessed the disaster and reported their observations on the SKYWARN net to know that their reports were of value — not only to the National Weather Service, but also to the American Red Cross and, by extension, our clients who benefited from the fact that our response was accelerated by the early creation of an Impact Assessment based, in large part, upon the reports of Amateur Radio operators. I hope they take encouragement from this knowledge and continue to be active in SKYWARN nets when severe weather approaches.

TOM CARRIGAN, NE1R
Northboro, Massachusetts

NO JOKING MATTER

♦ It's rare that I'm able to build projects that other members generously take the time to write up for our enjoyment in *QST*. Herman J. Birkner, W2FRH, described in wonderful detail his experience with a low power 20 meter antenna ["A Near End-Fed Antenna for Low Power 20 Meter Operation," Mar 2011, pages 46-47]. While I couldn't find exactly the right parts in my junk box or at the most recent hamfest, I was able to come close enough to his design. As an end-fed antenna, it needed just one support. For $25, I found a lightweight 20 foot telescoping fishing pole that collapses to just 44 inches. I gave up trying to explain to the sales assistant that the gold fish I wanted to catch was thousands of miles away.

I wrote Herman to tell him that my first near QRP QSO (7 W on the K-1) was a Russian operating portable in Senegal (6W). Since the K-1 was new, it took me longer to figure out how to use the RIT/XIT than it did for me to hear WN3R 599 TU. Herman and I had e-mailed often to compare notes on the antenna, as it took me almost two months to get on the air after it was built.

I want to thank all the authors who love Amateur Radio so that they are willing to take the time to share their experience, knowledge and passion. I also want to thank the ARRL for making significant improvements in *QST* and the website. I have to admit that I checked to make sure I wasn't reading the April issue, since Herman's antenna seemed too good to be true. Nearly 50 years ago I made that mistake, and I still smile and chuckle when I think of it.

DICK HAYMAN, WN3R
Rockville, Maryland

MAIL CALL

♦ In 1984, I was in the US Navy and stationed at the US Submarine Base in Groton, Connecticut. During that time, I was very active in Amateur Radio. We even ran a Field Day event using a natural uranium power source, as pictured in the December 1984 issue of *QST*, using a battery we charged on board the submarine USS *Hyman G. Rickover* while it was divorced from shore power. In July of that same year, I spoke with David Lambert in London, Ontario, Canada on 20 meters. I mailed him a QSL card at that time.

Three weeks ago, I received a QSL card in the mail from David confirming our contact from almost 27 years ago! I searched through several boxes in a storage locker, finally located my logbook from 1984 and confirmed the receipt of the QSL. I suppose the cliché "better late than never" comes to mind — I was very pleased and excited to receive the card after such a long time. Amateur Radio is a wonderful hobby and always full of surprises!

ROBERT L. VANDEVENDER II, KR2K
ARRL Life Member
Jupiter, Florida

EYE ON SAFETY

♦ I was reading the article by Norm Fusaro, W3IZ ["Field Day: It's Not About the Fish," Jun 2011, pages 65-67], and saw a picture in the article that drew my attention. Making a J pole antenna is a great simple project to get youth involved in Amateur Radio and to teach skills such as soldering; however, something very simple is missing — safety glasses! These are easy to find and you can buy inexpensive ones at a hardware store for about $2 a pair. People are impressionable and the way you teach others — young or old — is the way they are going to remember and do things. Set others up for success by following safe work practices, using the proper tools and always using the proper personal protective equipment.

ROBERT B. BROWN, KD6SWA
Fairfield, California

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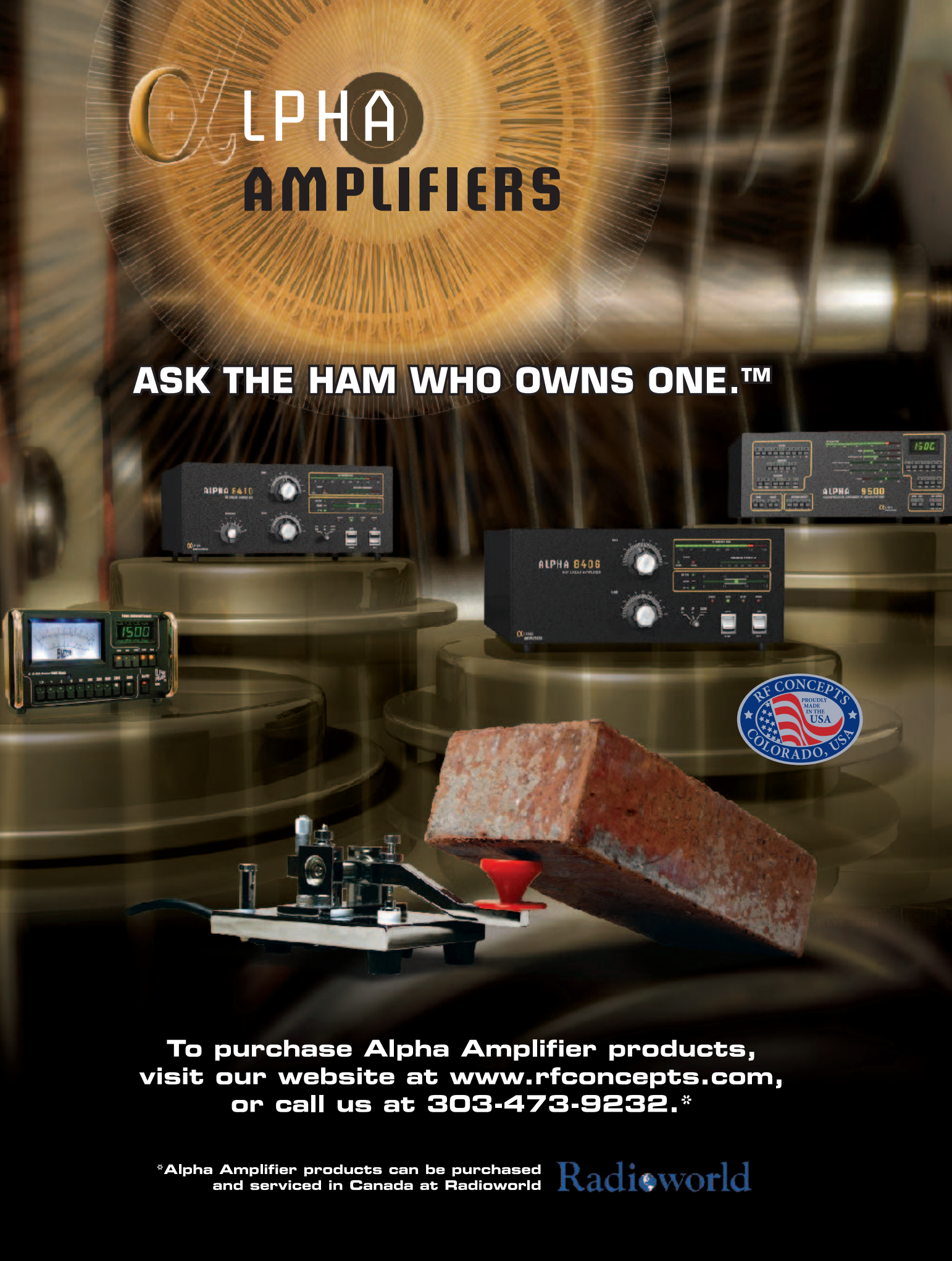

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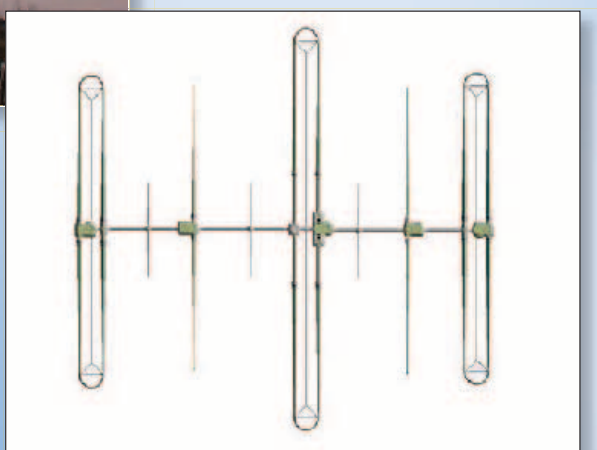

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A Modified MouseFET Low Power Transmitter

Build this updated version of a classic HF CW low power transmitter.

William E. Johnson, WØMS

The original MouseFET series of low power (QRP) CW transmitters were built by Mike Masterson, WN2A. They have been documented in *QST* and "QRP Classics."[1] Builders have used them for over 20 years and have enjoyed their excellent reliability.

The circuitry has been reviewed by many experts. Mike has documented many improvements and has posted the most desirable changes on his Internet web page.[2] I have built several versions of his updated design and recently built a 40 meter version. I included additions to meet my personal requirements. This article describes my experiences.

Transmitter Design

The CW transmitter covers 7004 to 7057 kHz, including the QRP calling frequencies of 7030 and 7040 kHz. It has an adjustable POWER LEVEL potentiometer mounted on the rear panel that controls the power output from 0 to 10 W. The frequency control is provided via a power diode used as a varactor. The varactor is non linear and has been biased to obtain the best frequency control between 7030 and 7040 kHz. I have included a keying circuit and a break-in transmit/receive (TR) relay. The transmitter is enclosed in a small aluminum utility box. You may want to use a larger one to satisfy your personal requirements. The transmitter schematic is shown in Figures 1 through 3.

VFO

The VFO (see Figure 1) is a series tuned Colpitts oscillator operated at half the output frequency. The VFO runs continuously. It is powered by an 8 V (78L08) voltage regulator. The series tuned Colpitts has a reputation of providing good frequency stability. A good tutorial on the series tuned Colpitts can be downloaded from the Internet. It is provided by Ian C. Purdie, VK2TIP.[3] L1, the VFO inductor, is wound on a T68-7 (white) toroid. It has a slightly better temperature coefficient than the T68-6 (yellow) core.[4] It has a temperature coefficient of 30 ppm/°C.

Buffer-Doubler

The output of the oscillator is buffered by Q2, an FET follower. It is also powered by the 8 V regulator and runs all the time. The FET follower excites a full wave frequency doubler. The doubler is quite efficient and drops the output by only 8 dB. It also attenuates the drive frequency up to 40 dB, if the diodes are matched. The SPOT switch controls the V_{CC} voltage on Q5, the IRF510. Just remove the voltage and key the low level stages to use the spot function. The spot frequency is within cycles of the transmit frequency. This is the result of using regulated voltages and the isolation provided by reducing the gain and adding both negative and positive feedback to Q3 (2N2222A).

Driver Amplifier

I used a 2SC2075 for the driver stage (Q4 in Figure 2). It has more gain than the 2N3053 used in the original MouseFET. It is an RF transistor, rated at 4 W out at 27 MHz designed for CB use. This allowed me to add positive and negative feedback to the 2N2222A transistor (Q3). This seemed to contribute to better buffering and keying.

Final Amplifier-Low Pass Filter

Q5, the IRF 510 final, and the low pass filter have not been changed from the original MouseFET. I experienced 16 W output,

Hamspeak

Break-In — Method of CW keying in which the system switches between transmit and receive between each code element.

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 business. Power is limited to 5 W dc input.

Colpitts oscillator — Classic oscillator circuit in which the feedback is provided by a signal from a portion of the tuned circuit set by a capacitive voltage divider.

FET — Field-Effect Transistor; a type of transistor commonly used for weak-signal amplification (for example, amplifying microphone signals). In a FET the current flow is from source to drain because a conducting channel is formed by a voltage *field* between the gate and the source. See **www.arrl.org/hands-on-radio**, look for *Experiment #12*.

QRP — Strictly speaking, an operating shorthand for "I am sending with low power." In common use it refers to low power, typically under 5 W output, operation viewed as a special challenge by many amateurs.

Varactor diode — A solid state two terminal device used in non-conducting mode. The capacitance between the terminals ic changed by applying a different voltage to them. This results in voltage variable capacitor.

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.

[1]Notes appear on page 33.

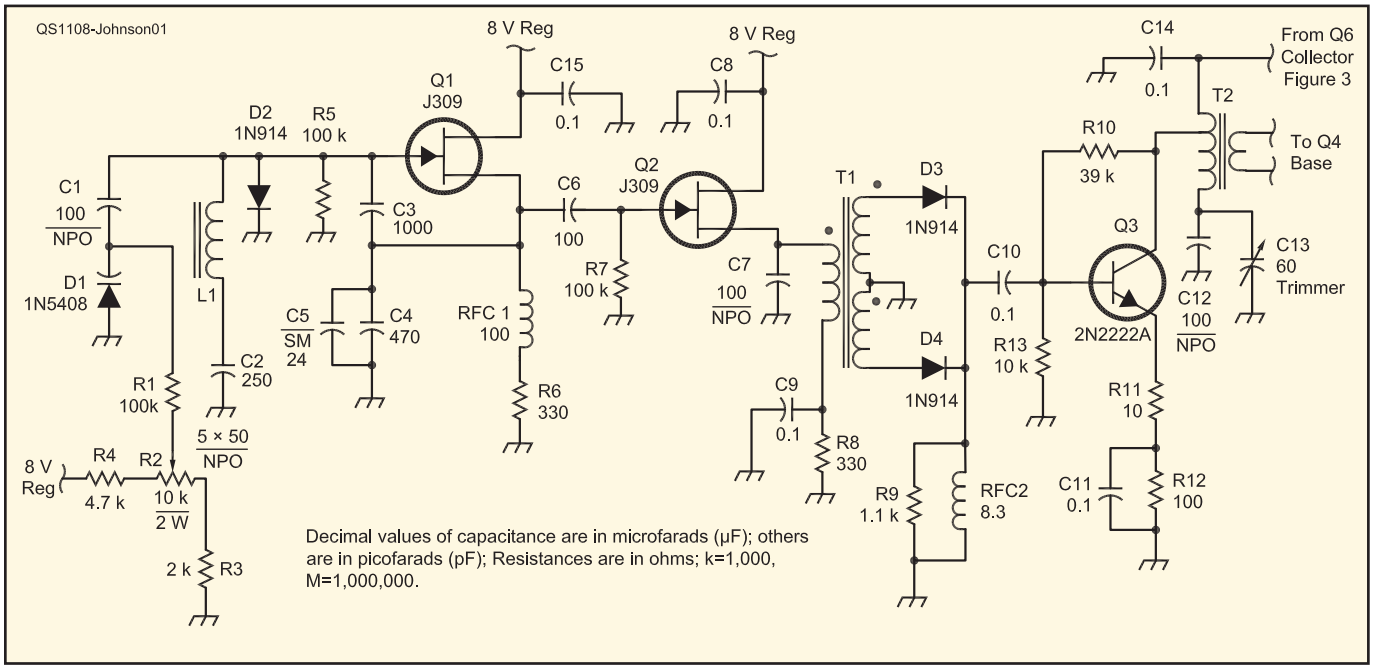

Figure 1 — Schematic diagram and parts list of the VFO and frequency doubler portion of the Modified MouseFET transmitter. Mouser parts are available at www.mouser.com.

C1, C6, C7, C12 — 100 pF NPO capacitor.
C2 — 250 pF, five 50 pF NPO capacitors in parallel.
C3 — 1000 pF, 50 V, polystyrene capacitor (Mouser 23ps210).
C4 — 470 pF, 50 V, polystyrene capacitor (Mouser 23ps147).
C5 — 24 pF silver mica capacitor.
C8-C11, C14, C15 — 0.1 µF disc ceramic capacitor.
C13 — 60 pF compression trimmer.
D1 — 1000 V, 3 A, silicon rectifier diode, 1N5408 or equivalent.
D2-D4 — 1N914 diode.
L1 — 14.1 µH inductor, 52 turns #29 AWG enameled wire on T68-7 (white) core, or 55 turns #29 AWG enameled wire on T68-6 (yellow) core. Anchor with RadioShack RS 278-441A.
Q1, Q2 — J309 field effect transistor (Mouser 512j309d26z).
Q3 —2N2222A NPN transistor (Mouser 511 2n2222a).
R1, R5, R7 — 100 kΩ, ½ W resistor.
R2 — 10 kΩ, 2 W linear potentiometer, Allen Bradley type J.
R3 — 2 kΩ, ½ W resistor.
R4 — 4.7 kΩ, ½ W resistor.
R6, R8 — 330 Ω, ½ W resistor.
R9 — 1.1 kΩ, ½ W resistor.
R10 — 39 kΩ, ½ W resistor.
R11 — 10 Ω, ½ W resistor.
R12 — 100 Ω, ½ W resistor.
R13 — 10 kΩ, ½ W resistor.
RFC 1 — 100 µH RF choke (Mouser 542 78 f101rc).
RFC 2 — 8.2 µH RF choke (Mouser 542 78f8r2rc).
T1 — Transformer, bifilar wound; primary, 18 turns #29 AWG enameled wire, secondary 11 turns #29 AWG enameled wire on FT50-61 core.
T2 — Transformer; primary, 28 turns #26 AWG enameled wire with tap at 7 turns from V_{CC} end. Secondary 3 turns #26 AWG enameled wire wound on T50-2 (red) core.

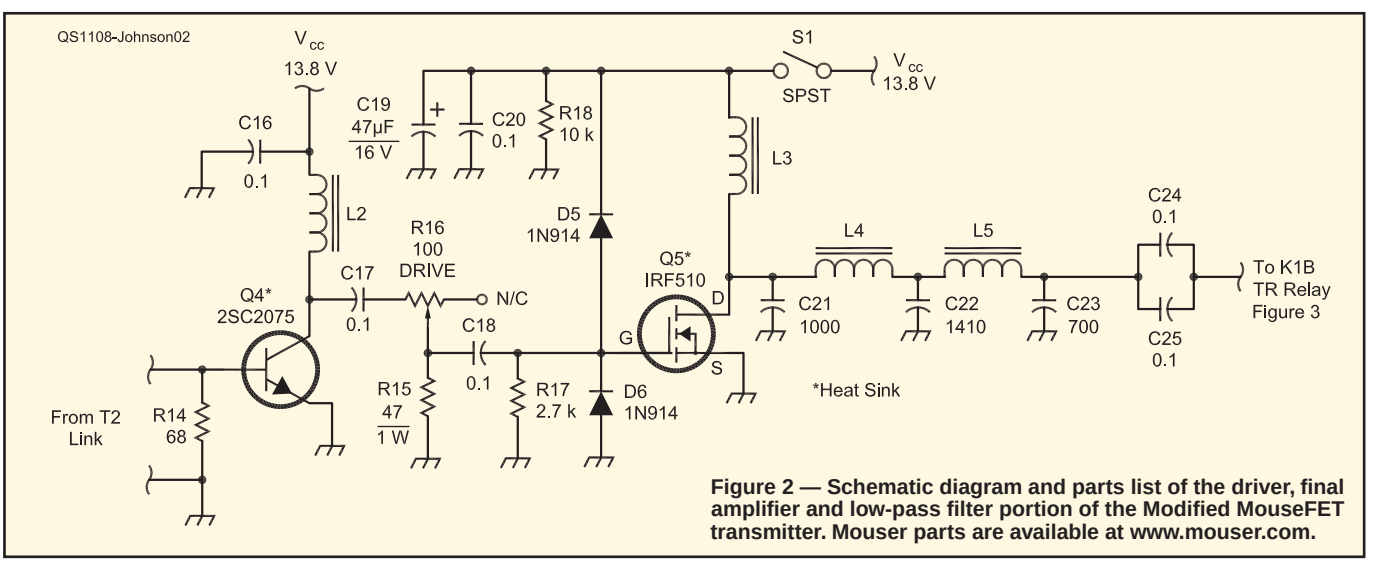

Figure 2 — Schematic diagram and parts list of the driver, final amplifier and low-pass filter portion of the Modified MouseFET transmitter. Mouser parts are available at www.mouser.com.

C16, C17, C18, C20, C24, C25 — 0.1 µF disc ceramic capacitor.
C19 — 47 µF, 16 V electrolytic capacitor.
C21 — 1000 pF silver mica capacitor (Mouser 598-cd19fo 102j031).
C22 — 1410 pF; three 470 pF silver mica capacitors in parallel.
C23 — 700 pF; seven 100 pF NPO capacitors in parallel.
D5, D6 — 1N914 diode.
L2, L3 — Inductor, 12 turns #26 AWG enameled wire on T50-61 core.
L4 — Inductor, 10 turns #26 AWG enameled wire on T50-6 (yellow) core.
L5 — Inductor, 15 turns #26 AWG enameled wire on T50-2 (red) core.
Q4 — 2SC2075 or 2N3053 NPN transistor.
Q5 — IRF510 (Mouser 844 irf 510 pbf).
R14 — 68 Ω, ½ W resistor.
R15 — 47 Ω, 1 W resistor.
R16 — 100 Ω, 2 W linear potentiometer, Allen Bradley type J.
R17 — 2.7 kΩ, ½ W resistor.
R18 — 10 kΩ, ½ W resistor.
S1 — Miniature SPST toggle switch.

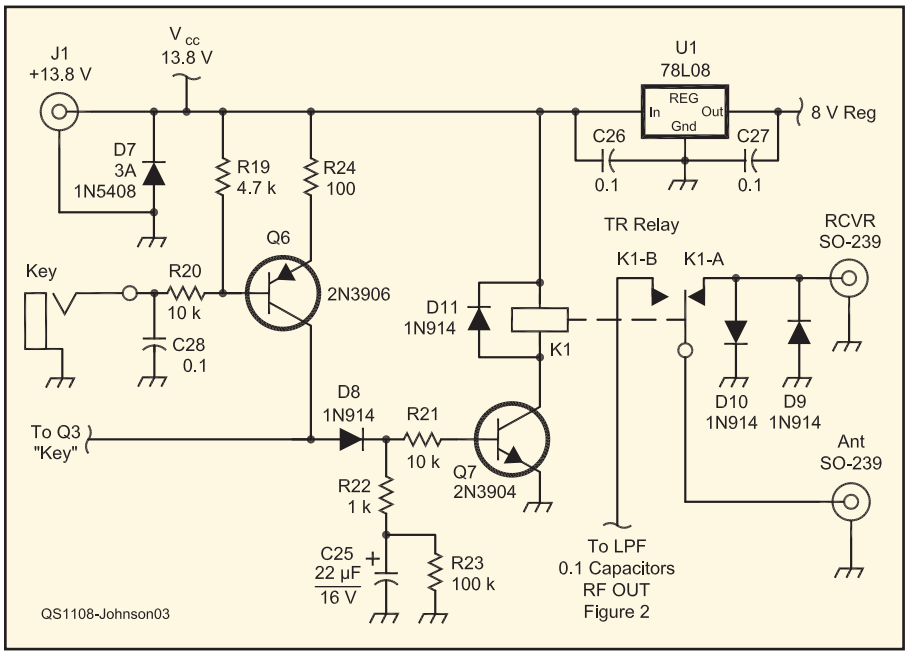

Figure 3 — Schematic diagram and parts list of the power distribution and control portion of the Modified MouseFET transmitter.

C25 — 22 µF, 16 V electrolytic capacitor.
C26, C27, C28 — 0.1 µF disc ceramic capacitor.
J1 — Power jack (RadioShack 274-1563).
K1 — TR relay, DPDT, DIP package.
Q6 — 2N3906 silicon PNP transistor.
Q7 — 2N3904 silicon NPN transistor.
R19 — 4.7 kΩ, ½ W resistor.
R20, R21 — 10 kΩ, ½ W resistor.
R22 — 1 kΩ, ½ W resistor.
R23 — 100 kΩ, ½ W resistor.
R24 — 100 Ω, ½ W resistor.
U1 — 78L08, 8 V voltage regulator IC (Mouser 511 l78o8abz).
Enclosure, 7 × 5 × 3 inches LWD or larger (see text), LMB 145 (Mouser 537-145PL).
Cushion feet (Archer 64-2342).
Two sided PC board, cut to fit. Install shorting jumpers in four corners and center.

while the gain of Q3 2N2222A was high. I decided to limit the output to 10 W. This reduced the heat in the enclosure. The IRF 510 MOSFET is a good choice for a QRP transmitter running 5 to 15 W output at a V_{CC} of 13. 8 V. For a good article on using a MOSFET as a QRP final, download the discussion by Paul Harden, NA5N.[5]

Power Distribution and Control

The schematic of the power distribution and control subsystem is shown in Figure 3. The power suppy voltage is supplied at the power connector J1. The center pin is positive polarity. I used an adjustable voltage supply of 12 to 13.8 V dc as the power source, but any supply in this range should work satisfactorily. The current rating on my supply is 2 A, somewhat higher than necessary. Diode D7 provides protection against applying the wrong polarity.

The voltage is applied to several circuits: voltage regulator U1, TR relay K1 and Q6, the transistor that keys Q3 in Figure 1. The time delay of Kl, the TR relay, is controlled by C25 and R23. Transistors Q6 and Q7 are turned on when the key jack is grounded. Diodes D9 and D10 help protect the receiver antenna input from any RF that might pass through the capacitance coupling of the relay contacts.

Construction

Most of the transmitter was constructed on two pieces of dual sided printed circuit board 6.75 × 3.0 inches wide. The PC boards have shorting jumpers installed on the four corners and center to provide a good ground plane. The wiring uses tie point terminal strips and "ugly" construction technique as shown in Figure 4. Many manufacturers, including Heathkit, used similar wiring techniques prior to the shift to solid state

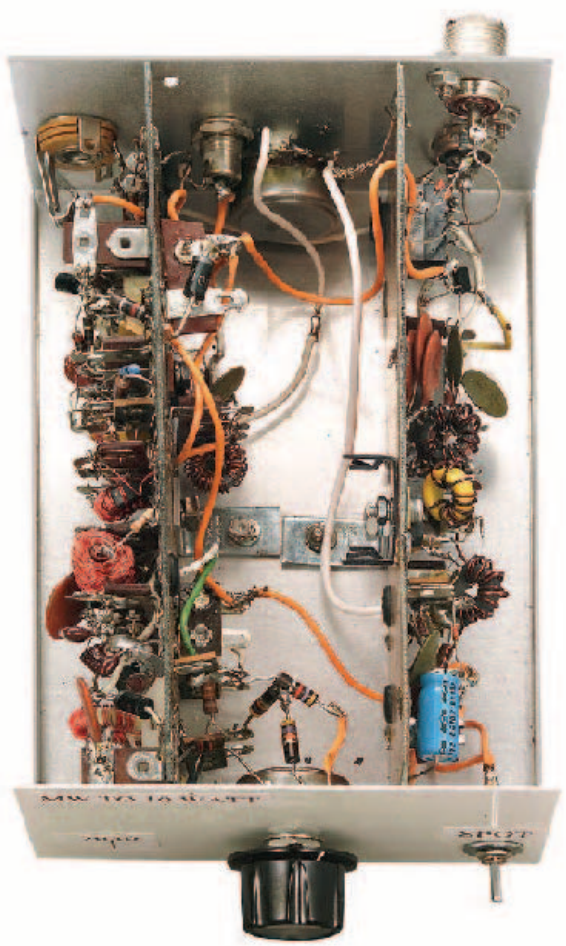

Figure 4 — View of the inside of the Modified MouseFET showing construction layout.

Figure 5 — Rear panel view of the Modified MouseFET showing connector layout.

devices and printed circuit boards.

The cost of tie point terminals has risen significantly over the years and I thus recommend using Manhattan style tie points. These are made by cutting the board into 0.25 × 0.25 inch pieces and cementing them to the larger board using general purpose household cement. I cut the pc boards by using a 10 inch long hand sheet metal cutter. The board on the left contains all of the circuitry shown in Figure 1. The driver transistor Q4 (2sc2075) is mounted on the far side of this board. The board on the right in Figure 4 contains the class C amplifier Q5 (IRF510), the output low pass filter and the TR relay. Figure 4 also shows a small heat sink to cool Q5. With a proper heat sink, this transistor has a power dissipation of up to 35 W.

After the photo was taken, I destroyed an IRF510 because of poor heat sinking when I held the key down for greater than 5 minutes. I added more heat sinking to the near and far side of this board. This allowed me to key down for longer than 10 minutes with no failures. The additional heat sinks are 2.0 × 1.5 inches bolted securely to the far side of the larger board. I had these available but they can be purchased from Mouser Electronics. Figure 5 shows the rear panel with the layout of the connector and key jack.

Performance

The transmitter was tested at the ARRL lab and it met the FCC requirements for spurious and harmonic attenuation.The series tuned Colpitts VFO has excellent frequency stability. The L1 (T68-7) core has a small positive temperature coefficient, which is largely offset by the use of the polystyrene capacitors that have a small negative temperature coefficient.

I will be looking for you near 7030 kHz to 7040 kHz, the QRP *watering hole*!

Notes

[1]M. Masterson, WN2A, "Three Fine Mice — FET CW Transmitter," *QST*, Dec 1986, pp 19-24.
[2]**www.qsl.net/wn2a/mouse.html**
[3]I. Purdie, VK2TIP, "Colpitts Oscillators," **www.electronics-tutorials.com**.
[4]Micrometals iron powder cores, **www.micrometals.com/appnotes_index.html**, *RF Applications*, *Issue H*.
[5]"The Handiman's Guide to MOSFET Switched Mode Amplifiers," **na5n@r166.com**.

ARRL member William E. Johnson, WØMS, was first licensed as W8VOK while in Michigan. He now holds an Amateur Extra class license. He received a BSEE from Lawrence Technological University in Southfield, Michigan and is retired from a career as a Professional Engineer.
Bill can be reached at 910 Newman Dr, Elizabeth, CO 80107, or at **w0ms@arrl.net**.

In the July/August 2011 Issue:

■ Craig Johnson, AAØZZ, presents a "Programmable PLL Local Oscillator for HF Receivers, Transmitters and Transceivers." Craig chose the Silicon Labs Si570 DSPLL programmable PLL synthesizer IC and custom software to build a local oscillator that produces a stable 10 to 157 MHz output signal. The oscillator can provide the local oscillator signals for quadrature sampling detector receivers and quadrature sampling encoder transmitters on the 80 through 10 meter amateur bands.

■ David Gordon-Smith, G3UUR, presents a filter design article in "Extended Bandwidth Crystal Ladder Filters With Almost Symmetrical Responses." G3UUR uses inductors in parallel with the crystals to build hybrid ladder filters and restore symmetry to the filter response.

■ Gary Appel, WAØTFB, describes software he wrote for "Filter Synthesis Using Equal Ripple Optimization" techniques. As Gary explains, the Newton-Raphson method is a way to use an initial approximation and then to arrive at a better approximation of the value. In this case the goal is a filter design with equal ripple across the passband.

■ James Hontoria, W1JGH, describes "A 10 MHz to 6 GHz Power Meter." Based on a Mini-Circuits ZX47 power detector, this meter uses an LCD to give a direct readout of power levels from –55 dBm to +10 dBm.

■ Robert Zimmerman, NP4B/VE3RKZ, describes five years of research at McMaster University in "Transmission and Reception of Longitudinally-Polarized Momentum Waves." James Clerk Maxwell's famous equations of electromagnetic radiation predict an alternative form of radiation, which NP4B refers to as *vector potential radiation*. Bob was involved in research that results in a demonstration of the communications potential of what was previously considered to be only a theoretical curiosity.

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New Products

DXTREME *STATION LOG* — MULTIMEDIA EDITION VERSION 7.0

♢ DXtreme *Station Log* Version 7.0 offers multimedia and advanced functions. The *Station Log* window includes the expected logging functions and also retrieves the frequency and mode from supported rigs through integration with Afreet Omni-Rig; displays DXCC and grid/VUCC status information for logged stations; indicates whether logged stations are users of ARRL's Logbook of the World (LoTW); retrieves and stores current and historic solar flux, A Index, and K Index values per station; allows tracking of the propagation mode used, and tracks QSLs sent and received. If the computer is connected to the DX spotting network, the DX Spot Checker queries the *Station Log* database and alerts the operator to spots needed for DXCC or VUCC awards. Multimedia functions let users listen to previous contacts and view QSLs whenever they browse their logs. The software can also be used to create QSL and address labels for physical QSLs, create signed TQ8 files automatically for uploading to the LoTW server; produce ADIF-based electronic QSLs for uploading to eQSL.cc, and produce a variety of reports. DXtreme *Station Log* runs in 32 and 64 bit versions of Microsoft *Windows 7*, *Vista* and XP. Price: $89.95 (North America) for new users; special upgrade pricing is available for current users. For more information or to order, visit **www.dxtreme.com**.

A Suspended Quarter Wave 40 Meter Wire Vertical Monopole

You can support a monopole from the top and avoid the need for a bunch of radials.

Bob Glorioso, W1IS

The antenna described here is now in its second incarnation. The first version, thrown together to try it out, finally needed to be replaced after being up for nearly 20 years. This antenna has several unusual characteristics. First, it is a full quarter wave wire vertical. Second, the bottom and radials are 10 feet off the ground, thereby minimizing ground losses and making it a very efficient radiator. Third, the design is a bit unconventional as it has only two radials. Why? Well, you really only need two radials on any vertical to provide a balanced counterpoise and two quarter wave 40 meter radials are easier to fit into a small yard.

The catch — the radials have to be in line, 180° apart, to obtain omnidirectional coverage even if they have to be woven through the trees or brush [see the recent *QST* article by David Robbins, K7BKI, for a different approach. — *Ed.*][1] To show that you only need two radials I have included the *EZNEC* azimuth pattern even though it is a boring circle (see Figure 1). As is true for all verticals, it radiates equally badly in all directions! But don't sell a low band vertical short. This is a great DX antenna. The elevation plot (see Figure 2) shows that the take-off angle is a respectable 21°, great for DX even though the gain is not high compared to horizontal antennas. [A 40 meter horizontal dipole would have to be 90 feet above typical ground to achieve the same radiation angle. — *Ed.*]

My antenna is hanging from the limb of a pine tree about 45 feet off the ground. This leaves room for the 34 foot vertical radiator and at least 10 feet of space from the base of the antenna to the ground — plenty of room under the antenna to mow the lawn. Note that the proximity of the tree to the antenna can influence the tuning so it is best to start with longer wires and prune them to get the SWR lowest in the part of the band that you use. I spend most of my time on the lower end of the CW portion with a few trips up to as high as 7.2 MHz. Table 1 shows that I have less than 1.35:1 SWR over the part of the band I operate though my rigs are very happy without a tuner up to the high end of the band where the SWR is still less than 1.75:1.

Table 1

Measured Standing Wave Ratio (SWR) over 40 Meter Amateur Band

Frequency (MHz)	*SWR*
7.0	1:1
7.1	1.05:1
7.2	1.35:1
7.3	1.75:1

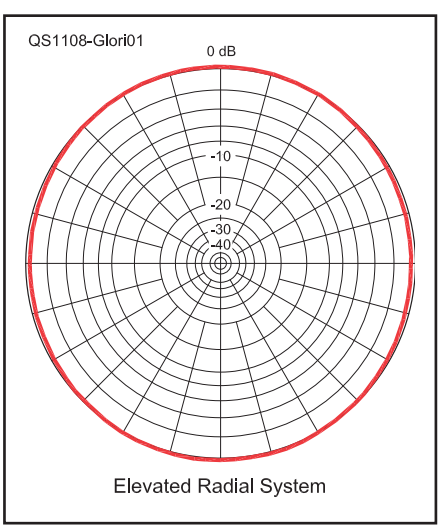


Figure 1 — 7.1 MHz azimuth plot at 21°. Note that it is omnidirectional in spite of only having two radials.

Construction

A dimensioned diagram of the antenna is shown in Figure 3. For the vertical radiator portion, I suggest starting with a 36 foot length of wire #14 AWG or larger. I used #12 AWG silky stranded wire available from The Wireman (**www.thewireman.com**) as item #516. I try to use #16 AWG wire or larger for my radials, so I purchased 75 feet of #14 AWG Flexweave insulated wire from The Wireman, item #542.

The most critical piece is the mount for the coax, radiator and radials. I used aluminum in my first version with an expedient strain relief for the radiator. My current antenna uses a scrap piece of double sided printed circuit board and a more respectable strain relief, an acrylic insulator (the Wireman #813 — see Figure 4).

First cut a 3 inch piece of acrylic plastic in half with a hack saw or band saw. Drill two holes to accommodate two 6-32 screws as shown in Figure 4. Next lay out the board

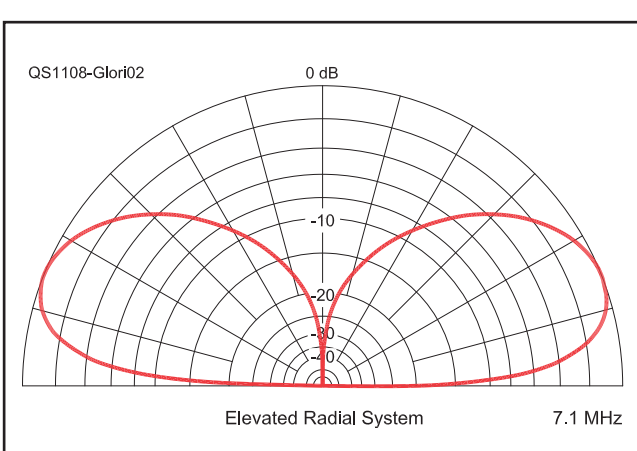


Figure 2 — Elevation plot of 40 meter elevated monopole. Note peak at 21° with maximum gain of –0.26 dBi.

[1]D. Robbins, K7BKI, "A Single Element Vertical Beam," *QST*, Jun 2011, pp 42-44.

to make sure you have enough room for the insulator, the coax connector and one radial screw. The other radial will be tied to the screw that holds the insulator. Make the hole for the coax connector. A punch is the easiest way but a ring of small holes and a half round file will also work as will a spade bit. Drill the holes for the insulator and one hole on the opposite side for the other radial. Mount all the parts and admire your work or panic and start over. Scrap PC board is cheap and you probably learned something anyway.

Cut the wires at least 35 feet long so you have enough wire to wrap around the insulators and some to spare for tuning. Strip about 1 inch from one end of each radial wire and tin them. Then bend the wires around the radial attach screws, one on the end of the board and the other holding the insulator, using one washer on each side of the wire and tighten. Attach insulators to the other ends as shown in Figure 5. Note the extra length for adjusting resonance

Feed the radiator wire through the hole in the insulator and wrap it around the long side of the radiator a turn or two leaving enough wire to reach the coax connector. Then solder it to the center conductor of the SO-239 coax jack. I also soldered the wrap to hold it in place. Put an insulator on the other end of the radiator.

Now get out your bow and arrow or sling shot, or warm up your arm and get a rope up 45 feet in a tree. If the radiator goes over a branch either put some shrink wrap on it or good electrical tape. I use a light cord to hold up the radials that are tied to a screw in a tree. The load on the radials is very light as trees don't move much at that height (see Figure 6).

My antenna is about 20 feet from the house so I used a short piece of RG-8X to keep the weight on the antenna down and fed that to a piece of Buryflex coax that goes under the grass and into the shack. The thinner coax and cord for the radials also keeps the antenna visibility down as it is on the street side of our house. I use a straight shovel or an edger to slit the grass and stuff the direct burial rated coax just below the turf. I have used this method to bury radi-

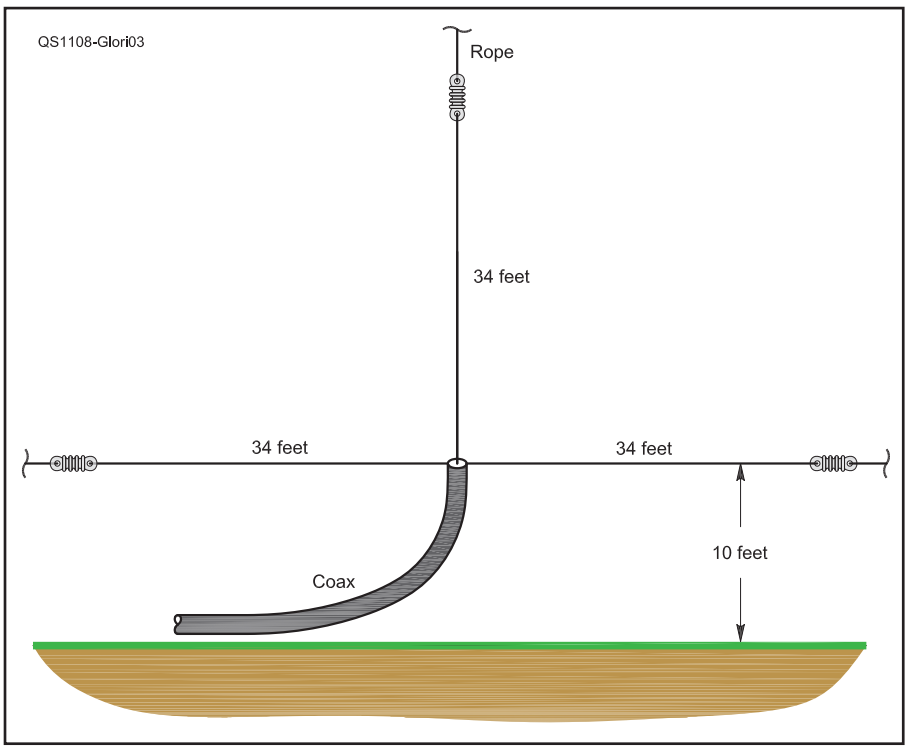


Figure 3 — Vertical monopole configuration and dimensions. (Not to scale.)

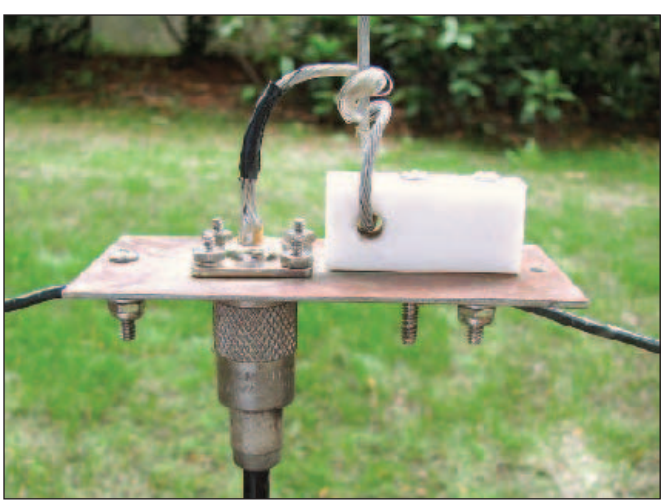


Figure 4 — Base connection point for radiator, radials and coax.

Figure 5 — Radial with extra wire for tuning — support cord is on the left.

Figure 6 — The vertical monopole suspended from my pine tree at 45 feet.

Hamspeak

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

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.

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

Elevation pattern — Graphical plot of the radiation intensity of an antenna at different elevation angles. For an omnidirectional antenna, the elevation pattern is the same at every azimuth angle. Other antennas will have elevation patterns that are different at each azimuth angle, so usually the plot at the most significant azimuth is shown. Elevation patterns with large signals near the horizon are generally preferred for line of site operations, such as in VHF mobile communication. Low elevation angles also provide for the longest distance communication via ionospheric propagation.

EZNEC — Antenna modeling software that provides a user friendly interface to the powerful *Numerical Electromagnetic Code* (NEC) calculating engine. Many of the antenna pattern plots used in *QST* articles are generated using *EZNEC*. Several versions of *EZNEC* antenna modeling software are available from developer Roy Lewallen, W7EL, at **www.eznec.com**.

Omnidirectional — An antenna, microphone or light source that radiates equally in all directions. In contrast to a directional source, such as a flashlight, that focuses its energy in a particular direction.

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. See **www.cebik.com/gp/gr.html**.

RG-8X — Coaxial cable type with 50 Ω characteristic impedance. RG-8X is of an intermediate size between RG-58 and RG-8. It has a foamed dielectric resulting in lower loss than RG-58. RG-8X can use a PL-259 plug with an adapter intended for RG-59 cable.

S-unit — Unit of measure on S-meter. Each S-unit is intended to represent a factor of 2 in input voltage at the receiver antenna terminals.

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.

Takeoff angle — Angle above the ground that an antenna radiates the most power. Lower angles, near the horizon, generally are the best for long distance propagation.

als for my 160 Meter Inverted L and to run coax out to my K9AY receiving loop nestled in the woods opposite the 40 meter vertical.

Next tune the antenna by lengthening or shortening the radials and the radiator a few inches at a time. An antenna analyzer is very helpful for this process. All the elements should be the same length when you are finished.

Operation

This is a terrific DX antenna but is marginal for domestic contacts shorter than a few thousand miles. I also have a 130 foot dipole fed with ladder line up about 50 feet broadside toward the east and west that works well on 40 meters. DX stations from all directions are regularly stronger than an S-unit or more on the vertical and most domestic stations see the same advantage on the dipole. Independent of the orientation of the dipole, the take-off angle on the dipole is about 40°, nearly twice that of the vertical, which is why the vertical beats the dipole for DX in all directions.

I have used this antenna mostly with my Ten-Tec Argonaut 509 that puts out about 4 W. Since I got the '509 on an Internet auction site 2 years ago, I have worked 139 countries on CW and 45 on SSB using this antenna. I have even called DX in pileups and gotten through!

ARRL member Bob Glorioso, W1IS, was first licensed in 1955 as WN1EBW and later as W1EBW. After earning BSEE and MSEE degrees he earned a PhD in Computer Science. He served in the US Army as a Captain managing a small group of researchers. After leaving the military he upgraded to Amateur Extra and received his current call.

After his military service, he joined the Electrical and Computer Engineering faculty at the University of Massachusetts, Amherst. His interest in designing and building computer systems led him to the Digital Equipment Corporation, first as Manager of the Corporate Research Group and later as Vice President of the Information Systems and Management Consulting Businesses.

He was founder and CEO of Marathon Technologies Corporation, fault and disaster tolerant systems until his retirement in 2003. Currently he is on the Board of Boston Green Goods and Boston Logic, and works part time for QC Avionix LLC, a company he started with his son, Scott, K1SRG, and Russ Moore, WA1RKO, making and selling electronic devices for general aviation aircraft.

His ham radio interests are low power (QRP), mostly on CW, antennas and working ARRL Field Day with the PART club in Westford, Massachusetts. He has published several technical books, papers and articles, including ham radio articles on subjects ranging from building and modifying gear to antennas. He is also a private pilot and flies a Bonanza and a Citabria. You can reach Bob at 70 Birch Hill Rd, Stow, MA 01775-1307 or at **w1is@arrl.net**.

Feedback

◊ In "Product Review — Kenwood TS-590 HF and 6 Meter Transceiver" [May 2011, pp 45-49] the discussion of ranking of close spaced dynamic range on Rob Sherwood's website contained an error in our interpretation of his data. The close-in dynamic range of the TS-590S transceiver in "up conversion" mode was misread as being the 9th best performing receiver in his table of receiver test data (see **www.sherweng.com/table.html**) because of its position in his list. The up conversion close-in dynamic range performance at 76 dB was actually 29th and the location at 9th place in the table was intended for easy comparison to that of the down conversion mode at 88 dB in 8th place.

◊ In "Direct Digital Synthesis for Those Classic Rigs" [Jun 2011, pp 37-41] a few errors crept into the schematic of Figure 2. On U3, pin 13 should go to analog ground, grounding one end of C16, C17 and C18. Similarly, on U5 pin 2 should be tied to digital ground, also grounding the negative ends of C21, C22 and C23.

◊ In "Two Small Helical Antennas for 2 Meters" [Jun 2011, pp 45-49] the red and green traces from Figure 6 were omitted and Figures 9 and 10 were reversed. A corrected version of each is included of the revised expanded article on the QST-in-Depth website at **www.arrl.org/qst-in-depth**.

VOSK — A Voice Operated Straight Key For Hands Free CW Operation

Don't let a glass arm or other disability keep you from sending great CW.

Arthur J. Glazar, W2NN

VOSK (Voice Operated Straight Key) is a battery powered accessory that converts microphone audio output into contact closures. For example, if you vocalize the sequence "dit dit dit" into the VOSK microphone, a sequence of three contact closures (the Morse letter S) appears at the output jack. VOSK is essentially a very sensitive voice operated relay.

Potential applications of VOSK range from frivolous to serious. On the frivolous side, you could conceivably operate hands-free CW while bicycling (carefully, of course). On the serious side, VOSK could provide a workaround for a major physical disability.[1] Between those extremes are hams like me, who can no longer use a straight key because of a *glass arm* or similar affliction. VOSK can help us because it requires no special training. With it, we can once again generate Morse code with a distinctive swing.

In some VOSK applications, vocalizing may be undesirable or difficult, and so, an alternative method of generating audio input is needed. One solution is to use a whistle. I purchased a silent dog whistle (see Figure 1) at a local pet shop. The frequency of this whistle is adjustable (approximately 3 to 5 kHz) by means of a threaded plug that varies the length of a resonant tube. The whistle makes it easy to generate crisp Morse characters but it requires a bit more wind than vocalizing.

Figure 2 shows the VOSK (with cover removed) together with an inexpensive computer headset, a convenient input/output device. The box has two HEADSET jacks and two TRANSCEIVER jacks. The HEADSET jacks accept the headset's microphone and earphone plugs. The TRANSCEIVER jacks (and adapter cables) provide the interface to a transceiver's audio output and CW key input.

VOSK uses a reed relay as the output keying device. Figure 3 shows an oscilloscope photo comparing a 100 ms burst of 200 Hz audio input (upper trace) against the output relay contact closure (lower trace).[2] The time scale is 20 ms per centimeter, indicating that the contact closure is stretched about 12 ms compared to the audio burst.

Figure 2 — VOSK (cover removed) with computer headset.

[1]Notes appear on page 39.

Figure 1 — A silent dog whistle. If you aren't up to whistling, this can work. Use caution if dogs are about.

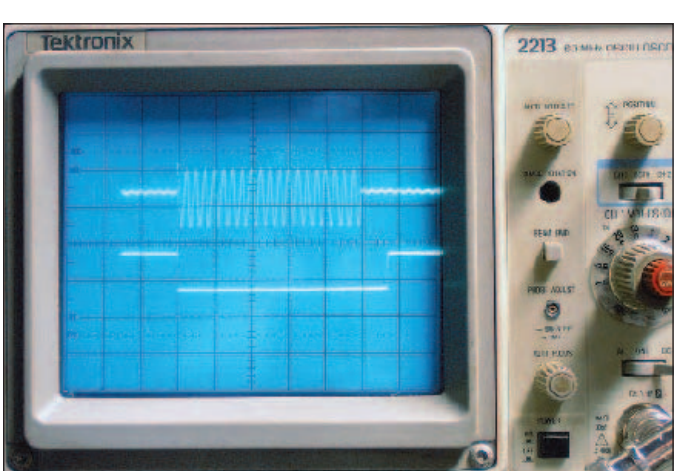


Figure 3 — Input 100 ms burst of audio (upper trace), output contact closure (lower trace)

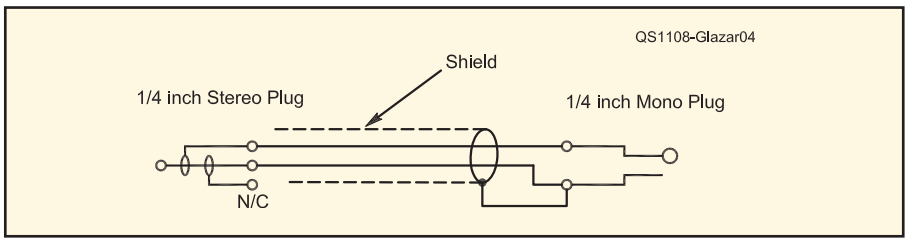


Figure 4 — Interface cable schematic.

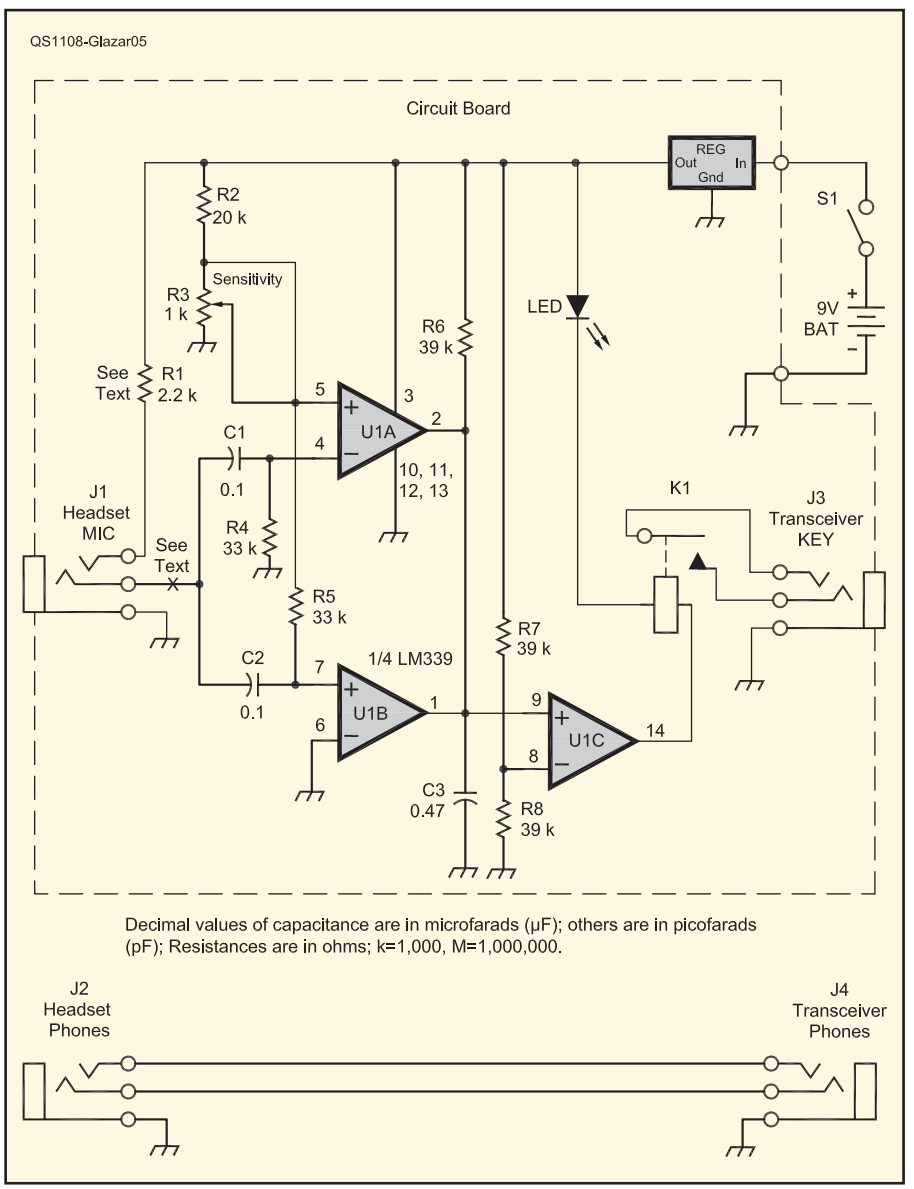


Figure 5 — VOSK schematic and parts list.

C1, C2 — 0.1 µF disk ceramic capacitor.
C3 — 0.47 µF disk ceramic capacitor.
D1 — LED (RadioShack #276-309).
J1-J4 — ¼ inch stereo phone jack (RadioShack #274-312).
K1 — Reed relay, Tyco OMR-106H (RadioShack #275-232).
R1 — 2.2 kΩ, ¼ W resistor (see text).
R2 — 20 kΩ, ¼ W resistor.
R3 — 1 kΩ potentiometer (RadioShack #271-280).
R4, R5 — 33 kΩ, ¼ W resistor.
R6-R8 — 39 kΩ, ¼ W resistor.
U1 — LM339 quad comparator (RadioShack #276-1712).
U2 — LM7805 5 V regulator (RadioShack #276-1770).
Aluminum project box, 5¼ × 3 × 2⅛ inches (RadioShack #270-238).
Circuit board — (RadioShack #276-150).
Battery clip — (RadioShack #270-326).

For simplicity, VOSK uses four identical ¼ inch stereo phone jacks. On the input side, these require adapters to mate with the headset's mini (⅛ inch) stereo plugs.

An alternative to using adapters, of course, is to rewire the headset with ¼ inch stereo plugs. On VOSK's output side, two simple adapter cables, fitted with ¼ inch plugs, are used to interface with the rig (see Figure 4). The mix of input/output connector sizes can be selected to accommodate a particular application.

Circuit Description

Figure 5 is a schematic of the VOSK circuit. The heart of the circuit is the popular LM339 quad comparator. Only three of the four comparators are used, with unused pins being grounded in accordance with the manufacturer's recommendations.

Audio from the microphone is routed through blocking capacitors C1 and C2 to comparators U1A and U1B. U1A processes positive half cycles of audio while U1B processes negative half-cycles. An adjustable threshold voltage, established by R2 and R3, is applied to both comparators to establish the audio sensitivity. In the absence of a signal, the threshold voltage keeps both comparators turned off (collectors pulled up to +5 V). A signal of either polarity that exceeds the threshold causes the wired-or output to go low. Functionally, U1A and U1B act together as a full-wave rectifier followed by a limiter, thus converting half cycles of millivolt audio into negative-going, 5 V amplitude rectangular pulses.

The input time constants provided by R4 × C1 and R5 × C2, set the lower cutoff frequency for audio input at around 50 Hz. The time constant provided by R6 × C3 filters out transients from the rectified and limited output of U1A and U1B. Comparator U1C then squares up the waveform applied to the relay coil. It is the action of the R6 × C3 time constant that is primarily responsible for stretching of the relay contact closure seen in Figure 3.

Light emitting diode D1 turns on whenever K1 is energized. It is a useful indicator when setting up the VOSK microphone sensitivity and for monitoring CW output visually, but is not strictly necessary for operation and may be omitted if desired.

Either an electret microphone or a dynamic microphone can be used with VOSK. Computer headsets employ electrets which require a nominal 5 V operating voltage. This is the function of R1. However, if a dynamic microphone is used, R1 should be disconnected or simply omitted. An SPST switch could be incorporated to permit easy switching between the two types of microphones.

An LM7805 IC voltage regulator, U2, provides regulated +5 V dc to maintain stable operation over the life of the battery. Battery current drain is approximately 7 mA

key-up, and 22 mA key-down.

Two identical interface cables are required between VOSK and rig. The schematic (see Figure 4) assumes that the rig uses ¼ inch mono jacks for both key input and headphones out. With the interface cables wired as shown, the headset's left and right earphones are connected in series, thereby doubling the impedance presented to the rig. If shielded cable is used, the VOSK and rig grounds can be kept isolated by not connecting the shield at the VOSK end. If unshielded wire is used, twisted pair is preferred.

Except for the jacks and power switch, all of the circuitry is built on a RadioShack 276-150 circuit board. The board is mounted on threaded standoffs and fits nicely in a RadioShack aluminum project box. There is sufficient clearance to mount a battery clip and battery alongside the board.

I recommend that the LM339 and the relay be socketed. Two separate TO-5 transistor sockets, properly spaced, work nicely for the relay.

Setup and Operation

Before installing a battery it is advisable to check the dc resistance across the battery terminals with an ohmmeter, with the power switch in the ON position. Readings will depend upon the type of ohmmeter used, the selected resistance range, and polarity of the test leads. But in any case, the reading should be greater than 1 kΩ if the wiring is correct.

Connect a microphone. Set R3 to maximum sensitivity (0 Ω). Install a battery and turn the power switch ON. If the LED is on continuously, increase the resistance of R3 (decrease sensitivity) until the LED goes out. Speak into the microphone and observe that the LED flashes in synch with the audio input. If this all checks out, the next step is to connect the VOSK output to a code practice oscillator or to a rig setup so you can monitor the quality of the keying without generating RF. I use my Kenwood TS-830S in the CW mode, listening to the sidetone with transmitter power turned off. The VOSK should be adjusted to the lowest sensitivity that yields good keying for a given audio input and microphone distance.

Some Observations and Tips

1. Reed relay contacts do not tolerate surge currents. Depending upon your specific application, you may want to consider adding a resistor (perhaps 10 to 100 Ω) in series with the output to limit current through the relay contacts.

2. I experience a bit of RF in my shack if I use my end-fed wire antenna on 40 meters, but I've encountered no RF feedback problems with VOSK. Other situations may require adding RF bypass capacitors on affected input/output leads in the VOSK.

3. If you don't use headphones, unwanted acoustic feedback may key the VOSK. There are several ways to avoid acoustic feedback (other than using headphones):

(a) Use the lowest possible VOSK sensitivity setting, and keep your mouth close to the microphone to generate sufficient audio input.

(b) Use a dog whistle exclusively, and raise VOSK's low frequency cutoff from 50 Hz to the whistle's range (let's say 3 kHz), by adding a series 1500 pF capacitor at point X in Figure 5.

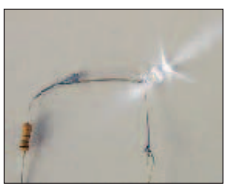
(c) Use a homebrew directional microphone. A RadioShack electret microphone element (#270-092) can be wired into the back of a ¼ inch stereo plug as shown in Figure 6 (wiring instructions are included with the element).

After wiring, screw on the plastic backshell and attach a length of rubber tubing using either adhesive or shrink sleeving. Finally, disassemble a dog whistle and force the input end of the whistle into the tubing (see Figure 7). This half of the whistle just serves as a mouthpiece; it does not whistle. You must hum or otherwise vocalize to get an output signal. And you may want to include a moisture filter somewhere in the line to protect the electret element.

Hamspeak

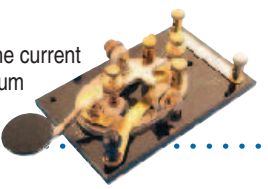
Electret microphone — Type of mic in which the voice diaphragm is one plate of a capacitor that moves with respect to a fixed plate during speech. The element includes a miniature solid state amplifier.

Glass arm — Colloquial name for a repetitive stress injury frequently impacting arms of wireline telegraphers due to continuous operation over a work shift using a straight key for sending. Also known as telegrapher's paralysis, it resulted in the development of a number of alternative sending devices using a side to side motion. First developed were sideswipers, then the mechanical semiautomatic "bug."



Light emitting diode (LED) — Semiconductor device from which light is emitted when current flows. These were originally used in place of incandescent bulbs as indicator lights. They now can be used in place of larger light bulbs and form the basis of some display screens. See **en.wikipedia.org/wiki/Light-emitting_diode**.

Straight key — Traditional up and down motion telegraph key with no automation.



Time constant — Time required for the voltage in an RC circuit or the current in an RL circuit to rise from zero to approximately 63.2% of its maximum value or to fall from its maximum value 63.2% toward zero.

Figure 6 — Electret element wired to ¼ inch stereo phone plug.

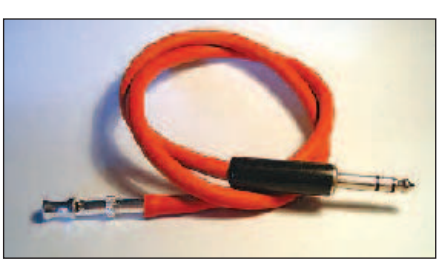


Figure 7 — Homebrew directional microphone.

Notes

[1]Gary Gordon, K6KV, "Build a Puff-and-Sip Key," *QST*, Mar 2004, pp 31-32.

[2]This corresponds roughly to a 13 WPM spoken "dit."

ARRL member and Amateur Extra class operator Arthur J. Glazar, W2NN, was first licensed in 1946 as W2TLX. In 1947 he obtained an FCC commercial radio telegraph operator's license and made his first ocean voyage as a radio operator. He continued his seafaring career during the Korean War, and then served two years in the US Army. Upon discharge in 1956 he took advantage of the Korean War GI Bill to obtain his degree in electrical engineering.

From 1960 until retirement in 1991, he worked in the electronics industry on Long Island, New York, specializing in EMC analysis in the later years. Art presently puts his spare time to work at the Cradle of Aviation Museum in Garden City, New York, where he restores vintage avionics. You can reach Art at 31 Amapola Ln, Kings Park, NY 11754-3908 or at **w2nn@arrl.net**.

The FSKit — A Simple Sound Card Interface for Generating Radioteletype Frequency Shift Keying

You can get on the air with digital modes, even if you have a newer computer.

Doug Hall, K4DSP

Have you noticed all the new digital modes being introduced lately? It's exciting to see the power of modern computers brought to bear on the problem of communicating data over difficult radio paths. Fast CPUs and the shift to sound cards for use in digital mode communication have brought us these new modes and have enhanced the old modes as well. Old fashioned RTTY has likewise benefited from the sound card revolution and is as popular as ever. In fact, RTTY is still the digital money mode for contesting and DXing and that's not likely to change any time soon.

Which Modulation Technique?

If setting up a new rig for RTTY, the question of whether to use audio frequency shift keying (AFSK) or radio frequency shift keying (FSK) often arises. AFSK is relatively easy to use as the tones from the sound card are fed into the transceiver's mic jack (or into the corresponding audio input port on the rear panel) and the levels adjusted for proper modulation. FSK operation, on the other hand, requires a logic (on/off) signal corresponding to the RTTY mark and space signals to be applied to an FSK input on the radio's rear panel.

If properly configured, there is no discernible difference between AFSK and FSK on the air. For various reasons many operators prefer FSK. For example, some radios only allow narrow IF filters to be used for RTTY if the FSK mode is selected. Some operators encounter problems with RF getting into the audio circuitry while using AFSK, especially if running high power. For whatever reasons, many operators encounter problems when configuring their sound cards and software for FSK operation.

If you're interested in using FSK for RTTY, or if you just want a simple sound card interface for digital modes, read on. This article describes a sound card interface that makes FSK generation easy. It also works fine for other digital modes and will allow you to explore those exotic new modes at your leisure.

Where's My Serial Port?

A common method for generating an FSK signal is to use the transmit data line on an RS-232 serial port on your computer. Some sound card software supports this method. The serial port is programmed to the RTTY baud rate (usually 45.45 baud) and the transmit data (TxD) line is connected to the radio's FSK input via a simple transistor interface. But if you've ordered a new computer

Hamspeak

AFSK — Audio frequency-shift keying. Digital mode modulation technique in which distinct audio tones are transmitted, generally from a single sideband transmitter, to simulate the shifting of a radio frequency with binary data as in FSK (see below).

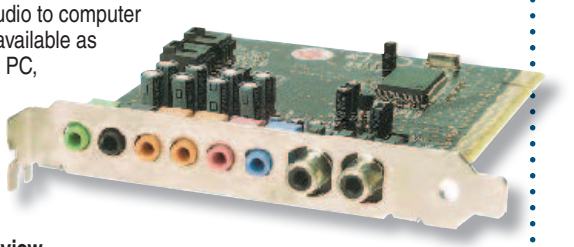
Baud — Digital signaling rate in symbols per second. For the special case in which a symbol represents a single bit (binary signaling), Baud equals the data rate. In most codes, however, multiple bits are sent in each symbol using multiple amplitudes, frequencies or most commonly phases. In this case, the data rate is a multiple of the symbol rate.

FSK — Frequency shift keying. A radio signaling method in which different logic states are transmitted by a shift in frequency. This is commonly employed for radioteletype transmission in which there are two signal states — current flow, or *mark*, or no current flow, or *space*. The frequency shift can be an audio tone shift on VHF FM, usually a 170 Hz shift between 2125 Hz (mark) and 2295 Hz (space). On HF the actual carrier frequency is usually shifted the same amount, although with an SSB transmitter (with good carrier and opposite sideband suppression), transmitting the audio tones will have the same effect.

RS-232 serial port — External interface to a computer that can be used to exchange data with peripheral devices. The port generally uses a single data line in each direction to transmit the data in serial format (rather than in parallel, as in a printer port with its eight connections per direction). It is defined to operate at speeds to 19.2 kbps over relatively short distances and includes many handshaking signals on separate wires.

RTTY — Radioteletype. Originally a communications system in which keyboard initiated data is sent to a mechanical key printer, like a typewriter. A five unit code is used to represent the 32 possible keys, including one to toggle between letters and figures (including punctuation). Often now synthesized using a computer or video terminal.

Sound card — Generic name for an audio to computer processing interface device. Originally available as an internal plug-in accessory card for a PC, the functionality is now generally available in the PC itself. Advanced models are often configured as an external device from the connected PC. See the May 2007 *QST* Product Review of samples of various configurations at **www.arrl.org/product-review**.



USB — Universal serial bus. Connection arrangement intended to allow computer peripherals to be connected to a PC. Originally supplied as a more compact replacement for RS-232 type serial connections on laptop PCs, it is commonly found on all recent PCs. See **www.usb.org**. This use of USB should not be confused with upper sideband, which shares the same abbreviation.

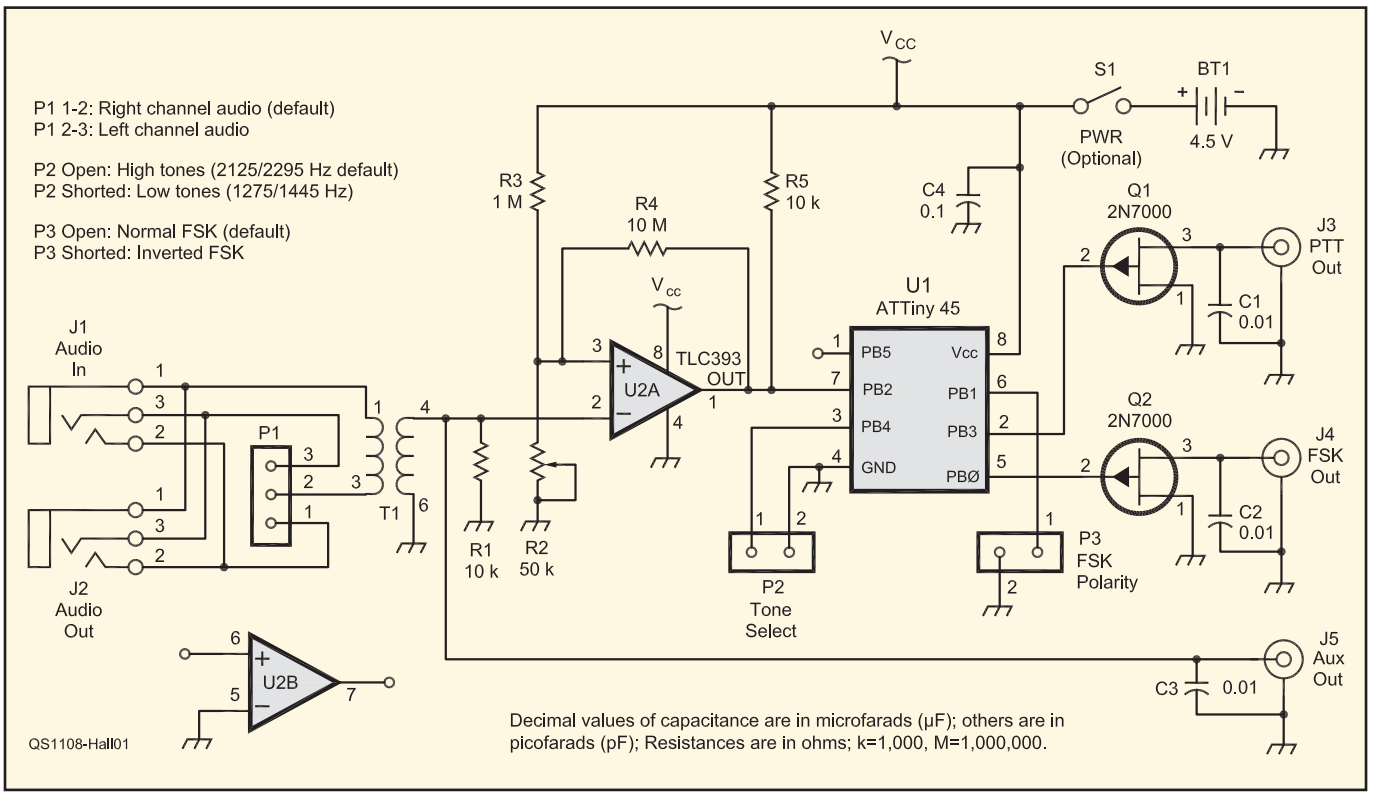


Figure 1 — The FSKit schematic and parts list. Mouser sourced parts are available from www.mouser.com.

BT1 — 4.5 V dc dry battery. Three AAA size in series, or equivalent.
C1-C3 — 0.01 µF ceramic capacitor.
C4 — 0.1 µF ceramic capacitor.
J1, J2 — 3.5 mm stereo phone jack (Mouser 806-STX-3100-3NB).
J3-J5 — RCA phono jack (see text).
P1 — Three pin header.
P2, P3 — Two pin header.
Q1-Q3 — 2N7000 N-channel MOSFET (Mouser 512-2N7000D74Z).
R1, R5 — 10 kΩ, ¼ W resistor.
R2 — 50 kΩ trimpot.
R3 — 1 MΩ, ¼ W resistor.
R4 — 10 MΩ, ¼ W resistor.
T1 — 600 Ω, 1:1 audio transformer (Mouser 42TL016-RC).
U1 — Atmel ATTiny45 microcontroller (Mouser 556-ATTINY45-20PU).
U2 — TLC393 comparator (Mouser 595-TLC393IP).

recently you're in for a surprise — many modern computers no longer come equipped with RS-232 serial ports.

Adding a serial port to these systems requires a plug-in card or a USB-to-serial adapter. The trouble doesn't end there — some computers don't have expansion slots and many modern USB-to-serial adapters no longer support 45 baud operation. For these and other reasons I decided to create an interface that required nothing more than the sound card signals to generate the necessary FSK signal as well as a PTT signal for keying the radio. The result is a versatile sound card interface I call the FSKit.

DSP Doesn't Require a DSP

The FSKit demodulates the RTTY AFSK signal from the sound card, much like the old RTTY terminal units did. The result is an FSK output signal that follows the AFSK mark and space frequencies at the input. But the demodulator in the FSKit doesn't use the traditional band-pass filters and slicer circuitry that the old terminal units used. Instead, it uses a simple, low-cost microcontroller to perform the necessary signal processing to demodulate the AFSK signal from the sound card.

This demodulator can be quite a bit simpler than a regular RTTY modem because it only has to demodulate clean audio. There is no fading, noise or other interference to deal with, only clean mark and space tones from the sound card. The FSKit uses the magic of software and takes advantage of the availability of a fast, inexpensive microcontroller to handle all of the signal processing. Digital signal processing doesn't necessarily require a dedicated digital signal processor.

How it Works

Figure 1 shows the FSKit schematic. The audio output from the sound card is connected to J1 and coupled via transformer T1 to the comparator circuit comprised of U2. This circuit converts the sine wave signal from the sound card into a square wave with a level suitable for interfacing to a digital input on the Atmel AVR ATTiny45 microcontroller U1.

The microcontroller is programmed to look for edges (high-to-low or low-to-high signal transitions) on the square wave and measure the time interval between them. The frequency is determined from this time interval, and the FSK output at pin 5 is set to the appropriate level based on whether the tone being measured is a mark tone or a space tone.

The FSK signal is interfaced to the radio via Q2, an open drain device. Also, Q1 is activated whenever there is a signal present on the input. It then provides a PTT output to the radio. Jumpers are read by the microcontroller to configure the unit for low (1275/1445 Hz) or high (2125/2295 Hz) RTTY tones, and to select normal or inverted polarity for the FSK signal. In order to simplify operation (and to reduce the chance of hum or ground loops) the unit is battery powered. The microcontroller is programmed to go to sleep (low power mode) and draws very little current if there is no input signal, so a power switch really isn't necessary. Microcontroller firmware is available on the QST-in-Depth website.[1] The entire circuit draws less than 10 µA while it's inactive, and only a few milliamps when it's active, so a set of batteries should last over a year.

The software is written using the *C* programming language and is compiled using the free (and excellent) AVR GCC tools and is available from the author's website.[2,3]

[1]Notes appear on page 42.

The AVR GCC compiler is available for *Windows*, *Linux*, or *Mac OS X*. Programmed ICs for U1 are available from the author for those who do not have the ability to program their own. Printed circuit boards are also available. Contact the author for more information.[4]

Construction

Figure 2 shows an FSKit assembled from the available circuit board, but the circuit is quite simple to reproduce, and wiring is not extremely critical. Point-to-point wiring will work just fine. You should consider using a socket for U1, as the microcontroller can be reprogrammed over and over and it's nice to have the option of adding new features in the future. (In fact, I encourage you to download the source code and make your own enhancements.)

U2 was chosen especially for low power consumption, so be careful with substitutions as they may have an adverse impact on battery life. Stereo jacks (3.5 mm) are recommended for J1 and J2 since they match those found on most sound cards and stereo patch cables are readily available. RCA phono jacks are recommended for J3, J4 and J5, but you are free to use whatever works best for you, or to wire your cables directly to the board. You don't *have* to use battery power, but however you choose to power the circuit make sure you *never* apply more than +5 V dc or you'll destroy the microcontroller. Power supply voltages less than +3 V dc will result in erratic operation. I've found that three AAA (or AA) batteries work well and provide many months of reliable operation.

Getting on the Air

Connect the sound card audio line output to J1 on the FSKit. An "audio-through" jack is provided at J2 if you need access to the sound card output for other functions. In addition the transformer isolated audio is available at J5 and can be connected to the audio input of your rig for use with PSK31 and other digital modes. Connect J4 to the FSK input on your radio, and connect J3 to the PTT input. Place a jumper on P2 if you are using RTTY low tones (1275/1445 Hz.) Leave the jumper off of P3 unless you know ahead of time that your radio requires inverted FSK.

Now fire up your favorite digital mode software and place it in transmit mode. Adjust the audio threshold control (R2) so that your radio keys and unkeys reliably as you switch between transmit and receive modes. You may also need to adjust the sound card output level in addition to adjusting R2. If you find that you are transmitting "upside down" (your mark and space tones are reversed but you are copying other stations) place a jumper on P3 to reverse the FSK polarity to your radio.

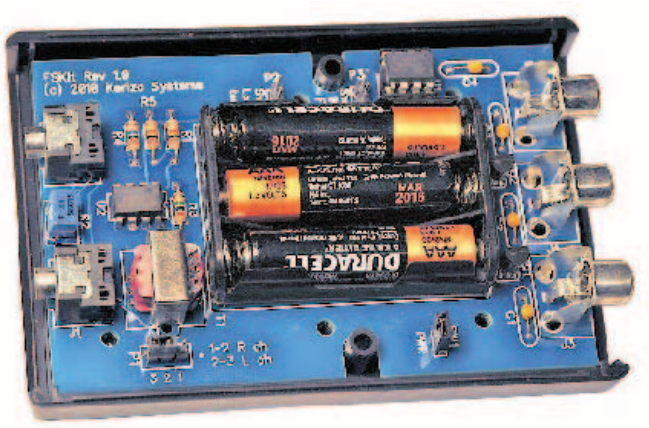


Figure 2 — An FSKit assembled from the available circuit board. The circuit is simple to reproduce, and wiring is not extremely critical.

Conclusion

The FSKit provides a simple sound card interface for digital modes and provides an FSK output for RTTY that does not depend upon legacy serial ports or other hardware. I have been using this circuit for over a year now under *Mac OS X* (using W7AY's excellent *cocoaModem* software) and with *Windows XP* (using *N1MM* contest logging software and *MMTTY* multi digital mode software) with excellent results.[5]

Notes

[1]**www.arrl.org/qst-in-depth**
[2]**www.avrfreaks.net/wiki/index.php/Documentation:AVR_GCC**
[3]**k4dsp.homeip.net/~doug/fskit**
[4]**k4dsp@arrl.net**
[5]**homepage.mac.com/chen/w7ay/Site/index.html**

ARRL member and Amateur Extra class operator Doug Hall, K4DSP, has been a ham for 36 years, and operates on all bands from 160 meters through 70 cm using SSB, CW and digital modes. He is also an avid mobile CW operator. He enjoys homebrewing both hardware and software, restoring and operating vintage equipment and experimenting with and modeling antennas. Other interests include computer controlled machining, motorcycling, sailing, kayaking and hiking with his wife of 31 years.

Doug has a degree in Electrical and Computer Engineering from North Carolina State University. In the 1990s he developed a line of DSP based noise filters for the Amateur Radio market (the JPS NIR-10 and NIR-12) and now works in the semiconductor industry specializing in microcontrollers. He also serves on the board of a college student ministry. He is a member of the Smith Chart Amateur Radio Society.

You can reach Doug at 4920 Grinnell Dr,

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Ten-Tec Model 599AT Eagle HF and 6 Meter Transceiver

Reviewed by Joel R. Hallas, W1ZR
Technical Editor, QST
w1zr@arrl.org

With the introduction of the Eagle, Ten-Tec has joined Elecraft and Kenwood in the HF and 6 meter transceiver market segment that features compact size and high performance receivers. The Eagle, also known as the model 599 without internal antenna tuner and 599AT with one, uses a down converting receiver architecture to a first IF of 9.0015 MHz on all bands. Supplied and optional roofing filters at the first IF allow the Eagle to achieve its dynamic range performance.

Does Size Matter?

We should emphasize that this is indeed a compact and lightweight transceiver. At a size about the same as the compact entry level radios from other manufacturers, this radio includes many of the features, and arguably competent performance, almost to the level of their much larger Orion series of transceivers. For a long time the Orion offered the best close in dynamic range on the market.

On the other hand, there just aren't as many knobs and switches on the front of this radio as on its larger brethren. This may please some operators, but may frustrate others as well.

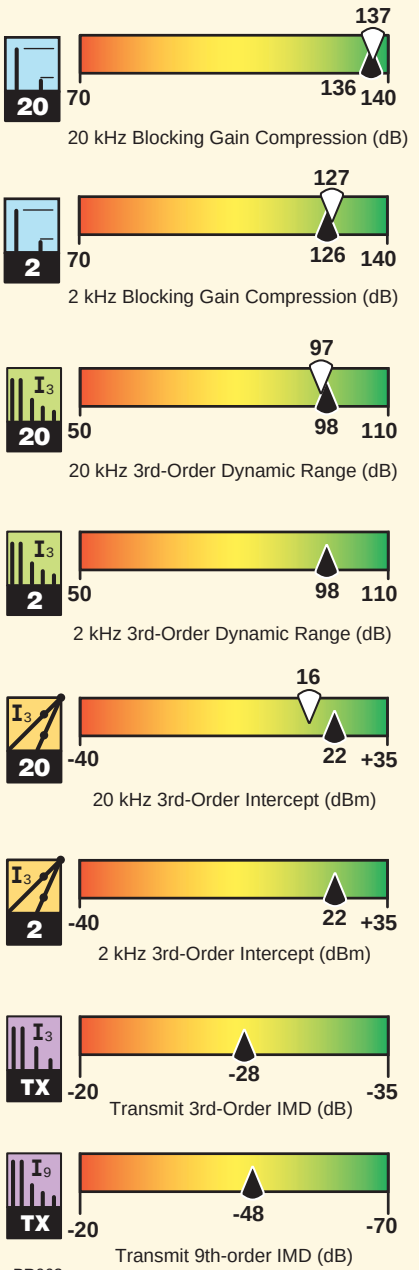
Front Panel

There are a total of just six rotary controls on the panel with two in concentric pairs. The TUNING knob is at the center, as expected. On the left are the concentric AF GAIN and RF GAIN knobs, while on the far right are concentric BW (bandwidth) and PBT (passband tuning) controls. The other rotary control is the MULTI knob. The MULTI knob is used to make adjustments to settings of parameters selected by one of the pushbuttons.

There are an even dozen pushbuttons on the front panel. Ten-Tec uses each button for at least two functions. The one shown and illuminated on each button happens with a quick tap or push. A secondary, often related function shown just above the button, is in play if the function (FNC) button is depressed — but there are exceptions. For example the BAN button is used to change bands. In primary function mode, each press moves to the next higher frequency band. In receive mode, the secondary function (marked MON) changes bands in the downward direction. If switched to a voice transmit mode, MON allows adjusting the level of the voice monitoring function. A clever multiplexing of labels occurs with the SP-CW secondary function on the MIC button. In voice modes, SP means *speech processor* level, while in CW mode SP means keyer *speed*.

Not well described in the current manual is an occasional *third* related function on a front panel button. For example the FAST tuning speed button has squelch on/off (SQL) as a secondary function. In order to

Key Measurements Summary



Bottom Line

The Eagle brings together a very good receiver in a compact footprint HF and 6 meter transceiver with minimal menus and controls.

set the squelch level, one needs to hold the FAST/SQL button in for 3 seconds while in FNC mode. Once you've held it long enough, a numerical value appears on the display that can be changed with the MULTI knob to set the desired squelch threshold. This was not quite intuitive to me, and I think it should be described in the manual. Ten-Tec notes that this has been included in *Manual Addendum C*, dated February 21, 2011. This is available on their website and clarifies the operation. Once you have reached that epiphany, it is something you will likely try if you can't find a way to do something — and it does show up in a few other places.

The tuning rate can be set to five levels by repeatedly pressing the (FAST) button, which changes the tuning step — 1 Hz, 10 Hz, 100 Hz, 1 kHz and 10 kHz. The appropriate visible digits on the display change along with the tuning rate and also with mode change. This provides a lot of choice, but has the downside that you need to go all the way around if you want to change back one step.

There are 100 memory locations available. Transmit and receive frequency, mode and bandwidth can be stored into a memory location. The procedure is well described in the manual, but I found it took a while to get used to. Pushing the V/M (*VFO mode to memory mode* change, not *VFO data to memory* as I first guessed) button enters the radio into memory mode. To store a frequency you push FNC to enter secondary mode. The display shows the last selected memory location, which you can accept as the destination by pushing the V/M button, or select another memory location by turning the MULTI knob. As you turn the MULTI knob, you can see any data stored in each location before you decide to enter the new data there.

You recall data from a memory location in a similar way, except you don't push the FNC button. What I found confusing was that while in memory mode, you store data with the MR (I would have guessed memory *recall*, but think memory *record*) function, while you retrieve it with the V/M button. It seemed a bit convoluted to me, but it comes naturally with practice.

The front panel MIC connector is the now usual 8 pin type, wired according to the Yaesu standard. The connector provides 9 V dc on a separate pin for use in biasing an electret type mic. The connector supports audio, PTT and bias connectivity only — other pins are not used. The DIN accessory connector on the rear panel includes a pin for line level audio input — for digital mode operation, or perhaps an external equalizer if used. Pressing the MIC button for 3 seconds switches the input to the back connector and the display MIC on the front panel is extinguished. The front and rear audio inputs have separate level adjustments provided. These are accessed by a short tap of the MIC button while in the appropriate connection mode — a handy arrangement.

The Eagle includes a monochrome fluorescent display screen that provides all critical operating information, but not all the bells and whistles of the "big boys." The default display shows the frequency of both A and B VFOs in the center. The frequency display is surrounded by the usual mode and

Table 1

Ten-Tec 599AT Eagle, serial number 3051271430

Manufacturer's Specifications	Measured in the ARRL Lab
Frequency coverage: Receive, 0.5-30, 50-54 MHz; transmit, ham bands only.	Receive, 0.5-30.01, 50-54 MHz; transmit 1.795-2.005, 3.495-4.005, 5.2485-5.415, 6.995-7.305, 10.095-10.155, 13.995-14.355, 18.063-18.173, 20.995-21.455, 24.885-24.995, 27.995-29.705, 50-54 MHz.
Power requirement: 13.8 ± 15 % V dc; receive, 1.25 A transmit, 20 A (typical).	At 13.8 V dc; receive 1.6 A (max audio); transmit, 16 A (100 W out). Operation confirmed at 11.7 V dc.
Modes of operation: SSB, CW, AM, FM, RTTY, PSK.	As specified.

Receiver

CW sensitivity: 500 Hz bandwidth, –132 dBm preamp on (typical), –126 dBm preamp off (typical).

Noise figure: Not specified.

AM sensitivity: 6 kHz bandwidth, 10 dB SINAD: <4 µV, preamp off.

FM sensitivity: 16 kHz bandwidth, 10 dB SINAD: <2.2 µV, preamp off.

Blocking gain compression: 138 dB/20 kHz, 127 dB/2 kHz RF gain at 12 o'clock, preamp off.

Reciprocal mixing (500 Hz BW): Not specified.

Receiver Dynamic Testing

Noise floor (MDS), 500 Hz DSP bandwidth, 600 Hz roofing filter

	Preamp off	*Preamp on*
0.505 MHz	–84 dBm	–88 dBm
1.0 MHz	–83 dBm	–91 dBm
3.5 MHz	–127 dBm	–133 dBm
14 MHz	–126 dBm	–134 dBm
50 MHz	–124 dBm	–131 dBm

14 MHz, preamp off/on: 21/13 dB

10 dB (S+N)/N, 1-kHz, 30% modulation:

	Preamp off	*Preamp on*
1.0 MHz	1.25 mV	549 µV
3.8 MHz	3.05 µV	1.60 µV
50.4 MHz	9.93 µV	2.06 µV

For 12 dB SINAD:

	Preamp off	*Preamp on*
29 MHz	2.78 µV	1.16 µV
52 MHz	3.30 µV	1.46 µV

Gain compression, 500 Hz DSP bandwidth, 600 Hz roofing filter†:

	20 kHz offset *Preamp off/on*	*5/2 kHz offset* *Preamp off*
3.5 MHz	>137/136 dB	134/127 dB
14 MHz	>136/137 dB	133/126 dB
50 MHz	134/133 dB	130/124 dB

20/5/2 kHz offset†: –115/–102/–95 dBc.

ARRL Lab Two-Tone IMD Testing (500 Hz DSP bandwidth, 600 Hz roofing filter)‡

Band/Preamp	*Spacing*	*Input Level*	*Measured IMD Level*	*Measured IMD DR*	*Calculated IP3*
3.5 MHz/Off	20 kHz	–30 dBm	–127 dBm	97 dB	+19 dBm
		–22 dBm	–97 dBm		+16 dBm
14 MHz/Off	20 kHz	–28 dBm	–126 dBm	98 dB	+21 dBm
		–18 dBm	–97 dBm		+22 dBm
		0 dBm	–55 dBm		+28 dBm
14 MHz/On	20 kHz	–32 dBm	–134 dBm	102 dB	+19 dBm
		–27 dBm	–97 dBm		+8 dBm
14 MHz/Off	5 kHz	–28 dBm	–126 dBm	98 dB	+21 dBm
		–18 dBm	–97 dBm		+22 dBm
		0 dBm	–55 dBm		+28 dBm
14 MHz/Off	2 kHz	–28 dBm	–126 dBm	98 dB	+21 dBm
		–18 dBm	–97 dBm		+22 dBm
		0 dBm	–54 dBm		+27 dBm
50 MHz/Off	20 kHz	–22 dBm	–124 dBm	102 dB	+29 dBm
		–16 dBm	–97 dBm		+25 dBm

Manufacturer's Specifications	Measured in the ARRL Lab
Second-order intercept point: Not specified.	Preamp off/on, +65/+67 dBm.
DSP noise reduction: Not specified.	14 dB maximum.
Notch filter depth: Not specified.	Auto notch: >70 dB. Attack time: 26 ms.
FM adjacent channel rejection: Not specified.	Preamp on, 29 MHz, 70 dB; 52 MHz, 71 dB.
FM two-tone, third-order IMD dynamic range: Not specified.	Preamp on, 29 MHz, 70 dB*; 52 MHz, 71 dB*.
S-meter sensitivity: S9 = 50 µV.	S9 signal at 14.2 MHz: preamp off or on, 72.9 µV.
Squelch sensitivity: Not specified.	At threshold, preamp on: SSB, 2.06 µV; FM, 29 MHz, 0.85 µV, 52 MHz, 1.0 µV.
Receiver audio output: >2 W into 4 Ω at at 10% THD.	1.3 W at 10% THD into 4 Ω. 1.7 W at 10% THD into 8 Ω (see text). THD at 1 V RMS, 1.4%.
IF/audio response: Not specified.	Range at –6 dB points, (bandwidth):** CW (500 Hz): 432-925 Hz (493 Hz). Equivalent Rectangular BW: 494 Hz. USB: (2.4 kHz): 50-2373 Hz (2323 Hz). LSB: (2.4 kHz): 50-2376 Hz (2326 Hz). AM: (6 kHz): 34-2978 Hz (5888 Hz).
Spurious and image rejection: IF rejection, >70 dB; image rejection >90 dB (HF), 70 dB (50 MHz).	First IF rejection, 14 MHz, 88 dB; 50 MHz, 98 dB. Image rejection, 14 MHz, 102 dB; 50 MHz, 75 dB.
Transmitter	**Transmitter Dynamic Testing**
Power output: 100 W.	SSB, CW, AFSK, PSK, FM, 0-109 W (HF), 0-100 W (50 MHz); AM, 0-45 W (HF), 0-74 W (50 MHz).
Spurious-signal and harmonic suppression: >50 dB (HF), >60 dB (50 MHz).	As specified (see text).
SSB carrier suppression: >70 dB.	As specified.
Undesired sideband suppression: >60 dB.	>70 dB.
Third-order intermodulation distortion (IMD) Products at 100 W PEP: Not specified.	3rd/5th/7th/9th order (worst case band): HF, –28, –40, –46, –48 dB; 50 MHz, –29, –40, –46, –50 dB.
CW keyer speed range: 5-60 WPM	6 to 53 WPM.
Iambic keying mode: Not specified.	Mode B only.
CW keying characteristics: 5 ms rise and fall time.	See Figures 1 and 2.
Transmit-receive turnaround time (PTT release to 50% audio output): Not specified.	S9 signal, 70 ms.
Receive-transmit turnaround time (tx delay): Not specified.	SSB, 16 ms; FM, 11 ms.
Composite transmitted noise: Not specified.	See Figure 3.

Size (height, width, depth): 2.9 × 8.5 × 10.3 inches; weight, 7.5 pounds with all options.

Price: Eagle 599 transceiver, $1795; Eagle 599AT transceiver with autotuner, $1995; roofing filters: 2000 (1.8 kHz); 2001 (600 Hz); 2002 (300 Hz); 2003 (6 kHz); 2005 (15 kHz), $125 each.

†AGC could not be disabled for this test.

‡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 3rd-Order Intercept Point. Second-order intercept points were determined using a –97 dBm reference.

*Measurement was noise-limited at the value indicated.

**Varies with PBT and Pitch control settings.

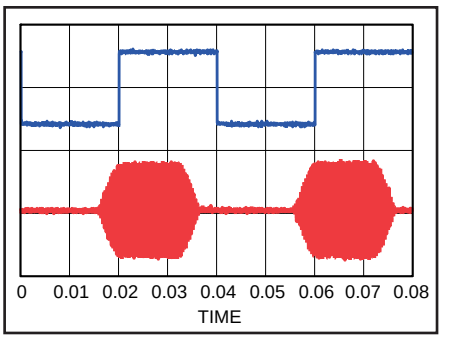


Figure 1 — CW keying waveform for the Eagle showing the first two dits in full-break-in (QSK) mode using external keying. Equivalent keying speed is 60 WPM. The upper trace is the actual key closure; the lower trace is the RF envelope. (Note that the first key closure starts at the left edge of the figure.)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

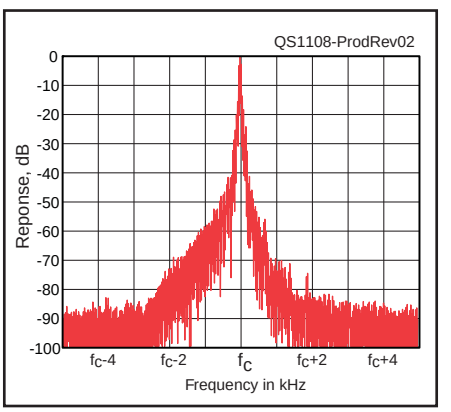


Figure 2 — Spectral display of the Eagle transmitter during keying sideband testing. Equivalent keying speed is 60 WPM using external keying. Spectrum analyzer resolution bandwidth is 10 Hz, and the sweep time is 30 seconds. The transmitter was being operated at 100 W PEP output on the 14 MHz band, and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

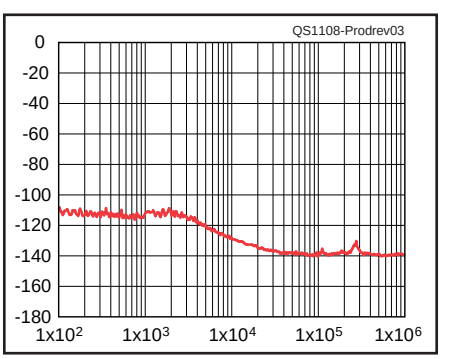


Figure 3 — Spectral display of the Eagle transmitter output during composite-noise testing. Power output is 100 W on the 14 MHz band. The carrier, off the left edge of the plot, is not shown. This plot shows composite transmitted noise 100 Hz to 1 MHz from the carrier. The reference level is 0 dBc, and the vertical scale is in dB.

function indicators. Some, such as mode and bandwidth, are always in view while some change as you make selections to let you know, for example, if either the preamp or attenuator are enabled.

During receive, a bar type S-METER is below the main frequency display. In transmit mode the bar graph changes to become an SWR meter. While this is handy for checking internal antenna tuner progress or for verifying antenna system operation, I really would have appreciated an indication

of power output, perhaps appearing after the antenna is tuned.

Rear Panel

The rear panel (see Figure 4) could best be described as uncluttered. The 13.8 V dc power connects via a pair of Anderson Powerpole connectors adjacent to the 25 A auto style blade fuse. Both are good choices, in my view. The single ANT (antenna) connector is a UHF, SO-239 type, jack. The next row down includes a ⅛ inch stereo KEY or keyer paddle jack, two DC OUT phono jacks (0.5 A maximum) to power accessories, a USB connector that replaces the usual serial port, an 8 pin DIN ACC (accessory) connector and a ⅛ inch mono EXT SPKR (external speaker) connector. A usable 3 inch up-firing speaker is included in the top cover, but for fixed station use most will opt for an external speaker.

The ACC connector currently provides a number of connections that many will appreciate access to, including: LINE IN, LINE OUT, PTT, AMP KEY LINE and GROUND. The other three terminations are reserved for future use, although they are identified with names: CLOCK OUTPUT, ENABLE OUTPUT and DATA OUTPUT.

Figure 4 — The uncluttered rear panel of the Eagle.

How's it Play?

The receiver and transmitter performance are top notch, as shown in Table 1 and accompanying figures. The Eagle offers close in dynamic range appropriate to its ancestry, and more than sufficient for most applications. This is a result of the down converting architecture with an HF first IF architecture shared with the Ten-Tec Orion.[1] This allows the use of narrow roofing filters with excellent shape factor, compared to upconverting radios with the more common VHF first IF. The exact dynamic range characteristics achieved will depend on which roofing filters you select. The filters can be added or changed quite easily.

Roofing Filters

There are slots for three roofing filter in the transceiver — two in addition to the 2.4 kHz filter supplied. Available roofing filters include 300 and 600 Hz bandwidths, intended for serious CW DXers and contesters, a 1.8 kHz for tighter control of SSB intermod, a 6 kHz for AM or wide SSB reception and a 15 kHz roofing filter intended for FM. Keep in mind that these filters are *roofing* filters designed to limit close in, but out of passband, spurious responses.

The actual operating bandwidth is set by the digital signal processing (DSP) filter that is behind the roofing filters — automatically changed as you set the bandwidth. The selectivity can be smoothly set using the dedicated one function BANDWIDTH knob from 100 Hz — in 25 Hz steps through the SSB bandwidth range to anything narrower than the widest roofing filter bandwidth. To set the bandwidth to wider than 2400 Hz for ESSB, AM or FM reception, you will need either the 6 kHz or 15 kHz filter. The choices go to 4, 5 and 6 kHz with the 6 kHz filter and all of those plus 10, 12 and 15 kHz with the 15 kHz filter.

I do enjoy AM operation from time to time, and found that listening with the 15 kHz roofing filter gave much more flexibility than the 6 kHz "AM" filter. AM transmission will work with either the 6 kHz or 15 kHz roofing filter. While the 6 kHz filter provides bandwidths through the "communication" range, for most AM reception that didn't have interference, such as on the AM broadcast band, I preferred listening through the wider bandwidths available with the 15 kHz filter.

Given the number of slots — and the fact that most AM operation is without concern over near-in dynamic range — I would opt for the 15 kHz filter and get FM operation for "free." If it were mine, since I mostly operate CW, in the two free slots I would add the 300 or 600 Hz filter, probably the latter, and the 15 kHz unit for wide bandwidth modes. Still, the serious CW contester might opt for 300, 600 and 1800 Hz. The phone-only op might choose 1800, 2400 Hz and 6 or 15 kHz.

The CONFIGURATION menu is used to tell the Eagle which filters you have and which slot each is in. During testing a problem with spurious response while using the unshielded 15 kHz filter was resolved by moving it into slot 1, where it is farther from the offending internal signal source; otherwise the filter slot is arbitrary.

In addition to the tests shown in Table 1, the Lab tested the Eagle with the 300 Hz roofing filter and our close-in dynamic range measurements were within 1 dB of those taken with the 600 Hz filter. There were no noticeable differences between the 600 Hz filter and the 300 Hz filter except there is a loss of about 2 dB of sensitivity with the 300 Hz filter in line. As you adjust the bandwidth control, the receiver automatically selects the proper filter. As you approach and pass the 300 Hz mark and go lower, you can hear the volume drop.

CW Features

The Eagle includes an internal iambic keyer (mode B only) with a rear panel ⅛ inch stereo jack for paddles. If you plug in a mono plug — or presumably a stereo plug with ring and sleeve tied together — it figures you must have a straight key and turn off the keyer. There is no provision for having both enabled at once.

As expected for a Ten-Tec transceiver, full break-in works flawlessly at any speeds I run at — usually below 30 WPM — and likely much higher. The keying is relay actuated, but the relay(s) are almost inaudible — I had to turn off the sidetone monitor and put my ear next to the radio to hear them at all. In order to adjust CW features, while in CW mode tap FNC then repeated activation of the MIC/SP-CW button will cycle through the various adjustments, such as keyer speed, weight, break-in delay and sidetone monitor level.

A full break-in keying line is available in the ACC connector to support keying of an external linear amplifier. A configuration menu choice provides for selecting the RF CW QSK DELAY. This is used to delay the receive turn-on between code

[1]For a discussion of the different transceiver architectures, see the sidebar included in J. Hallas, W1ZR, "Product Review — The Ten-Tec Omni-VII HF/6 Meter Transceiver," *QST*, Jul 2007, p 63. Past *QST* reviews are available to members on the ARRL website at **www.arrl.org/product-review**.

elements. The actual RF keying delay is fixed at 17 ms, which worked flawlessly with my elderly Ten-Tec Centaur linear in full break-in mode.

SSB Features

Phone ops have not been forgotten in the Eagle features list. The VOX works smoothly. A monitor function is provided, the level setting sharing the front panel button and adjusted with the MULTIFUNCTION knob while in voice modes and switched to transmit. This is best used with headphones to avoid acoustical feedback, but is very handy for setting up the mic gain and speech processing. A single LED indicates ALC peak level — a workable, if not too precise method, in my view. The Eagle is set to operate with typical mics through setting of the front panel MIC control. If additional range is required, for coarse adjustments a screwdriver controlled MIC GAIN potentiometer is accessible through a hole in the side of the cabinet. The default settings worked fine for both mics I tried.

I was fortunate to run across a nearby friend calling CQ on 20 meters one Saturday morning. Vlad Spitzer, W1ZP, the president of our local club, is located just 6 miles away and had a signal plenty strong enough to evaluate the Eagle's audio. He knows my voice, and said that I had good quality audio that sounded just like me when I called him using a Heil GoldLine mic with HC-5 element. I also tried the provided Ten-Tec 702 hand mic, which Vlad said sounded fine, but somewhat less like me. The Eagle does not offer any audio equalization, so your audio response will be set by the mic, or with external equalization if you use it.

Digital Features

The Eagle's rear panel accessory connector provides line level audio inputs and outputs. The output is always available and at a constant line level suitable for a sound card line input. The audio input is only active if selected by the MIC button, as described above. As noted, the separate level adjustment for the rear connector is convenient for setting up the sound card levels.

I successfully operated PSK31 using traditional audio links and VOX for transmit-receive control. A PTT line is also available on the accessory connector that could be used with a traditional sound card interface device. The Eagle manual describes a direct USB to accessory connector adapter accessory that allows connection to a PC sound system that has USB I/O. This was not available at the time of our testing. The manual doesn't indicate whether or not other ACC functions, such as amplifier keying, are available at the same time.

AM and FM Features

FM operation requires the optional 15 kHz roofing filter. Addendum B (added January 13, 2011) describes the process by which CTCSS repeater access tones are supported. There is no indication in the manual that standard repeater offsets are supported at this point, but repeater pairs may be established using the split function. Transmit and receive frequencies can individually be set into memory, along with the CTCSS tones. I didn't have an opportunity to try FM in my Eagle.

AM operation worked fine, and could be accomplished with either the 15 or 6 kHz roofing filter. Other voice features, such as the automatic digital notch filter work as well in AM as in SSB mode.

Optional Antenna Tuner

Our tested radio was the 599AT model that includes the built in antenna tuner. The tuner works on 160 through 10 meters, but not on 6 meters. I found it was able to tune my various antennas on all bands — including using my 100 foot center-fed dipole on 160. That's a real challenge since it has a very low impedance and probably a 25:1 SWR — more than Ten-Tec promised. It took a couple of tries, but I was very impressed it ever got it. That antenna with other tuners works well on 6 meters, so it's too bad the Eagle tuner doesn't tune that band.

The tuner function occurs via relays — as do most these days. While they are audible, they are not loud. The tuner may take 10 to 20 seconds to find a solution the first time, but seems to remember what it did the last time. If you change bands with the same antenna and then come back, retuning isn't needed. If the TUNE button is pushed, it tunes again, whether it needs to or not.

If you want to bypass the tuner, a 3 second push of the TUNE button takes it off line. This is very handy if you want to drive a linear amplifier or have matched antennas as well as those that need a tuner.

Standard Equipment and Accessories

The Eagle comes equipped with the model 702 dynamic hand mic with mic clip, a 4 foot power cable with matching Powerpole connector, a pair of fork terminals for power supply connection, a matching DIN plug for the accessory jack, a 3.5 mm stereo plug for the key jack, a spare fuse, an Allen wrench for the knobs and the 2.4 kHz roofing filter. The additional roofing filters discussed earlier are each $125. Additional Eagle specific accessories currently on the Ten-Tec website include the internal noise blanker (#320) at $49 and their mobile mounting bracket (#321) at $39. They offer a recommended switching power supply (#941) at $169, as well as their line of speakers, table mics and headsets. At the time of article preparation, the USB sound card adapter discussed in the manual was not listed on their website.

A Few Notes and Suggestions

The Eagle worked as advertised, or very closely (see Table 1), although we did uncover a few issues during testing. The first issue we noticed occurred during spurious response testing. At full power output, the Eagle passed FCC requirements on all bands. We noted, however, that on 6 meters the second harmonic stayed at the same amplitude if power were reduced so that at lower power levels it was noncompliant. This might result in serious problems for the amateur who used the Eagle to drive a 6 meter linear amplifier with a reduced input power requirement, for example, or if someone enjoyed operating low power on 6 meters to avoid interference to other services in the neighborhood. A hardware change improved the harmonic suppression to >60 dB at all power levels. If you think you will be operating under these conditions, check with Ten-Tec to find out if the problem is applicable to your serial number, and if so, how they will get your radio into compliance,

We also had some issues with FM operation that appeared to point to the 15 kHz filter, but were resolved by Ten-Tec with firmware version V1b.795 that we downloaded during testing. All firmware versions are available on their website.

A few other nits that might not bother everyone:

- The speaker wires are very short. Unless you are very good about remembering this while removing the top cover, you will break off the thin speaker terminal strip, leaving the connection hanging directly on the voice coil waiting for the next time (don't ask me how I know!). This is mainly an issue while adding or changing roofing filters.
- I did miss having a power output indication. Somehow, even though you can adjust the power output to any level you want, and the flashing LED on SSB voice peaks gives some assurance, I find it reassuring to know that signals are really leaving the radio.
- In the Lab, the receiver could not produce the specified audio output level of 2 W with a 4 Ω load. At the 10% total harmonic distortion (THD) level of 1.3 W, the distortion quickly rose past 10%, indicating the audio amplifier was quickly heating up. With an 8 Ω load the output rose to 1.7 W at 10% THD, and at that level, the

THD did not rise but stayed steady. Based on this testing, for best results the Lab recommends using an external speaker with 8 Ω impedance.

Firmware

Ten-Tec released a couple of firmware updates during the review process. Each was downloaded and installed without difficulty using the USB to computer connection. This uses the same type of cable that connects your PC to a USB printer, for example. These are readily available — I even found one in my basement cable box. The same connection can be used to work with control and logging software on your PC.

The process for upgrading firmware is spelled out in Section 4.2 of the manual. Make sure that you use a recent version, release 1.007 or later, since the process has been streamlined. Once you go through the preparatory steps, you turn on the transceiver while holding down the A/B button and run the update program. The only mildly disconcerting aspect of the software upgrade process is that the radio shows no indication of progress — it looks as if it's powered down the whole time, although the PC indicates that it is loading software. When finished, the Eagle magically powers up and briefly flashes the revision number, as it does each time it powers up.

Documentation

The Eagle comes with a fairly comprehensive 37 page manual. The manual is updated with addenda following significant firmware changes, so you will likely need to download a new copy, or at least addenda, following a firmware upgrade.

The manual is organized in a few different ways. First, the front and rear panels are described with keyed numbers on each control. Unfortunately, the descriptions of the control functions are neither listed in numerical order nor alphabetically. They seem to be grouped by common functions, but without headings indicating the group. Since the multiple functions of each control can transcend a single function, it can take a search to find out how a particular control operates. With the exception of the few cases discussed earlier it's all in there somewhere. There are also paragraphs oriented along the lines of how to set up to operate in different modes.

The manual covers setup and operation, including a basic "In Case of Difficulty" section. The detailed schematics (16 pages), programmer's guide and other support documents are available on the Ten-Tec website. Also provided is a set of detailed step-by-step instructions on how to provide a parallel (–3 dB) receive antenna connection on the rear panel for use with a second receiver, panadapter or external noise blanker. It will take an electric drill, but many will welcome the opportunity. Ten-Tec notes that current production models include the 9 MHz connector for panadapter or second receiver use, as well as a spare connector for the next accessory.

Manufacturer: Ten-Tec Inc, 1185 Dolly Parton Parkway, Sevierville, TN 37862; tel 800-833-7373; **www.tentec.com**; **sales@tentec.com**.

Ten-Tec 777 DX PRO Headset

Reviewed by Joel R. Hallas, W1ZR
Technical Editor, QST
w1zr@arrl.org

Ten-Tec offers a high quality headset at a moderate price in their new DX PRO line. Units are available with both stereo (model 777) and mono (model 776) headphones, making them suitable for use with most transceivers.

In May 2011 *QST*, I reviewed the new Heil Elite headset.[2] It is always tough to review an amateur headset without comparing it to a Heil model and that is particularly true with this one. The headphone suspension and gooseneck mic boom appear virtually identical to those of the Heil Elite. There are, however, some key differences:

- We made note in the May review that the Heil Elite uses a new mic element with a flat response — designed to work with equalization, either in an external unit or within many of the newer transceivers, to tailor the audio response. As noted in Table 2, the Ten-Tec mic has built-in frequency compensation (articulation) that makes it sound good without the need for additional equalization.
- The Ten-Tec headphones have cushions that fit around the ear, rather than on the ear, as with the Elite. The DX PRO does not include the cloth covers of the Elite.
- The Heil Elite includes a headset phase reversing switch while the Ten-Tec does not.

Otherwise, they look very much like peas in a pod.

Table 2
Ten-Tec 777 Manufacturer's Specifications

Microphone

Element: Unidirectional dynamic.

Frequency response: Optimized for 1.8 kHz.

Sensitivity: –80 dB ±3 dB at 1 kHz (0 dB = 1 V/bar at 1 kHz).

Connector: ⅛ inch gold plated monaural phone plug.

Headphones

Impedance: 22 Ω per channel (stereo).

Frequency response: 10 Hz to 22 kHz.

Connector: ¼ inch gold plated stereo phone plug.

Weight: 14.5 oz.

Price: 777 Stereo DX PRO, $129; 776 Mono DX PRO, $109; Radio specific adapter cables for Ten-Tec (also Yaesu), ICOM and Kenwood (also Elecraft), $19.95 each; R9622 mini PTT switch, $14.95; R9623 foot switch, $29.95.

Bottom Line

The Ten-Tec DX PRO headsets are the perfect choice for an operator looking for a comfortable, high quality boom mic headset that can provide fine sounding audio without the need for external equalization.

An Eagle Friendly Headset

It is actually a coincidence that the review of this headset is in the same issue as is the review of the Ten-Tec Eagle HF and 6 meter transceiver, but it makes perfect sense in a serendipitous way. While many new transceivers do include transmit audio equalization making them suitable for use with a mic having a flat response, the Eagle does not. Thus the articulation built into the DX PRO headset's mic would seem to make it a natural for operation with the Eagle as well as other transceivers that don't offer mic equalization, or even for operators who just don't want to fuss with it.

How Do They Play?

I found the headphones very comfortable to wear for extended periods and enjoyed them both for phone and CW operation. By just positioning the mic boom below my chin, I was not bothered by it during CW or keyboard mode operation. It also did not get in the way of drinking coffee, a requirement for me during contest operations. The

[2]J. Hallas, W1ZR, "Heil Pro Set Elite Headset," Product Review, *QST*, May 2011, pp 50-51.

receive sound quality was excellent — even while listening to loud classical music from the stereo system.

The unidirectional dynamic mic also worked very well during phone operation. I could tell by listening to the transceiver's monitor that the articulation was accomplishing its purpose — providing crisp clear communications quality speech. A removable blast screen is provided to help reduce wind or syllabic noise. The boom positioned the mic just forward of the left corner of my mouth — a good spot to avoid direct frontal overdriving.

Once again, I called on Dick Kalt, W1FYI, for his assessment. Dick, a professional broadcaster, lives about four miles away and, with our Yagis pointed at each other, we had excellent signal to noise ratios each way on 20 meters. Dick agreed that the mic with no additional equalization sounded nicely articulated and was pleasant to copy. He went on to say that anybody listening, especially using a wide (to 3.3 kHz) receive bandwidth, will find the overall sound to be articulate and comfortable to listen to, even for long transmissions.

As with most headsets there is no PTT switch built in. The optional Ten-Tec adapter cables — available for most current radios — include a ¼ inch phono jack for a PTT or foot switch for TR switching. Ten-Tec offers optional hand and foot operated PTT switches that we did not have for testing — but we had good results using our radio's VOX instead.

The headset comes with a very handy coiled cord. In its fully compressed state, it is about 40 inches long (plus adapter cable, if used) — just right to go between my usual operating position and the transceiver front panel. It can extend to at least 9 feet without putting too much strain on the curls. No more getting this cable stuck in my swivel chair wheels.

Manufacturer: Ten-Tec Inc, 1185 Dolly Parton Parkway, Sevierville, TN 37862, 800-833-7373; **www.tentec.com**; **sales@tentec.com**.

New Products

XTAL SET SOCIETY QRP STEP ATTENUATOR AND DUMMY LOAD KIT

♢This step attenuator is designed to be placed in-line between a QRP transceiver and antenna to reduce the output power in steps to find the lowest power needed to maintain contact. It includes a bypass switch for reception and/or full power operation. Three 6 dB and one 3 dB power attenuator pads are provided, so a 5 W signal can be reduced in 15 half-power steps to as low as 0.2 mW. A 5 W dummy load is included for bench work or comparison with an antenna. An LED power indicator, adjusted to emit light at or above about 40 mW, samples the output of the line of attenuation pads and can be used with the pads to provide a rough estimate of transmitter power. Maximum power input is 5 W. The full kit includes parts shown and case. Assembly requires pliers, screw drivers, solder, soldering iron, masking tape, drill and 9/32, 5/32 and 1/8 inch drill bits. Assembly time is said to be less than one hour for the regular builder. Price: QRP SADL full kit, $49.95. QRP SADL kit without case, $41.95. QRP SADL kit with PC board and manual only, $24.95. For more information, or to order, visit **www.midnightscience.com**.

COMET CAA-500 ANTENNA ANALYZER

♢ The CAA-500 Antenna Analyzer from Comet measures SWR and impedance over seven frequency ranges from 1.8 to 500 MHz, including the 222 MHz band. The cross-needle analog meter displays SWR and impedance continuously as you sweep the selected frequency range with the thumb wheel frequency adjustment. Impedance range is 12.5 to 300 Ω, and VSWR range is 1:1 to infinity. The digital readout is specified for 1 kHz accuracy. The CAA-500 has two antenna connectors — an SO-239 for 1.8-255 MHz and an N female for 300-500 MHz. The unit is said to operate 12 to 14 hours with six AA internal batteries (with low battery indicator) or from external 8-12 V dc, 200 mA power source. Price: $449. For more information, visit your favorite dealer or **www.natcommgroup.com**.

W1ZR

THE DOCTOR IS IN

Q Wayne, WA4WZP, asks: Since I received my license in 1965, most of my activity has been on VHF and UHF. On those frequencies, I was able to have all parts of my antennas up in the clear. In my current location, I have almost no room for antennas — and those I have need to be of the stealthy type — so I am learning new stuff!

I want to get active on 20 meter PSK31. My plan for a 20 meter antenna is to build the "Flag Pole Vertical" as shown in the March 2011 issue of *QST*.[1] I have no experience with HF verticals so I have done some research, but can't find answers to a several things.

I know ground radials are needed for a ¼ wave monopole, but does it make a difference if they are buried in the ground or can then be on top of the ground and covered by grass? If they need to be buried, how deep should they be? Is there any difference between using bare copper or insulated copper? Will aluminum wire work?

Another question: The vertical portion has to be insulated from the ground, but does it make a difference if the bottom of the vertical is 2, 6 or 12 inches above the ground?

A Let me offer a suggested reading to add to your research. The March 2010 issue of *QST* has an article by Rudy Severns, N6LF, on radials for vertical monopoles.[2] His article is based on carefully measured data. It is actually a condensed version of the key points provided in a seven part series he wrote for *QEX*, and I think it provides a definitive answer to many of your questions — particularly about the length and quantity of the radials.

First, there are two major categories of radials — elevated and buried or on-ground radials. The key differences are summarized below:

◊ A small quantity of elevated resonant and insulated radials is as effective as a large number of buried or on-ground radials. These should be a quarter wave long and insulated and built just like an antenna — think "ground plane" antenna, as used on VHF. These only need to be a foot or so above ground — but watch for lawnmowers and pedestrians!

◊ Buried or on-ground radials. These do not need to be resonant, and there is little difference between them. If the ground is not very conductive, on-ground may be somewhat better; if highly conductive, buried may be somewhat better. So it may depend on when it last rained. A popular approach is to use metal staples, perhaps made from coat hanger wire, to hold the radials on the surface and below the lawn mower blade. After a season or two they should be kind of buried.

Unlike the elevated case, buried or on-ground radial length is not critical, although Rudy found that the traditional four ¼-wave on-ground radials don't work as well as would putting the same amount of wire into more shorter radials. As more are added, they can be longer. Rudy found that eight 0.2 wavelength radials were within (extrapolating between his data in Figures 1 and 2) about 1 dB of 60 ¼-wave radials, when used with a ¼-wave vertical such as you plan. Using 16 ¼-wave radials get you within a few tenths of a dB.

The height of the base is not critical in most respects — however, the monopole really starts at the ground. So if you feed it a foot off the ground it will be sort of like an off-center fed dipole. The portion above the feed point may need to be shortened by that foot to be resonant.

Aluminum or copper wire will work. I would avoid steel — unless copper clad. Insulated wire will also work as a radio ground, but bare wire in the soil may be better for lightning protection. It's not a bad idea to have an arrester at the base.

Q Victor, K3SHD, asks: Although I have had my VHF handheld transceiver for a number of years, I just noticed something I do not understand when I swapped battery packs. The radio is marked with an FCC Part 15 compliance and conditions that other devices must carry. It includes the conditions that it may not cause harmful interference and that it must accept any interference received, including interference that may cause undesired operation. Why is this radio demoted to the status of a Part 15 device if it is operating properly and either causes or receives interference when used in any allocated Amateur Radio bands in which Amateur Radio has either a secondary or primary allocation status? Is it really a Part 15 device?

A It is not a Part 15 device, but some of its functionality may be covered under Part 15. While the typical FCC Part 15 device is a limited low powered unlicensed radio system that must put up with interference from licensed spectrum users, and can't cause harmful interference to them, there are some special cases. One that may be the reason your handheld has the notification is if it includes a scanning function. Scanning receivers are required to emit no more RF than Part 15 devices and require the Part 15 sticker notification. Any such limitations only apply to the scanning function, not the radio transmission and reception functionality, which is covered under FCC Part 97 — the rules that govern Amateur Radio.

Another place you will sometimes see Part 15 notification is on equipment with serial connectivity intended to connect to PCs. PC peripherals are required to meet Part 15 standards and from the point of view of the FCC, the radio looks like a computer peripheral device. The Part 15 notice only applies to that function, not the entire radio.

Q Ken, KF8OR, asks: I've seen a lot of info published on the differences between vertically and horizontally polarized antennas for VHF, especially 2 meters. However, what would happen if I mounted my commercial vertical half wave antenna 25 feet above ground as a horizontal antenna, instead of a vertical antenna? Would it still exhibit gain, and what would the directional pattern look like?

A Yes, it should work fine — as an end fed half wave horizontal antenna. The vertical and horizontal free space patterns would switch, so it would no longer be

[1] Ed Esborn, K1UQE, "A 20 Meter Flagpole," *QST*, Mar 2011, p 52.
[2] R. Severns, N6LF, "An Experimental Look at Ground Systems for HF Verticals," *QST*, Mar 2010, pp 30-33.

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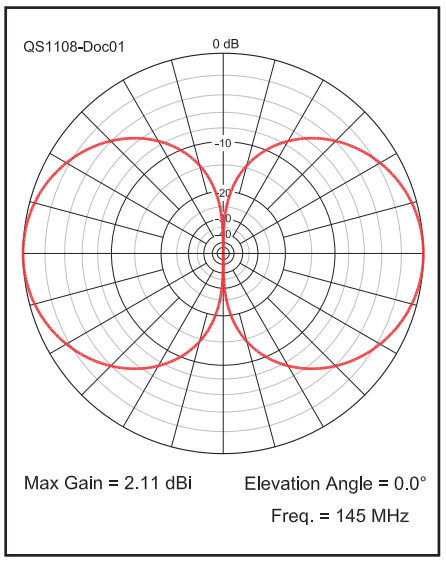

Figure 1 — Free space azimuth pattern of a horizontal half wave antenna. Note that radiation is horizontally polarized — not optimum for most FM work. The effects of a coax feed line hanging vertically will reduce the depth of the nulls and provide some vertically polarized signal, if not attenuated by a choke at the feed point.

omnidirectional, but rather would have a dipole-like azimuth pattern (see Figure 1). It would be most useful working CW or SSB stations — they mostly use horizontal while 2 meter FM stations use vertical polarization. There will be considerable loss working between horizontal and vertical antennas, although you likely will still be able to get into local repeaters — I can with my horizontal Yagi, for example.

Q Al, WA2VJL, asks: I have a commercial multiband (20 through 6 meter) vertical monopole on my roof, about 20 feet above ground mounted on a tripod. If I install another one of the same type, mounted the same way on the same roof, about 25 feet from the present one, will it provide any benefit? The present one is on the south end of the roof, and the new one will be on the north end of the roof. If it will do some good, how would I hook them up with one coax to the station?

A It all depends on what you are looking for. Your current single monopole will have an omnidirectional azimuth pattern on all its bands. Antenna gain results from a redistribution of energy toward particular directions — much like putting a reflector behind a flashlight bulb. What you can do with two spaced vertical elements is shift the radiation pattern to get gain in some directions and loss in others.

The most straightforward way is to feed the pair in phase. This requires that you have a coax T connector somewhere with one port going via coax to the radio, and the other two ports going to the antennas. It is critical that the lengths from the T to each antenna be the same.

With this arrangement, you will get an east-west bidirectional pattern with nulls going north and south on 15 and 17 meters. On 20 meters the spacing is too close for deep nulls, but you will still have a stronger signal to the east and west. On 12 meters, the pattern has major lobes to the east and west with smaller lobes to north and south. Ten meters will have a cloverleaf pattern — almost equal in four directions with nulls between. The pattern on 6 meters is a real mess with lots of lobes.

The gain at the pattern peak compared to a single antenna will be as shown in Table 1.

Keep in mind that a 6 dB change is equal to 1 S-unit on a calibrated S-meter. Also keep in mind that the bands with nulls will be down perhaps 20 dB in the direction of the nulls. This only makes sense to me, if you wish to work to the east and west and don't care about the north-south direction.

If your antennas are really 50 Ω, the combined port of the T will be 25 Ω. That would be a 2:1 SWR — not too terrible, but it could be on the edge of the radio having problems — so you may need a tuner on at least some bands.

If you run equal length coax to the station, you could switch to just one antenna to fill in the pattern — that might be viable. You could also get exotic and switch to out of phase connections. This will give you a figure eight pattern to the north and south. Unfortunately, it is much more complicated to make happen — the impedances of the two coupled antennas will be different if out of phase, so it will be hard to get equal currents (not a problem with in-phase). Also, the half wave line section required to switch one antenna to 180 degrees out is a different length on each band.

Q Ronald, KØIC, asks: When I tune my antenna, I tune for maximum power out on the meter in my manual antenna tuner. I use a nominal 100 W PEP output transceiver and the tuner says I have about 300 W going out when I tune for maximum output. Am I doing something wrong by tuning that way with a solid-state transmitter? I used to work in AM broadcasting and I was told that was the best way to tune.

A With your broadcast transmitter, you were tuning into a matched antenna. The only variables were those associated with the transmitter output network. In that case maximum output meant maximum power to the antenna. This is a very different situation from your present configuration.

The antenna tuner is a variable impedance matching device and will present a wide range of impedances to the transmitter — most beyond its specified range. You thus have a real potential of doing damage to the output circuit if you just look at the forward power. The net power going to the antenna is the forward power minus the reflected power. Thus you want to maximize the difference — usually found at the point at which the reflected power is lowest. The higher the mismatch, the higher the indicated forward power — most of which is dissipated in the tuner and transmitter — not the antenna.

The best way to adjust a tuner is to first do it with an antenna analyzer on the radio port and adjust it for an impedance of 50 Ω resistive at the desired frequency. Then hook it to the transmitter and adjust for desired power output using the transmitter controls. Most modern transceivers don't have any tuning controls, but vacuum tube equipment did. You then check to make sure the tube plate current is within ratings.

To tune with a modern transceiver, first find an unused frequency near the one you want to use. Then find a way to reduce the power to the minimum needed to indicate some REFLECTED (not FORWARD) power. This will usually be around 5-10 W. Some transceivers have a TUNE button that does this painlessly. Now tune the antenna tuner to minimum reflected power, likely 0 W or close. Then increase the power to the usual range and trim adjustments a bit, if needed to still indicate minimum reflected power. Now almost all of your power will be going to the antenna where you want it.

Make a tuning chart for each band showing the tuner knob settings for every antenna. That way, you can quickly get very close every time you change bands. On mine, I have a notation of the settings every 100 kHz on a spreadsheet that I print out. That way, if I add or change an antenna, it is easy to update my "cheat sheet."

♦*Anyone interested in helping with a study of HF noise as a function of height above ground please contact Kai Siwiak, KE4PT, at* **ke4pt@amsat.org**.

Table 1

Peak Gain of Two Element Vertical Phased Array with In-Phase Elements

Band (meters)	*Gain Over Single Element (dB)*
10	4.2
12	4.8
15	4.32
17	3.7
20	2.7

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.

W1ZR

GETTING ON THE AIR

What do Automatic Antenna Tuners Do For Us and How Do They Do It?

First, we should take a moment and discuss what it is that we mean by *antenna tuner*. As many have pointed out over the years, that name is really a misnomer — antenna tuners don't really *tune* antennas. What antenna tuners do is transform the impedance of a load — perhaps that of an antenna system — to that desired by a source, perhaps a radio transmitter or transceiver.

An antenna tuner (we will stubbornly continue to use the term since it is in common use) can perform this function in a number of ways. Perhaps the most commonly encountered is one that uses adjustable inductors and capacitors in an L network as shown in Figure 1.

Why Do We Need an Antenna Tuner?

To transmit radio signals, you need a transmitter, often the transmitter side of a *transceiver* — a combined transmitter and receiver — and an antenna. Note that we did not mention antenna tuners, a device that often goes between the transmitter and antenna. This is because, strictly speaking, an antenna tuner isn't necessary, at least not in all cases. The antenna tuner is only required if the transmitter can't put its output power into the antenna because of an incompatibility between them.

Radio Incompatibility?

A radio transmitter comes with a set of specifications. For proper operation, the owner is responsible to ensure that the requirements listed in the specifications are met. Some are straightforward, such as "power required: 13.8 V dc at 20 A max." If we plugged such a radio into a 120 V ac outlet, we wouldn't have a right to expect it to operate properly — in fact we might expect to see smoke and flames. We would need an intermediate device, called a *power supply*, to transform the 120 V ac in our outlet to the 13.8 V dc our radio wants.

The compatibility issue we will be considering here is one relating to the ANTENNA IMPEDANCE specification. While not all transmitter specifications include an explicit antenna specification, most will say something such as ANTENNA IMPEDANCE: 50 Ω (Unbalanced) or possibly ANTENNA IMPEDANCE: 50 Ω (Unbalanced) with SWR of 2:1 or less. These specifications indicate the load that the antenna system must present to the radio for proper operation. As with the power supply, if the antenna doesn't meet the specification's requirements, we might need an intermediate device — in this case, an antenna tuner.

So What's the Problem?

It would seem that we can solve our incompatibility problem by just buying (or building) an antenna that has a compatible specification of a 50 Ω resistive impedance and connecting it to our radio. This is quite true, and can be very successful — within certain constraints. This compatible case is referred to as a *matched* system. Unfortunately, the real world rears its ugly head in a few ways:

- The biggest issue is that most antennas will exhibit their design impedance on a single frequency. This is not an issue with many radio services — broadcast stations, for example — that operate on a single assigned frequency. Some services, such as the Amateur Radio Service, however, can operate

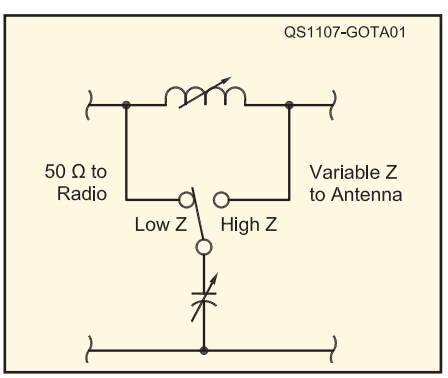

Figure 1 — L network antenna tuner configurations. If the capacitor is switched to the left end of the inductor it will match impedances lower than the Z_0. If switched to the right it will match higher impedances.

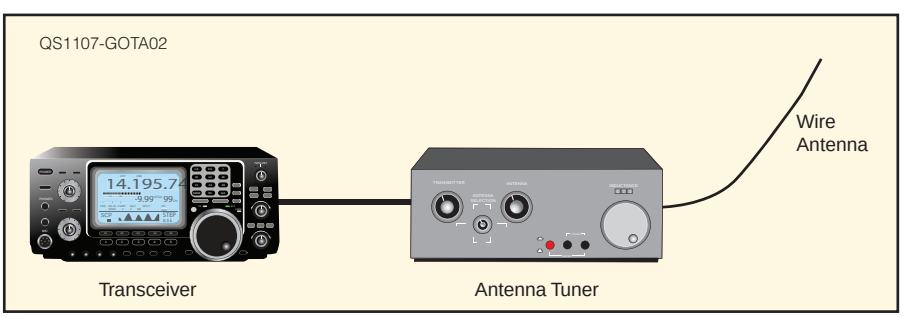

Figure 2 — In this case, the tuner is at (or inside) the radio and connected directly to the antenna. If a match can be found, all the transmitter power will go to the antenna, except for a small amount that is lost in the tuner.

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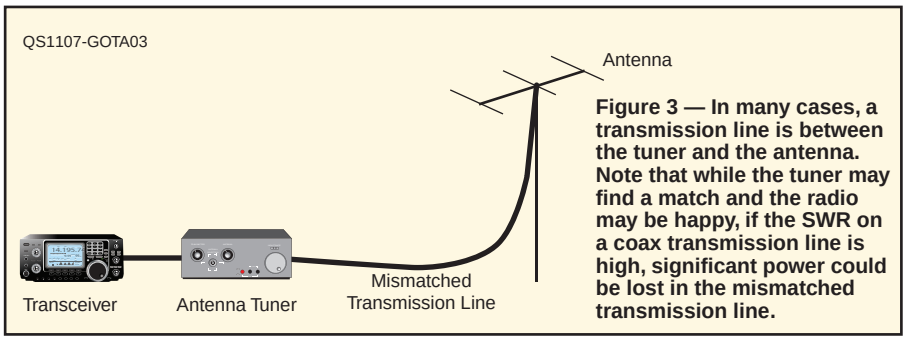

Figure 3 — In many cases, a transmission line is between the tuner and the antenna. Note that while the tuner may find a match and the radio may be happy, if the SWR on a coax transmission line is high, significant power could be lost in the mismatched transmission line.

anywhere within assigned bands. Shifting frequency from one end of the band to the other, or between bands, will generally result in a significant change in antenna impedance.

■ A real antenna is always installed at some height above the local terrain. The electrical properties of the soil and the height above ground will have a significant impact on antenna impedance.[1] For example, perhaps the simplest antenna, a resonant center-fed half wave horizontal dipole has an impedance that varies from around 40 to 100 Ω as it moves from 0.1 to 0.35 λ (wavelengths) above ground.

What Happens if the Radio and Antenna Aren't Matched?

Most radios can tolerate a certain amount of mismatch from an antenna system. This is often specified in terms of standing wave ratio (SWR), a measure of mismatch. Often the allowed value is 2:1; which, for a 50 Ω system, would represent resistive values of 25 or 100 Ω (50/2, or 50 × 2).[2,3] Note that while the radio will operate without damage at this level of mismatch, it may not operate quite as well as if it were matched.

A mismatched load impedance in early solid state transmitters could result in damage to components in the power amplifier stages. Modern transceivers have *foldback* circuitry that senses the mismatch and reduces transmitter power to avoid damage. Note that while the transmitter will not be damaged, and still can be used, it will put out less power, sometimes beginning to fold back at an SWR as low as 1.5:1. This may be why our 100 W transmitter actually puts out 25 W.

So What Can We Do?

Perhaps not surprisingly, one solution to this issue is something that is generally called an *antenna tuner*. The antenna tuner is a variable impedance transforming device that can transform the impedance of an antenna system so that it appears to the transmitter as a 50 Ω load, while causing almost all of the transmitter power to be delivered to the antenna system, just as if everything were matched.

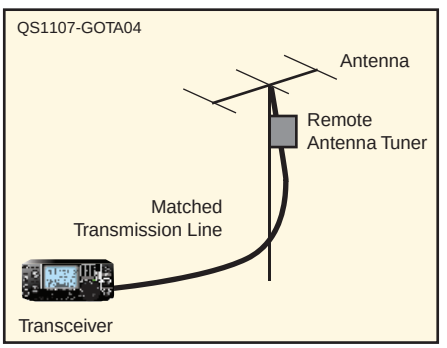

Figure 4 — In this case, a remote automatic antenna tuner is mounted at the antenna. If a match is found, the loss in the transmission line will be that of a matched system — generally much less than for a mismatched line — and most of the power will be radiated by the antenna.

As shown in Figure 2, the antenna tuner can be placed directly at the transmitter and connect directly to an antenna. In many cases, a *transmission line* is used between the transmitter and the antenna. A transmission line is frequently used if the transmitter and antenna are not in the same place. As shown in Figures 3 and 4, the antenna tuner can be placed at either the antenna end or the radio end of a transmission line interconnecting the radio and antenna. It could even be put at an intermediate point.

What the Tuner Does

By adjusting the values of the L and C in the tuner, we can often find a setting that will transform the antenna system impedance to the value that the radio wants to see. The range of transformable impedance values depends on the design of the tuner and again can be ascertained by looking at its specifications.

In an automatic antenna tuner, relays controlled by a microprocessor try to quickly find a combination of L and C values that will result in a match. Some tuners use motor driven variable capacitors and rotary inductors. This usually takes a few seconds. Many tuners memorize the settings to serve at a starting point to speed the process the next time.

Some tuners, including many automatic tuners that are built into radios, only claim to be able to transform impedances within a 3:1 SWR range. Others, that I call *wide range* tuners, claim to be able to transform any impedance with up to a 10:1 SWR to 50 Ω.

The 3:1 tuners are intended to match systems that are just at the edge of their operating range.

Tuning an Automatic Tuner

As its name implies, tuning an automatic tuner should be, well, *automatic*. If it's a tuner that is part of the radio, or designed to operate with the radio, there is likely a TUNE button that reduces power, sends a carrier on the desired frequency and then forces the tuner to tune. Many after-market automatic tuners first measure the frequency and try the settings that worked the last time you used that frequency, or one close to it.

If the tuner is one that is not designed to work with the radio, you generally will need to initiate the process in some way. In many cases, if a transmitted RF signal is sent to the tuner it will measure the SWR and automatically initiate the tuning process if it needs to. There are two concerns here:

■ Many tuners want adjustments to be made at reduced power to avoid burning relay contacts.

■ Reduced power should also be used during tuning to avoid potential transmitter damage from trying to feed a mismatched load, as well as to reduce interference to others.

You will need to find a way to easily reduce power for tuning. Some radios do exactly that with a TUNE button. Pushing the TUNE button on my transceiver sends a reduced carrier out of the transmitter until I push it again. If you don't have a TUNE button, you may need to manually reduce power and then hit a key to send a signal. If your transmitter supports AM voice, it will usually put out a carrier of about 25% of full PEP when keyed, so that is a possibility as well, although that is usually somewhat more power than desired.[4]

Want to Learn More?

Check out our new book, *The ARRL Guide to Antenna Tuners* — it has the full story on manual and automatic tuners of all flavors.[5]

[1]J. Hallas, W1ZR, "The Real World Meets Your Real Antenna," *QST*, Apr 2010, pp 47-48.

[2]In addition to these two resistive values, there is a whole set of combinations of resistive and reactive impedance components that will also result in an SWR of 2:1.

[3]D. Walraven, K5DVW, "Understanding SWR by Example," *QST,* Nov 2006, pp 37-41.

[4]If there is a mic connected to the radio, to be safe do this only in the voice portion of the band.

[5]J. Hallas, W1ZR, *The ARRL Guide to Antenna Tuners,* available from your ARRL dealer or the ARRL Bookstore, ARRL order no. 0984. Telephone 860-594-0355, or toll-free in the US 888-277-5289; **www.arrl.org/shop/**; **pubsales@arrl.org**.

NØAX

HANDS-ON RADIO

Experiment 103
Detecting RF — *Part 2*

In last month's column we discussed some simple circuits to detect RF, beginning with that most ancient of detectors, the Branly coherer.[1] This month, we continue our journey of detection, changing emphasis, as we do, from voltage to current.

Field Strength Meter

We suspended operations last month after touching on RF voltage probes and peak detectors as examples of envelope detectors. Another useful example is the *field strength meter* (FSM). In its simplest form, the FSM is just a wideband, untuned AM envelope detector with a meter to show relative field strength. As such, it can be used for *go/no-go* testing and general better or worse evaluation. These are the most common type of FSM, often found at hamfest flea markets for a few dollars — don't pass up that bargain.

If you use the ARRL's *QST* online archives, read the article "Learning to Use Field Strength Meters" by W1FB.[2] It presents an increasingly capable series of passive (powered only by the detected signal) and active (amplified) instruments. The author presents a method for calibrating an FSM and shows how to use it for various useful tasks. We'll present another such task a little further on.

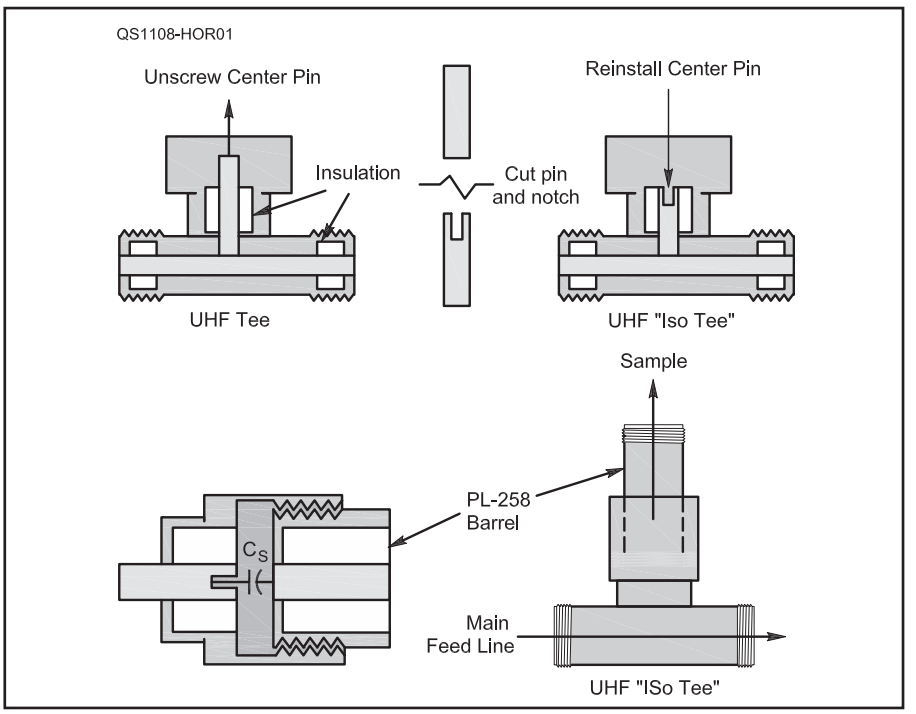

Figure 1 — The "IsoTee" is made by removing and shortening the center pin of a UHF Tee connector. A slot is filed or cut into the pin to allow it to be seated with a small screwdriver. If a PL-258 barrel adapter is inserted, the combination creates a small coupling capacitance, C_S, for sampling a signal in the main feed line.

RF Sampler

An RF sampler is not a box full of RF candies, but a method of extracting a little bit of one's transmitted signal for measurement or observation. The goal of an RF sampler is to provide a signal that is an exact replica of the much more powerful signal, but without affecting the transmitter through loading or adding of unwanted reactance.

The voltage divider method places a high value two-resistor series string (R1+R2) across the feed line being sampled with one end of the lower value resistor (R2) connected to the common side of the line. The voltage out of the divider $V_{OUT} = V_{IN} \times R2 / (R1+R2)$. If R1 = 9 × R2, the output voltage is 1/10 the input voltage. Voltage dividers look simple but at high power, the voltages encountered require high voltage resistors that are large enough to limit their effectiveness at high frequencies. For that reason, voltage dividing samplers are generally limited to low power uses.

Capacitive couplers extract a portion of the signal through a very small value of capacitance, usually a few picofarads. This can be done by connecting a leaded capacitor directly to the line or as in the novel *IsoTee* variation shown in Figure 1. The shortened center pin of the IsoTee does not make a connection with the contact of the mating connector, creating instead a very small value of coupling capacitance, C_S, between the end of the shortened pin and the center conductor of the inserted connector.

Because the reactance of C_S decreases with frequency, without some kind of opposing compensation the amplitude of the sample relative to the sampled signal will increase with frequency. For this reason, capacitive couplers are generally only used for relative and not absolute measurements.

Current Transformer

An even better method of coupling involves no contact — less worries about high voltage — and provides a relatively constant coupling over a wide frequency range. A magnetic coupler uses a *current transformer* to sample the current in the main feed line instead of voltage.

We're all used to power transformers and the equation that relates primary and secondary voltages: $V_{SEC} = V_{PRI} \times n$, where n is the secondary to primary turns ratio, n_{SEC} / n_{PRI}. A current transformer has the same structure of primary and secondary windings and the magnetic core, so what's different about it?

In our usual uses of transformers the primary is hooked up to a voltage source with a

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

[2]D. DeMaw, W1FB (SK), "Learning to Use a Field Strength Meter," *QST*, Mar 1985, pp 26-29.

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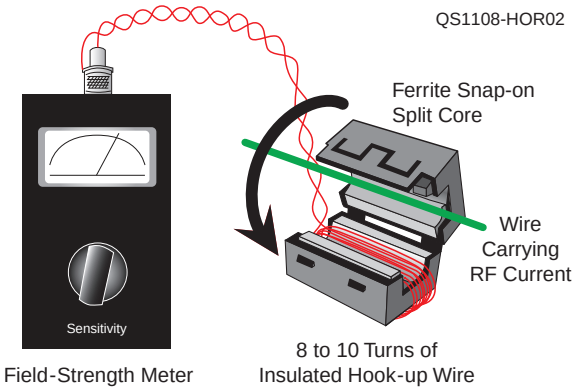


Figure 2 — A garden variety field strength meter (or SWR bridge) can provide enough sensitivity to make a relative display of RF current from a split core ferrite current transformer.

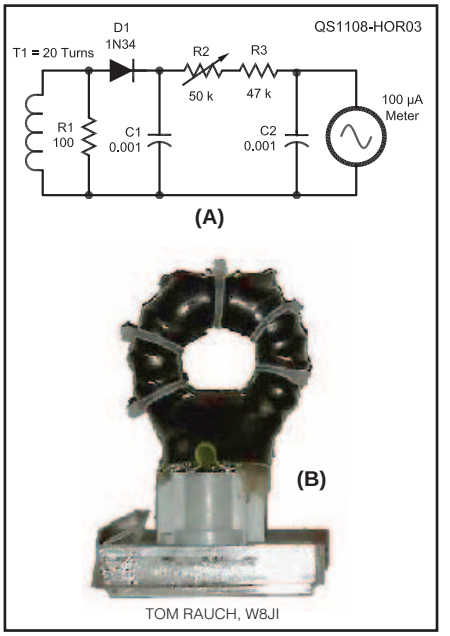


Figure 3 — By using a well designed current transformer, this simple RF current probe provides repeatable, consistent performance over the MF and HF amateur bands. A germanium diode at D1 will provide the most sensitivity. At (A) the schematic, at (B) the transformer.

very low internal impedance, such as the ac power line. The intent is to transfer power from the primary circuit to the secondary circuit and the load presented to the primary by the secondary winding is significant. Under such circumstances, the current in both windings is determined by the secondary load.

A current transformer is used differently in that its primary is connected to a source of current and very little power is transferred from primary to secondary. The primary often consists of a single turn formed by a wire passed through the center of a toroid core on which the secondary is wound.

This results in a fairly high turns ratio and, if moderate to low impedances are connected to the secondary, the impedance presented to the primary winding is low. As a result, there isn't much voltage drop across the primary — in fact the primary circuit is affected very little and the secondary current is then determined almost entirely by the turns ratio: $I_{SEC} = I_{PRI} / n$ and the voltage across the secondary is determined by the secondary load, $V_{SEC} = (I_{PRI} / n) \times R_{LOAD}$.

Because the two windings are completely isolated, current transformers are used in power systems to sense current without having to contact the high voltage conductors. Clamp on meters are common examples of current transformers. This sounds like a good way to sense RF in a high power circuit, doesn't it?

RF Current Probe

If you are just looking for a relative indication of RF current, such as when you are hunting common mode current on cable shields or current on ground wires, you can make your own clamp-on RF current probe using a split core ferrite bead and an inexpensive field strength or SWR meter as shown in Figure 2. Wind the secondary turns through the central hole — do not twist them together. Outside the core, twist the wires together to hold the winding on the core and reduce RF pickup that is not from the primary wire. Slip the core over the current carrying conductor and snap it together.

The exact mix of the core is not important as you are simply trying to convert current in the primary to a signal in the secondary. A core intended for RFI suppression such as a RadioShack 273-105 will work fine, as will the garden variety field strength meter or SWR bridge — just experiment with sensitivity settings until you are able to detect the current. This cheap and easy sensor makes a great RF current sniffer. Don't expect accuracy or repeatability.

If you are willing to put a little more effort into creating a wideband RF current probe, a design by Tom Rauch, W8JI (**www.w8ji.com/building_a_current_meter.htm**) may be just what you need. Figure 3 shows the circuit of the probe and the final assembly.

T1 is the current transformer, consisting of a T-157-2 powdered iron core with a 20 turn secondary, resulting in a current ratio of 20:1 (1 A in the primary results in 50 mA in the secondary). D1 and C1 form the detector with the current meter and calibration resistance making up the low-pass filter's load resistance as discussed in the previous column's section on envelope detectors. C2 provides additional filtering.

Tom notes that for consistent performance over a wide range, it's important to keep leads short and minimize stray capacitance. For this reason, the toroid core and simple circuitry are simply glued to the back of the meter with the calibration resistor's screw adjustment exposed. (Tom's website explains how to calibrate the current probe.)

The toroid must be slipped over the antenna or radial wire to be tested, but the design gives very consistent results over a wide frequency range (1.8 to 30 MHz). If you would like to try your hand at a clamp-on style RF current probe, check out the design by Lyle Koehler, KØLR at **www.nutstreet.net/k0lr/currprob/currprob.htm**.

The current transformer style of RF current probe also makes a good RF sampler as exhibited in the May 2011 *QST* Technical Correspondence item, "A High Power RF Sampler," by Tom Thompson, WØIVJ. The sampler is made so that it can be permanently installed in a coaxial feed line and the output sample is approximately 40 dB below that in the main feed line of a 50 Ω system.

RF Ammeter

The final RF detecting device we will review is the *RF ammeter*. These special meters were once very common but are now mostly used by AM broadcast stations and new ones are quite expensive. Nevertheless, you will find used RF ammeters for sale through surplus dealers and at hamfests and online auction sites. (Be sure you are buying an actual RF ammeter — it's not uncommon for meters labeled "RF Amps" to actually be simple current meters calibrated for use with an external sensing unit.)

The *thermocouple* RF ammeter is really a sensitive voltmeter across a low resistance thermocouple. (The thermocouple must also have low resistance with respect to the antenna or feed-line circuit through which the current is flowing or it may affect the current magnitude.) Current flowing through the thermocouple creates a voltage that is then displayed by the meter. A *hot wire* RF ammeter uses the mechanical expansion of a heated wire to change the deflection of the meter needle. RF current flowing in the wire creates the heat.

Ralph Hartwell, W5JGV, has devised his own style of RF ammeter based on the envelope detecting properties of Schottky diodes. You can learn more about Ralph's approach at **w5jgv.com/rfa-2/rfa-2.htm**.

AG1YK

HINTS & KINKS

RECYCLED SPEAKER HOUSING

◊Need a quick speaker cabinet? Try using a 25 pack CD-ROM case. It does a nice job and was simple to build. For grille cloth I used porous-nonadhesive shelf liner. The audio wire is brought out through the center to simplify screwing the case together. I have not put any sound deadening material inside since the sound quality is pretty good without it. — *73, Thomas Hart, AD1B, 54 Hermaine Ave, Dedham, MA 02026,* **tom.hart@verizon.net**

FT-857 AIR VENT MOUNT

◊I wanted to mount my Yaesu FT-857 transceiver's control head someplace on my car dashboard and not obstruct my radio, GPS or any other dashboard function. I bought the Yaesu YSK-857 separation kit but the kit does not come with a means to attach the control head to the dashboard. I looked into other kits that are specially designed to attach to car cup holder or the air-conditioning vents, but this was added cost.

The following design was a solution I found that would not add any cost. It requires two binder clips and four #10 nuts, screws and washers. You'll also need a screwdriver, needle nose pliers and ⅛ inch drill.

DAVID LOPEZ, N6RI

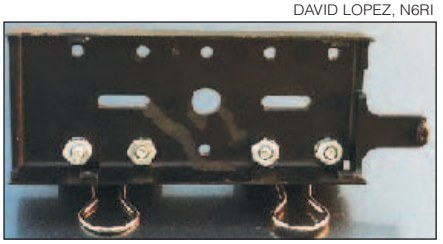


Figure 1 — Binder clips attached to the mounting frame.

DAVID LOPEZ, N6RI

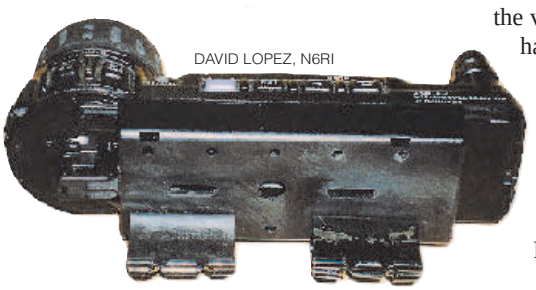


Figure 2 — Controller head ready to be mounted to the air vent louvers.

First, remove the chrome clip handles from the binder clips to permit access for marking the hole locations. The second step is to align the binder clips on the control head mounting frame and mark the location on the clips where to drill the holes. Next with the ⅛ inch drill bit, drill the holes.

Use the hardware to attach the binder clips to the back of the mounting frame (see Figure 1) Note: Do not over tighten the screws flattening the curvature of the binder clip. This curvature is what provides the force to hold the radio control head on the air vent louvers.

Once the binder clips are securely fastened to the mounting frame (see Figure 2) we are ready to reattach the lower clip handles to the binder clips. These clip handles are used to attach the completed assembly (control head and mounting frame) to the vent louvers. With the clip handles attached to the binder clips it's easier to clip or remove the assembly to the louvers. These clip handles can be removed once the assembly is attached to the vent for a cleaner look. I keep my clip handles attached so I don't lose them.

Now we are ready to attach the complete assembly to the air vent louvers. Simply squeeze the binder clip handle to open the clips slightly and slide the assembly over one vent louver. That completes the job as you can see in Figure 3 showing mounted head on car air vent. — *73, David Lopez, N6RI, 424 Las Riendas Dr, Fullerton, CA 92835,* **lopezd2@sbcglobal.net**

DAVID LOPEZ, N6RI

Figure 3 — Mounted radio controller head with clip handles attached.

WHIP ANTENNA WEATHER GUARD

◊The second week of December of 2010 found most of my part of Tennessee under a freezing rain watch. "No big deal," I thought to myself, as this was going to make for an excellent excuse to sit in a nice warm shack and cruise 40 and 30 meters. Unfortunately, my plans were cut drastically short when I did a quick SWR check before hitting the airwaves and found that there was no combination of transmatch settings that was going to overcome a suddenly high SWR.

A glance out the window confirmed that the antenna was still erect but the weather was bleak. A quick trip to the backyard confirmed my suspicions. Ice had already formed on the antenna bracket, effectively shorting the loaded whip to the grounded base plate. A couple of whacks with the back of a crescent wrench broke off the existing coating of ice. A quick re-check of the SWR proved that the ice had been the culprit. But the precipitation was increasing and unless I wanted to make a trek to the antenna once an hour, I had to do something.

Sitting back down at my desk and pondering my options, I took a long draw from a plastic bottle of my favorite soft drink and sat back for a moment. As I gazed at the bottle, it struck me that the top of the bottle somewhat resembled an umbrella. It was then that I had my weather guard epiphany. Put the umbrella *on* the antenna.

I started by taking a pair of paramedic shears and cutting the top off of a two liter soda jug, being careful to make as even a cut as I could. I then removed the loaded whip from my ground-mounted mast and brought it into the shack. My initial thought was to drill a hole in the regular cap of the bottle that was just a hair smaller than the diameter of the antenna, and then force it over the rod, allowing me to "screw" the shroud I'd made from the bottle top onto it.

Unfortunately, no matter how slowly or carefully I tried to do it, the caps kept splitting. [A step drill might do better here — *Ed.*] My next thought was to use electrical tape. I set the antenna through the neck of the bottle top and marked where the top of the shroud sat. From that point, I began to wrap the rod with the tape, gradually building up

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

STEVEN ROBESON, K4YZ

Figure 4 — The soda bottle antenna shroud over the end of the 40 meter resonator.

DONALD LARKIN, W8RVT

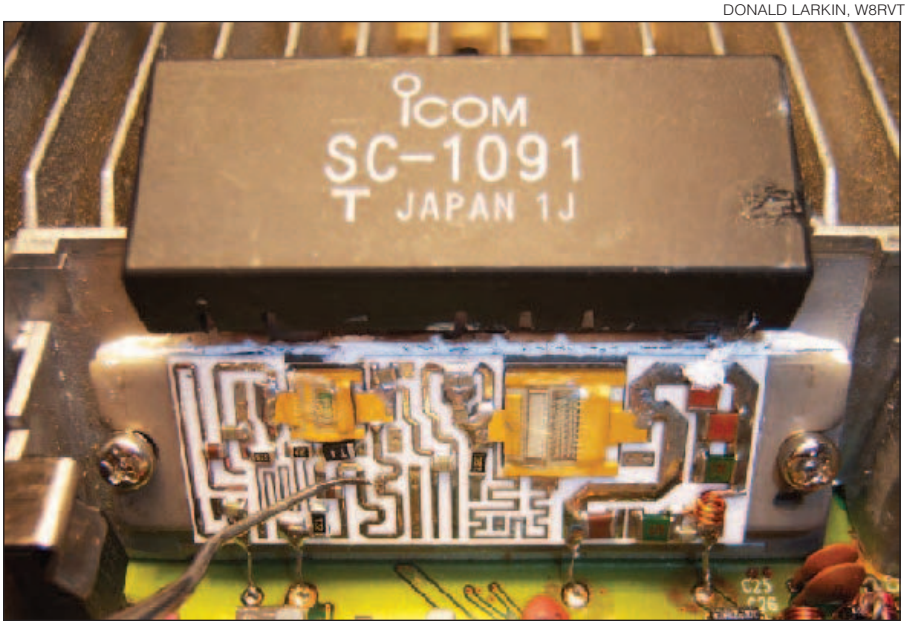


Figure 5 — The tip of the dental pick indicates the repaired gap in the stripline inductor.

a "knob" of tape at the point where I wanted the shroud to sit.

I would occasionally reseat the shroud over the end of the whip in order to see how much more tape might be needed in order to obtain a tight fit. It actually took less tape than I thought. I wound up having to unwind a couple of layers to get a snug fit without bunching up the tape as I pushed the shroud over the end of the whip. Once I obtained the desired fit, I taped the outside edge of the shroud to the antenna.

The result was a very tight fitting shroud that actually covered the entire top of the antenna bracket and keeps all precipitation off of the plate (see Figure 4). I am sure this could be done with a smaller bottle (1 liter) for mobile uses and might even be sealable along the edges for mobile installations where the antenna rides close to the ground. — *73, Steven Robeson, K4YZ, 151 12th Ave NW, Winchester, TN 37398-1061,* **k4yz@arrl.net**

PA MODULE REPAIR

♢I was working on a VHF transceiver whose symptoms were loss of output power during transmission or no output at all. With an oscilloscope, I was able to determine that the power amplifier (PA) module had RF input and proper dc voltage on the input pins but no RF output.

Not wanting to spend $80 to replace it, I decided that investigating couldn't make it worse. With the module mounted in place, I placed a small screwdriver between the heat sink and one end of the module cover and twisted the screwdriver until I heard a faint snap. I then did the same at the other end of the cover. The cover popped off revealing the components inside.

Since the problem was intermittent, I reasoned that the components were good and the problem was a faulty connection. I first confirmed that there was voltage on the two input pins (while transmitting) and the collector of the output transistor. Next, I checked the collector of the driver and found *no* voltage. The only thing between the collector and the input voltage pin is a stripline inductor. I moved my scope probe along the stripline until I located the break. I confirmed this by checking for power output with the probe bridging the gap.

The final fix was using a fine tip soldering iron and a dot of solder to bridge the gap (see Figure 5). To prove the fix, I placed the transceiver in a freezer for an hour and successfully retested. I snapped the module cover back in place, using a very small amount of silicon adhesive to hold it. — *73, Donald Larkin, W8RVT, 630 Garrison Rd, Apt B, Battle Creek, MI 49017-4545,* **w8rvt@arrl.net**

WALL WART ELEVATORS

♢Running out of sockets in that outlet strip? Too many "wall warts" in the shack? Here is a way to get a few more plugged in. Go to the hardware store and get several 3-wire to 2-wire adapters. Use them as elevators as shown in Figure 6. — *73, Tom Tengdin, WB9VXY, 1643 Carla Ct, San Luis Obispo, CA 93401,* **wb9vxy@arrl.net**

TOM TENGDIN, WB9VXY

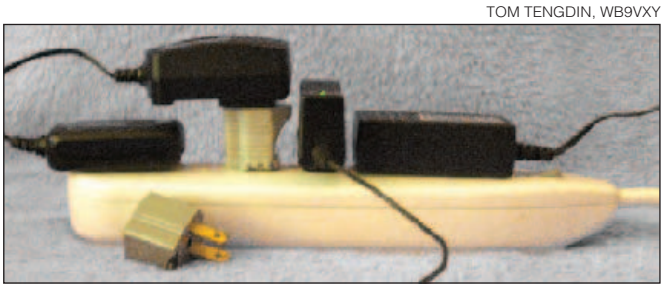


Figure 6 — Ground adapter plugs can help your wall warts rise above a congested outlet strip.

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

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

GeoFox Radiosport Rally

Boy Scouts foxhunt rallies youth, excitement and ham radio.

Stu Turner, WØSTU

Three red-shirted Boy Scouts surge out of the Pike National Forest's deep green pines and golden aspen, hooting and hollering and pumping their fists in the air, broad grins illuminating their faces. "We're done! Yeah! Did we win?" One celebrating Scout, slight of build, wields a 3 element Yagi with brilliant yellow tape measure segments flopping gently as he jogs toward the finish line. Another, older and presenting a glowing teenage shine from exertion, cradles a global positioning system (GPS) unit in his upturned palm and slows to a walk with his 11 year old teammate. These young Scouts of Monument, Colorado Troop 6, have just successfully completed the first-ever *Troop 6 GeoFox Radiosport Rally.*

A total of 31 Boy Scouts participated in this hybrid Radiosport event that combined the challenge of Amateur Radio foxhunting with GPS-guided geocaching along an aggressively rolling wooded course atop the front range of the Rocky Mountains. [Geocaching is an outdoor sporting activity in which the participants use a GPS receiver and other navigational techniques to hide and seek containers, called "geocaches" — *Ed.*]

I learned of GeoFoxing from the North Bay (California) Amateur Radio Association (**www.nbara.org**). Teams of three or four Scouts comprised of young Technicians, savvy GPS operators and additional supporting teammates, circumnavigated a 4 mile circuit of seven segments, alternating foxhunting and geocaching activity in a timed competition. Geocaches provided frequency information and hints for the next leg's foxhunt, while fox locations supplied new GPS coordinates to be found and sometimes required that latitude-longitude values be decoded from the beacon's CW signal. These young boys loved the action and the competition, but how can you go wrong combining boys with radios, cool home-made antennas, secret codes, GPS units and a beautiful forested landscape in which to run and explore?

"GeoFox is awesome! Let's do it again!" announced enthusiastic Scout Kent Griffith, KDØMFR, at the evening's campfire where every Scout had a spellbinding GeoFox war story to tell, classically spiked with laughs, groans and grins. This young man's gusto was typical of the reaction of each of the Scouts completing this unique event. It not only developed Amateur Radio and land navigation skills, but provided a stunning example to dozens of Scouts and parents of the thrill and enjoyment provided by Amateur Radio and Radiosport action.

STU TURNER, WØSTU

Scouts Quentin Marchetti, KDØKGJ (left) and Austin Armstrong, KDØKJP, prepare antenna segments for soldering during the tape-measure Yagi workshop.

STU TURNER, WØSTU

Cole Turner, WØCOL (center) provides first-year Scout Reese Pepple (left) a practical lesson in foxhunting, while Ryan Daniel lines up a GPS vector in their team's winning GeoFox course run.

Setting the Hook

"I think we have the seed for a really fun new Radiosport, and a terrific hook to get young people interested and actively involved in Amateur Radio," stated event co-coordinator Bob Witte, KØNR. Indeed, fully two-thirds of the Scout participants were not licensed amateurs, but each had the chance to personally engage in the foxhunting and radio reporting requirements of the GeoFox course under the supervision of a licensed peer. Peer interaction seems key to engaging young people in Amateur Radio and this event provided the licensed boys ample opportunity to show off their radio skills to friends. In complement, the unlicensed Scouts got hands-on ham radio experience during an enjoyable activity that encouraged them to become Amateur Radio operators and join in the fun.

Additional radio demonstrations were provided by the sponsoring Tri-Lakes Monument Fire Radio Association (WØTLM). This group of Amateur Radio operators includes Amateur Radio Emergency Service (ARES®) and Radio Amateur Civil Emergency Service (RACES) qualified hams, as well as local fire and rescue personnel, who work together to provide enhanced communications support for fire and emergency response. "This is an incredibly valuable event," noted El Paso County Sherriff fire and rescue responder and event volunteer Buzz Lovell, N8NMZ. "In just a few short years these boys will be our first responders. Instilling these kinds of communications skills and developing comfort with radio operations will pay huge dividends to us all in the future."

Many Boy Scouts made their first HF radio contacts thanks to EMT responder Elliot Linke, KBØRFC, who erected and operated a portable HF station. Steve, WGØAT, provided demonstrations of low-power CW operating, complete with his two "pack goats," Rooster and Peanut, that pack radio gear to the tops of some of Colorado's highest peaks. All together, the GeoFox event and extra radio activities provided a striking showcase of

STU TURNER, WØSTU

Here are (from left) Scouts Ethan Bucknall, KDØMFP; Kent Griffith, KDØMFR, and Matthew Lyons, KDØLLA, conducting foxhunting practice in the forest during a Scout backpacking excursion.

Amateur Radio capabilities wrapped in fun and excitement. Even the goats enjoyed the day, attending closely to the myriad red shirts who offered tasty treats.

And They're Off

Although, getting an event like the GeoFox Radiosport Rally organized and running was not a trivial undertaking, it is quite feasible for a small radio club and youth organization to accomplish. A crucial factor was having a group of licensed young peer ham operators to distribute across the competing teams. Each young Technician was tasked to supervise a team's foxhunting activity and to be the radio control operator for the team's position and progress reports, as well as other ancillary communications as needed during the event. Bringing up a crew of young hams to form the core of the teams is perhaps the biggest challenge in the creation of this type of activity.

With the Troop 6 Scouts, educating 10 young Technician hams began 1 year prior to the GeoFox rally. The WØTLM organization conducted a Technician course that Bob Witte, KØNR, and I taught along with two other experienced hams. As a radio merit badge counselor for the troop, I encouraged a handful of Scouts to enroll in the 2 day class and I provided extra tutoring for them. They were incredibly successful and Troop 6 instantly had five 11 year old Technicians. Once these boys began to show off their "ham bling" accoutrements at troop meetings and conducting basic radio operations at camp outs, others quickly decided to join the next Technician class. Within 8 months of the initial Scout licensing, the troop hams had doubled to 10 and the parent licensees had grown to nine.

With this core group, we established a weekly Troop 6 radio net to hone basic skills and we obtained tactical net experience by volunteering the Scouts to assist in the operations of a local Independence Day parade and a nonprofit music festival. Both public service activities were successful and the Scouts have been invited back to help again.

A few weeks before the planned GeoFox rally, I held an antenna workshop in which semiprepared materials were provided for the construction of tape measure Yagi antennas to be used for foxhunting. Following a design published online by Joseph Leggio, WB2HOL, PVC pipe segments and hairpin match wires were precut to length. The Scouts measured and cut all tape measure elements, prepped all components, tinned and soldered the driven element connections and pieced together the antenna for 2 meter band operation. The boys got practice foxhunting on two different campouts prior to the GeoFox rally, receiving training on close-in techniques such as third harmonic tuning. With this rather brief preparation we launched into the Troop 6 GeoFox Radiosport Rally plan.

The Course, of Course

The GeoFox course was designed to be challenging, but not overwhelming, for the group of 11-14 year old Scouts. The goal was to keep teams moving through the prescribed route and minimize overruns or bunching. Teams were started at 20 minute intervals to allow ample distance between them and total time to completion was the competitive measure of success.

All GeoFox team reports, communication with event headquarters and foxhunts were conducted on assigned 2 meter frequencies. The licensed Scouts typically used a 5 W dual-band handheld transceiver that also provided 70 cm capability. This allowed the use of third harmonic spurs of the 2 meter beacon transmissions with substantially reduced signal strengths for close-in foxhunting. The home built 2 meter tape-measure Yagi antennas performed admirably for direction finding even in the higher band.

We couldn't provide each team with foxhunt "sniffers" for close-in hunting and since extended hunts in a small area would likely cause the sequenced teams to bunch up, we made each find-point (either fox or geocache) highly visible. This is a change from the typically well hidden foxhunt and geocache challenge, but it was a prudent modification for this event given the age and experience of the youngsters. Even with several blaze orange survey flags marking each location, the boys found the course quite challenging.

We constructed three fox beacons for the course with output power in the range of 50-100 mW. The foxhunt legs of the course were less than 1 mile long, so low power beacons were necessary to avoid too quickly maxing out the handheld transceiver's S meters that were the only source of signal strength information available to the foxhunters.

Commercial electronic packages and feed-line-attenuated handheld transceivers were used for the beacons. Each worked well and included one of the following: Byonics PicCon microcontroller, Doppler DF Instruments SquawkBox T-hunt transmitter or Argent Data Systems ADS-SR1 controller. The transmit duty cycle was approximately 33% or about 20 seconds on and 40 seconds off. The fox messages were largely CW numerals and station identification, but one beacon allowed random transmission of voice messages. Encouraging and mildly taunting tidbits were included in the voice transmissions, adding a little spice to the hunt.

The GeoFox course location and terrain was carefully selected for safety, access to find-point locations and variety. Thorough study of terrain and topographic maps, as well as online aerial and satellite imagery was undertaken to map out prospective circuits in the forest that were nestled within a surrounding set of national forest roads and trails. The roads and trails promoted easy placement of foxes and caches by automobile and bicycle.

For More Information

- Byonics PicCon microcontroller (**www.byonics.com/piccon**)
- Doppler DF Instruments SquawkBox T-hunt transmitter (**www.silcom.com/~pelican2/PicoDopp/MICROHUNT.htm#SQBX**)
- Argent Data Systems ADS-SR1 controller (**www.argentdata.com**)
- WB2HOL Tape Measure Yagi (**theleggios.net/wb2hol/projects/rdf/tape_bm.htm**)
- North Bay Amateur Radio Club (**www.nobarc.com**)

An on-site survey of prospective routes followed and resulted in the final selected course layout.

For our rally, the course consisted of seven legs and one optional "out-and-back" bonus leg. Completion of the out-and-back segment earned the team a time reduction, but it required quick estimation of the time necessary to go "out and back" in order to ensure a net advantage would result. The total length of the course was approximately 4 miles and completion times ranged from 3½-5½ hours.

Each find point was well marked and provided a card of information and instructions necessary to continue on the next leg. A signature card was affixed to the reverse of the instruction card left at the site and each team member signed to prove his visitation to the point. Additionally, each find-point provided a secret word, the series of which fit together to form a Scouting motivational statement that was to be provided to headquarters upon route completion.

The challenge of course creation includes the testing of beacons with the intended direction finding equipment in the course terrain. In our case, the terrain was mild mountainous territory and signal strength dropped markedly in low spots. Additional attenuation and reflection by numerous large boulders was also a factor. Some tweaking of transmitter power and location was necessary to ensure proper levels of performance for the synergistic effects of equipment and terrain.

Lessons Learned

Our GeoFox rally ran well but this first-ever effort was far from perfect. We took home a number of lessons to improve our next rally. A few of the most significant include:

- Particularly with very young and inexperienced participants and numerous teams, post marshals on the course and at the find-points to provide personal aid and assistance when needed and to distribute responsibility for tracking team positions and progress confirmation.
- Organize the headquarters operation well, to include a single, large, mark-up map for tracking teams of youngsters, multiple coordinated radio operators and good procedural coordination with both course marshals and team radio operators — keep it simple!
- Minimize the number of different frequencies required for coordination; a single headquarters and marshal frequency and one unique reporting frequency per team should suffice for tracking and coordination, as well as reduction of improper team-to-team "espionage."
- Do your best to train young foxhunters on the tricks and pitfalls of direction finding and give them ample practice in advance of the event. Similarly, ensure that GPS operators are familiar with the GPS unit to be used and are skilled at direction finding with it.

DARRYL LINGLE

Ham Scouts survey the forest they're about to venture into on the GeoFox course. From the left are David Benda, WØDTB; Michael Merola, KDØLLC; Austin Armstrong, KDØKJP, and Matthew Lyons, KDØLLA.

KIRK HILL

Demonstrating the radio hobby to the Scouts, Rooster shows off his radio gear packing capacity and shuns owner Steve Galchutt, WGØAT, who refuses to share his hotdog.

Remember, with young participants the primary goals are having fun and gaining experience with GeoFoxing and ham radio, not overly strict adherence to competition rules. Youngsters will make errors and they learn best with immediate mentoring corrections. Make good mentoring and proper coaching and correction integral parts of your event. The kids will appreciate your guidance, be safer and have a more enjoyable experience overall.

Exciting Interest in Ham Radio

"Was it hard?" I asked the Scouts at our weekly troop meeting a few days after the rally.

"Yes!" they chorused, nodding vigorously with wide eyes and emphatically injecting brief elaborations.

"Was it fun?" I immediately inquired.

"Yes!" they boomed in unison, louder and with even more zest, and all enthusiastically endorsed that the troop have another GeoFox Radiosport Rally soon.

Even more telling of the enjoyment and excitement about ham radio fostered by this youth-centered activity is the response of action by the Scouts and adults involved to become licensed ham operators. Within a week following the rally one of our adult scoutmasters quickly studied and tested, earning his Technician license. Five Scouts and three parents signed up for the WØTLM Technician class, filling up the available spots. At least a dozen additional Scouts and many of their parents have either placed their names on our course waiting list or personally expressed interest in earning an Amateur Radio license.

Getting more young people involved in Amateur Radio is a responsibility we all share. Generating fun and excitement with GeoFox events like the Troop 6 GeoFox Radiosport Rally is a terrific way to take advantage of peer influences and operator experience across all age groups to help raise the next generation of hams. I hope you will get your radio club involved with a youth organization, whether Boy Scouts, 4H Club, school or church organizations, and share your love of ham radio with some terrific kids. 73 and good luck.

ARRL member Stu Turner, WØSTU, is a space systems engineer and retired military officer who was first licensed in 2009. He is an assistant scoutmaster and radio merit badge counselor for BSA Colorado Troop 6 and a ham radio course instructor for WØTLM radio club where he helped more than 80 new hams become licensed in 2009-2010. His Amateur Radio interests are broad, as he is "still exploring all the possibilities," but he enjoys HF operations, satellite and ARISS contacts and finding novel new ways for him and his scouts to apply their Amateur Radio skills in public service and for fun. Stu is currently working with James, KDØMFO, to develop a web-based Technician training course. He may be contacted at **stu.turner@comcast.net**.

To Log — or Not

Created with electrons or graphite, a log still has a place in your shack.

Rick Lindquist, WW3DE

When I was W8EXK in West Virginia in the 1960s, an FCC inspector visited my shack (a very apt term then). Just why he drove more than 200 miles from Baltimore is a story for another day. Among other things, he asked to see my log. At the time the FCC required hams to log every transmission. After a few years of dutifully documenting each burst of RF, failed and successful, I'd taken to logging only contacts, saving many innocent pens and trees. The FCC guy, also a ham, looked over a few pages and quipped, "You sure don't call CQ very much." Busted! (No, I did not get cited.)

Heirloom or Operating Aid

Times have changed. An entire generation or so of hams has come up through the ranks not having to keep a station log. So, why bother? "Maybe I am 'old school,' but I enjoy keeping a log," says Pete Riker, K4BKD, a ham since 1959 who still has all his paper logbooks. Others — especially contesters — consider logging essential. Only the method is at issue. Very few contesters still log on paper, but computer logging has made the task a whole lot less onerous, offering benefits that go beyond a mere record of contacts.

Any divide in logging philosophy reflects in some respects the debate between e-books and bound volumes. Do you want a log you can peruse page by page or an electronic database you can view on screen, search, organize and print at will? Computerized logging can offer the best of both worlds.

In any form a log is a diary of your Amateur Radio activity. Riley Hollingsworth, K4ZDH, the FCC's former Amateur Radio rules enforcer, has recorded every contact on paper since he was licensed in 1961. "I consider them my most valuable Amateur Radio heirlooms," he says. "If the shack caught on fire, I'd grab them all first. Equipment can be replaced."

Radio amateurs spawned in more recent times seem inclined to keep electronic logs, if they keep one at all. Licensed in 1992, ARRL Rocky Mountain Division Director Brian Mileshosky, N5ZGT, has logged every contact since. The League's youngest director allows that as much as he loves "flipping through paper logs written in my own handwriting long ago to reminisce," computer logging is more efficient and yields a wealth of information "with just a few mouse clicks."

JEAN COLLIER, N1MJC

The author uses *N1MM Logger* to record North American QSO Party contacts as well as to control his radio and transmit exchange information.

Try *that* with your paper log.

The radio amateurs I consulted cited various ways that computer logging enhances their operating experience:

- Expedites contact documentation (and obviates writer's cramp).
- Lets you upload contacts to Logbook of the World (LoTW) (**p1k.arrl.org/lotwuser/default**) and similar databases.
- Often offers equipment control capabilities, so you're always where you want to be without having to think about it.
- Eases award tracking and QSLing.
- Immediately lets you know if you've already worked a given station.
- Keeps a running tally of your contest score and statistics.
- Lets you work more DX in less time.

Another plus: Much logging software is free — the feature-rich *Ham Radio Deluxe* (*HRD*) suite and the popular *N1MM Logger* come to mind. This makes computer logging cheaper than paper logging — and greener too.

VHF-UHF contester Fred Stefanik, N1DPM, describes his slow transition from paper logbooks through paper scraps to "nothing at all" before going the computer route. Licensed since 1978, Fred finds computer logging augments his operating pleasure by eliminating not only contest dupe sheets but those scrids of paper that once littered his shack. Doing away with those odious dupe sheets alone certainly is another compelling factor in favor of electronic logging.

Top Band stalwart Jon Zaimes, AA1K, uses *N1MM Logger* for both contest and casual logging. That way he doesn't have to swap out software when he starts a contest. A disadvantage is that *N1MM* does not track awards.

Even hams who keep a log tend not to log mobile or repeater contacts. I find it too hard to write and drive, although I have logged on tape while operating as a QSO Party "rover."

The Dark Side

One supercilious fellow at an event saw me using my laptop to call CQ and send a contest exchange. He declared it "cheating." To what degree does computer logging compensate for a lack of operating skill? Strong feelings regarding the degree of assistance such software can provide fuel ad nauseam debates among contesters.

A less-obvious downside: Electronic logs stored on 3.5 inch floppy disks may no longer be accessible. On the other hand, properly stored paper will never go out of style. Luddites 1. Computer loggers 0.

Miss Manners

Amateur Radio etiquette dictates keeping some sort of log so you can honestly reply to those pesky (just kidding!) QSL card requests. Living in a semiprecious state/multiplier (Delaware) I still receive numerous pleas for QSLs. If I didn't keep a log, I wouldn't be able to confirm the contact — unless, of course, I had a super memory, which I do not.

Pledge Drive

The developers of logging software packages who generously make the fruits of their genius available at absolutely no cost deserve our support and gratitude. Contribute, if asked. *HRD* conveniently includes an onscreen DONATE button. Or, you can always buy a program, develop your own or stock up on ARRL logbooks.[1]

Rick Lindquist, WW3DE, is managing editor of NCJ. *He lives in Slower Lower Delaware with his wife Jean, N1MJC, and their two cats. When he leaves the shack he is a member of the National Association of Watch and Clock Collectors and BoatUS. He can be reached at 25483 Jamie Ct, Seaford, DE 19973-8310,* **ww3de@arrl.net**.

[1]Available from your local ARRL dealer or from the ARRL Bookstore, ARRL order no. 1250. Telephone toll-free in the US 888-277-5289 or 860-594-0355, fax 860-594-0303; **www.arrl.org/shop**; **pubsales@arrl.org**.

BOB INDERBITZEN, NQ1R

ARRL youth activities at the 2011 ARRL National Convention were organized by Megan McClellan, K5MEM. As Ham-Com wound down, Megan engaged in an "antenna duel" with ARRL Youth Volunteer Jimmy Harnett, KE5TUZ.

STEVE FORD, WB8IMY

ARRL President Kay Craigie, N3KN, made a gift presentation of a clock in the form of a stylized F-15 fighter to Masa Ebisawa, JA1DM, of the JARL.

A Tale of Two EXPOs: Hamvention® and Ham-Com

Steve Ford, WB8IMY

The Odyssey began when the Dayton (Ohio) Hamvention® opened its doors at 9 AM Friday morning, May 20. The weather was impossibly perfect — clear skies and warm temperatures. After weeks of rain in the Midwest, the Hamvention crowds were more than ready for a weekend of sunshine and enjoyment.

The public address announcement declaring the opening of Hamvention was still echoing in the exhibit halls when a sea of humanity poured into the ARRL EXPO area. Many headed directly for the QSL card-checking tables. This portion of the EXPO was busy throughout the event with amateurs eager to have their precious cards validated for award credits on the spot.

In the back of the EXPO, Bob Allison, WB1GCM, ARRL Laboratory Engineer, was putting the finishing touches on an unusual piece of electronic equipment. The object of his attention was a backup of OSCAR 1, the first Amateur Radio satellite ever launched into space. The OSCAR 1 backup had been on display at ARRL Headquarters for decades, but Joe Carcia, the W1AW Station Manager, lovingly restored it to operational condition. Safe under a protective Plexiglas cube, OSCAR 1 came to life at the ARRL EXPO, continually sending HI in Morse code on 2 meters. See the video on the ARRL YouTube channel at **http://youtu.be/q9TyItV80js**.

HAROLD KRAMER, WJ1B

ARRL Marketing Manager Bob Inderbitzen, NQ1R, stands beside a giant issue of *QST* at Ham-Com.

Near the OSCAR 1 display was the EXPO project building center. Throughout Hamvention children, and more than a few seniors, relaxed and built their choice of a Ten-Tec 1054 regenerative shortwave receiver or an ARRL Morse code practice oscillator with key.

Another popular section of the ARRL EXPO was "international row" with individual booths and representatives from Amateur Radio organizations in China, Japan, Germany, the United Kingdom and Qatar. Nguyen Bac Ai, XV2A, and Nguyen Minh Duc, XV2REH, from the Vietnam Amateur Radio Club were also on hand to greet visitors.

One of the stars of the ARRL EXPO was NASA astronaut Doug Wheelock, KF5BOC. An International Space Station commander, Wheelock was a powerful presence in the EXPO all three days. His autograph pen was in constant use, as was his smile before the ever-present cameras.

On Saturday the EXPO received a surprise visitor: FCC Chairman Julius Genachowski. He toured the area and spoke at length with ARRL officials.

As the show was winding down on Sunday afternoon, ARRL President Kay Craigie, N3KN, made a gift presentation of a clock in the form of a stylized F-15 fighter from the nearby National Museum of the US Air Force to the JARL's Masa Ebisawa, JA1DM, in honor of the many years he has supported Hamvention in particular and the DX community in general.

STEVE FORD, WB8IMY

ARRL Laboratory Engineer Bob Allison, WB1GCM, and the OSCAR 1 satellite backup.

BOB INDERBITZEN, NQ1R

Tommy Gober, N5DUX, ARRL Education & Technology Program Instructor, shares resources for introducing wireless technology into school curricula. Here he shows off a "Tape Measure Yagi" — a more advanced project he uses with students that have earned an Amateur Radio license. The antenna is used for fox hunting, and exercises involving heading and signal strength.

Ham-Com, June 10-11

Less than a month later, the ARRL team was on its way to the Lone Star State. Plano, Texas is home to the Ham-Com convention, which this year was also the ARRL National Convention. While not as big as Dayton, Ham-Com more than compensates with sheer enthusiasm.

On June 9 ARRL volunteers, officials and staff arrived to prepare the EXPO in the main exhibit hall. The OSCAR 1 satellite put in a repeat appearance, as did the project building center. When the doors opened the next morning, amateurs swarmed through the EXPO aisles. The exhibit area was anchored on one side by a huge ARRL store where attendees could browse and buy the latest ARRL publications, join ARRL and renew their memberships. This section, along with the QSL card checking table, was a magnet throughout the event.

One frequent EXPO visitor was retired Federal Communications Commission Enforcement Bureau Special Counsel Riley Hollingsworth, K4ZDH. At one point during the convention he addressed a packed house of attendees in the largest ballroom at the Plano Centre, complimenting the Amateur Radio Service as a community "bound together by the magic of wireless and a love of public service." He shared reflections on ensuring the longevity of the Amateur Radio Service "for a thousand years." While paying tribute to earlier generations of radio amateurs, he recognized ARRL Rocky Mountain Division Director Brian Mileshosky, N5ZGT and Southeastern Division Vice Director Andrea Hartlage, KG4IUM, for their service as young leaders in Amateur Radio. He also credited ARRL for its persistent pressure on FCC during the late '80s and '90s when the Commission was essentially uninvolved in Amateur Radio enforcement.

The current FCC Special Counsel, Laura Smith, also attended the show. She spoke Saturday morning, offering some reflections about her day-to-day activities. She explained that most complaints made to the Enforcement Bureau could be avoided simply by "spinning the dial." When FCC enforcement is necessary, Laura reminded the audience that "Amateur Radio is a privilege, not a right." She also used the opportunity to recognize ARRL Laboratory Engineer and power line noise expert Mike Gruber, W1MG, for his expert technical assistance with educating and working with utility companies on power line interference problems.

STEVE FORD, WB8IMY

Astronaut Doug Wheelock, KF5BOC, and RJ Paleski in the ARRL EXPO project building center.

Only three weeks separated two of the largest Amateur Radio conventions of 2011.

BOB INDERBITZEN, NQ1R

FCC Chairman Julius Genachowski with ARRL President Kay Craigie, N3KN.

ARRL West Gulf Director David Woolweaver, K5RAV moderated the ARRL Members forum at noontime on Saturday. He recognized several ARRL-affiliated radio clubs within the West Gulf Division that had recently participated in an ARRL membership campaign. In the same forum, Plano government officials formally recognized Ham-Com Vice President Fred Varian, WD5ERD, for his years of public service to the City of Plano, and particularly for his efforts as a radio amateur.

While details from within the secret enclave of the ARRL Royal Order of the Wouff Hong are unavailable, we know that nearly 100 convention goers, including many seeking initiation into the order, attended the lively and historic ritual and ceremony (held late Friday night at the Holiday Inn in Plano, the convention headquarters hotel). The Wouff Hong ceremony was sponsored by the Dallas Amateur Radio Club and Ham-Com.

If you couldn't make it to Dayton Hamvention or the 2011 ARRL National Convention in Plano, you can browse photo albums from these events on the ARRL Facebook page at **www.facebook.com/arrl.org**.

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

What's New at Dayton 2011?

A summary of some of the new products that made their first public appearances at Hamvention.

HF Transceivers

One of the most attention-getting items at Hamvention was the new Elecraft KX-3 transceiver. The KX-3 is a 10-W 160 to 6 meter rig with the option to add an external 100 W amplifier. The receiver is direct conversion, software-defined, with an I/Q output. Elecraft did not announce a selling price, but stated that production was scheduled to begin by the end of this year.

Hilberling GmbH was at Dayton again this year, but with a new version of their PT-8000 160 through 6 meter transceiver. They anticipate making this high-end rig available in the US before the end of this year, but no retail price was available at press time.

MFJ proudly displayed their new MFJ-9200 QRP transceiver at their booth on the floor of Hara Arena. This 5-W CW rig covers 80 through 15 meters through the use of interchangeable band modules. The '9200 comes with one module of the buyer's choice, with additional modules available at $29.95 each. The MFJ-9200 retails for $249.95.

Although it appeared in the marketplace several months beforehand, Dayton was the first chance many had to glimpse the new Ten-Tec Model 599 Eagle transceiver. [See page 43, this issue.] This 160 through 6 meter rig is compact enough for mobile operation, yet packs all the necessary features for home use. The Eagle sells for $1795; it is $1995 if you add an automatic antenna tuner.

WARD SILVER, NØAX

Elecraft KX-3 transceiver.

MFJ-9200 transceiver.

STEVE FORD, WB8IMY

Receivers

Software Defined Radios were in high profile at Hamvention. SSB Electronic demonstrated their new 4.0 version software for the Perseus SDR receiver as well as their new LAN SDR.

The new WiNRADiO WR-G33DDC "Excalibur Pro" software defined receiver (SDR) made its debut as well. With coverage from 9 kHz to 50 MHz, the WR-G33DDC boasts a frequency stability of 0.5 ppm and a dynamic range of 107 dB. It also offers a 50 MHz wide real-time spectrum analyzer with a waterfall display. The selling price was unavailable at press time.

WiNRADiO

WiNRADiO WR-G33DDC "Excalibur Pro" software defined receiver.

Antennas and Tuners

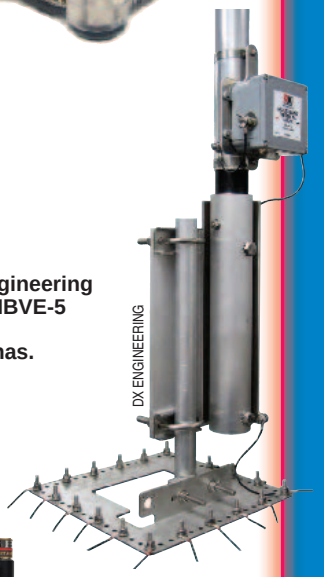
DX Engineering displayed their new DXE-MBVE-5. It's a 43-foot, multiband high performance vertical antenna for 160 through 10 meters featuring the patent pending SAF-T-TILT™ tilt-over base, which allows safe raising and lowering of the antenna without complete removal of antenna mounting hardware. Package prices begin at $194.95.

Anticipating the return of better propagation on the higher HF bands, MFJ introduced the HyGain SPT-500 — a ⅝ wavelength vertical antenna for 10 meters. $59.95.

MFJ also debuted a portable 20-meter dipole known as the MFJ-2299, a ½ wavelength antenna comprised of two telescoping elements. It also sells for $59.95

In the antenna tuner category, MFJ showed two high-power, weatherproof, remote automatic antenna tuners. The MFJ-994BRT is rated at 600 W from 1 to 30 MHz and sells for $499.95. The MFJ-998RT is rated at 1500 W from 1 to 30 MHz and is priced at $769.95.

N6BT was showing off his new Bravo 7-band HF antenna ($289) and his Q52 5-band 2-element Yagi antenna ($549).



DX ENGINEERING

DX Engineering DXE-MBVE-5 series antennas.

Test Equipment

Bird Technologies showcased their new AT-500 handheld antenna analyzer covering 2 to 520 MHz. This $1400-class product combines the functions of several instruments, providing SWR, field strength, match efficiency and return loss data.

Comet also had a new antenna analyzer to talk about: the CAA-500. It measures impedance and indicates SWR from 1.8 to 500 MHz using an analog crossed-needle meter. $399.

The new Ten-Tec 1225 SWR/wattmeter kit offers full scale ranges of 20 W, 200 W and 2000 W, measuring average and peak power, as well as SWR, from 1.8 to 30 MHz with an analog crossed-needle meter. $159.

NCG/COMET

Comet CAA-500 antenna analyzer.

Station Accessories

Argent Data Systems rolled out a unique product at Hamvention: their SSTVcam module. This is a roughly 1.5 × 1.5-inch digital camera with a built-in slow scan encoder, great for sending up in high-altitude balloons or just monitoring your repeater site; no PC required. $80.

Begali Keys was present at the show with new finishes for their popular keys. Prices were not available at press time.

Hagerty Radio attracted attention with a new VFO driver amplifier kit. Cost is $39 complete. It is specifically designed to drive a vacuum tube rig. To make the point Jim Hagerty was demonstrating it with an old Hallicrafters HT-40 transmitter at the show.

At HamGadgets, Dale, NØXAS, was busy demonstrating his new Master Keyer MK-1. Right alongside were updated automatic keyers (ID-O-Matic III) and the Universal Keying Adapter 3 for interfacing with the high negative voltage of vacuum tube keying circuits.

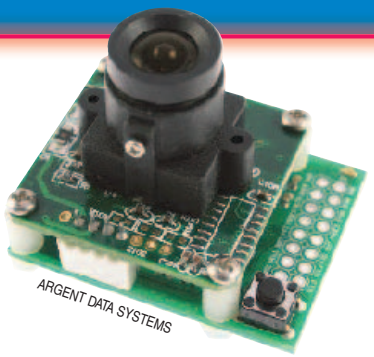
Heil Sound introduced several new products at Dayton. The Gold Elite dual-element microphone, with selectable wide and narrow response ranges, sells for $160. The HM-12 microphone, part of the new Genesis product line, features an open frame full range dynamic element that will work on most amateur transceivers. The HM-12 will carry a retail price of $70. The Heil HB-1 Economy Boom is an articulated arm using a substantial steel channel structure and balanced with four external springs. The HB-1 is capable of supporting up to a 2.5 pound microphone and will fit all standard Heil microphone boom mounts and hardware. It will sell for $70. The FS-3 single channel footswitch features an all-steel design and retails for $25. Finally, the PRO MICRO headset is available in two modes: the PMS-6 single side and the dual headphone model PMD-6. Retail prices are $79 and $99, respectively.

International Radio unveiled its new 150 W triplexer that can allow three radios on 20, 15 and 10 meters to share a common antenna with up to 2:1 SWR. Price and availability were unknown at press time.

N3ZN Keys introduced the newly updated ZN-SLR series single lever paddle. The ZN-SLR is now on a 3½-inch diameter, ⅞-inch thick base and weighs 3 pounds, 5 ounces. The brass and painted versions sell for $365 and the Bronze Special edition sells for $385.

Sierra Radio Systems rolled out their new HamStack platform intended specifically for amateurs who want to design and program their own microcontroller projects. The HamStack starter pack includes a solderless breadboard, USB in-circuit programmer, a guide book and software — all for $124.95 at **www.hamstack.com/hamstack.html**.

SSB Electronic launched its new low-loss Ecoflex coaxial cable series at Hamvention. The new coax will be available for sale in the US this summer.



ARGENT DATA SYSTEMS

The Argent Data Systems SSTVcam.

STEVE FORD, WB8IMY

Begali Keys was proud to show off the new finishes on their popular line of products.

HEIL SOUND

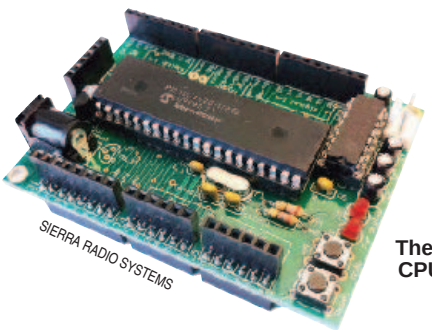
The new Heil Sound Gold Elite microphone.

STEVE FORD, WB8IMY

Trey Garlough, N5KO, and the new International Radio triplexer.

N3ZN KEYS

N3ZN Keys introduced the newly updated ZN-SLR series single lever paddle.



SIERRA RADIO SYSTEMS

The HamStack CPU Board.

See an expanded version of this Hamvention new product roundup (with equipment specifications where available) on the ARRL Web at

www.arrl.org/news/new-products-at-dayton-2011

FEMA Administrator Calls Amateur Radio "The Last Line of Defense"

In an FCC forum on earthquake communications preparedness, Federal Emergency Management Agency (FEMA) Administrator Craig Fugate described Amateur Radio operators as "the ultimate backup, the originators of what we call social media." The forum — held May 3 at FCC Headquarters in Washington, DC — brought together officials from the White House, the Department of Homeland Security, the United States Geological Survey, FEMA, the FCC and the private sector. Fugate and FCC Bureau of Public Safety and Homeland Security Chief Jamie Barnett gave the opening remarks.

Later in the forum, Fugate spoke more on Amateur Radio. "During the initial communications out of Haiti, volunteers using assigned frequencies that they are allocated, their own equipment, their own money, nobody pays them, were the first ones oftentimes getting word out in the critical first hours and first days as the rest of the systems came back up," he told the forum. "I think that there is a tendency because we have done so much to build infrastructure and resiliency in all our other systems, we have tended to dismiss that role 'When Everything Else Fails.' Amateur Radio oftentimes is our last line of defense."

Fugate said that he thinks "we get so sophisticated and we have gotten so used to the reliability and resilience in our wireless and wired and our broadcast industry and all of our public safety communications, that we can never fathom that they'll fail. They do. They have. They will. I think a strong Amateur Radio community [needs to be] plugged into these plans. Yes, most of the time they're going be bored, because a lot of the time, there's not a lot they're going to be doing that other people aren't doing with Twitter and Facebook and everything else. But when you need Amateur Radio, you really need them."

FEMA Administrator Craig Fugate

You can watch a video of the forum on YouTube (**www.youtube.com/watch?v=bzxkvo1i_Y**). Fugate's remarks begin at 18:55.

RADIO AMATEURS ASSIST AMERICAN RED CROSS, SERVED AGENCIES DURING JOPLIN STORM

On May 22 at 5:41 PM (CDT), the single deadliest twister in almost 60 years — and the second major tornado disaster in less than a month — swept through the southwestern Missouri city of Joplin, slamming straight into St John's Regional Medical Center. The tornado killed 117 people. As soon as the storm cleared, area Amateur Radio operators responded to requests from the American Red Cross and local hospitals to help provide communications support.

"On Sunday, right after the tornado hit, I received a call from the American Red Cross office in Springfield, asking for radio support," ARRL Missouri Section Emergency Coordinator Ken Baremore, WØKRB. "I contacted Greene County Emergency Coordinator William Gilmore, KCØTCF, and asked him to join me in Springfield. We got there at 9 PM and used a newly installed 2 meter beam to talk to the Joplin repeater, establishing communications between the two American Red Cross offices. Cell phone coverage was spotty at best, but mostly non-existent, and the circuit was overloaded most of the time. We left about 12:30 AM."

Officials evacuated long-term patients from the city's other medical center, Freeman Health System, to make room for emergency cases from the tornado, said Missouri Governor Jay Nixon. That hospital treated 465 patients, including 11 who died, the hospital said in a statement. A Freeman Health System hospital in nearby Neosho, Missouri, treated 39 people, the hospital said. Patients from St John's were taken to hospitals in Springfield and Northwest Arkansas.

"Sometime late Sunday evening, we received a call from Freeman Hospital, requesting assistance to help provide communications support," Baremore said. "Using Amateur Radio, we provided communications between Freeman Hospital in Joplin to the hospitals in Springfield, as the tornado took

MIKE GULLETT/AP

Damaged vehicles litter the parking lot of St John's Hospital in Joplin, Missouri, after a tornado hit the Southwest Missouri city on Sunday, May 22. According to reports, the tornado hit the hospital head-on.

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

down phone lines and cell towers. Springfield is about 70 miles east of Joplin. Members of the Southwest Missouri Amateur Radio Club, along with Christian County Emergency Coordinator Pat Conway, WA6JGM, helped out with this, using mobile radios set up just inside the doors of the hospital. John Howard, KØVET, activated the Missouri Emergency Services Net (MESN) and it was up until 11 PM Monday night. It ended up steering a lot of people to the proper website for health and welfare messages. By 9 AM Monday, the hospital no longer needed radio amateurs to provide communications support and we were released." Baremore said that radio amateurs are still on standby status to provide communications support between the American Red Cross offices in Springfield and Joplin.

According to SATERN National Director Major Patrick McPherson, WW9E, the Kansas and Western Missouri SATERN Team was activated for the Joplin storm. "SATERN assisted with communications in the affected area. The MO-KAN Division SATERN began running nets on 75 meters at 3.920 on Tuesday at 9 AM, 3 PM and 9 PM to support the operation. SATERN Central Territorial Coordinator Bill Shillington, W9ZCL, and SATERN Associate Central Territorial Coordinator Ken Panczyk, W9KMP, were dispatched to the tornado scene to assist in the general response."

"Our ham operators expended more than 2000 hours during this week — and we are still counting, as we have additional hours to record," Baremore said. "And this was for the hams reporting through the Emergency Operations Center. Countless other hours were spent by individual hams helping in various ways — what an unbelievable response. It is a great feeling to know that I am part of an organization with people willing to give up vacation time to help out in a time of need. I hope we don't have another need anytime soon, but it is nice to know that we have hams and ARES® members ready to serve."

ARRL HEADQUARTERS HOSTS OVERSEAS VISITORS

Where is Amateur Radio growing the fastest? The answer may surprise you — it's China. The enthusiasm of Chinese radio amateurs was very much in evidence at ARRL Headquarters on Tuesday, May 24, when a dozen amateurs from Beijing and Shanghai toured ARRL Headquarters. The group — which included representatives of Chinese AMSAT — had attended the Dayton Hamvention® the previous weekend, where a booth for the Radio Association of China and its subsidiary, the Chinese Radio Amateur Club (CRAC), was a part of ARRL EXPO.

ARRL Chief Executive Officer David Sumner, K1ZZ, met with Zhu San Bao, BY1CRA, Executive Vice Chairman of The Radio Association of China, to hear about the evolution of Amateur Radio in China and to explain ARRL operations in more detail. China is now represented in the International Amateur Radio Union by the Chinese Radio Sports Association (CRSA). CRAC has been established to cover all aspects of Amateur Radio and is assuming some of the functions of the CRSA.

The Chinese guests capped a busy period of international activity at HQ that began on Monday, May 16, with a visit by Gopal Madhavan, VU2GMN, who is a Director of IARU Region 3, as well as President of the Amateur Radio Society of India (ARSI). The following day, two officers of the Viet Nam Amateur Radio Club (VARC) — Chairman Nguyen Minh Duc, XV2REH, and President Nguyen Bac Ai, XV2A — arrived to tour ARRL Headquarters and to discuss their plans for hosting next year's IARU Region 3 Conference.

All of these visitors included Dayton in their itineraries. While the Hamvention always attracts many foreign visitors, the theme of this year's event — Global Friendship — made their presence especially appropriate. To mark the theme, the ARRL EXPO area included exhibits representing, in addition to China and the IARU itself, four IARU Member-Societies: Deutscher Amateur Radio Club (Germany), Japan Amateur Radio League, Qatar Amateur Radio Society and Radio Society of Great Britain. The Radio Amateurs of Canada exhibit was nearby, rounding out our "global village."

2010 ARRL ANNUAL REPORT NOW AVAILABLE

The ARRL Annual Report for 2010 — now available online — reviews the major events of the year and documents the renewed growth of both the ARRL and the activities of the Amateur Radio Service. For the fourth consecutive year, ARRL membership grew — totaling 156,475 members at year end.

ARRL Chief Executive Officer David Sumner, K1ZZ, said that Amateur Radio faced challenges, not only in 2010, but in years to come. "But we also have great strengths," he explained, "and if we harness them effectively over the next few years, the ARRL and Amateur Radio will be well positioned for a bright second century — at least as bright as their first."

The *2010 ARRL Annual Report* can be downloaded in its entirety from the ARRL website at **www.arrl.org/annual-reports**.

SECTION MANAGER NOMINATION NOTICE

To all ARRL members in the Alabama, Alaska, Delaware, East Bay, Kansas, Michigan, New Mexico, Santa Barbara, Tennessee and Western Massachusetts sections: You are hereby solicited for nominating petitions pursuant to an election for Section Manager (SM). Incumbents are listed on page 16 of this issue.

To be valid, a petition must contain the signatures of five or more full ARRL members residing in the section concerned. It is advisable to have a few more than five signatures on each petition. A sample nomination form is available on the ARRL website at **www.arrl.org/section-terms-nomination-information**. Nominating petitions may be made by facsimile or electronic transmission of images, provided that upon request by the Membership & Volunteer Programs Manager the original documents are received by the Manager within seven days of the request.

We suggest the following format:

(Place and Date)

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

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

(Signature___ Call Sign___ City___ ZIP__)

Any candidate for the office of Section Manager must be a resident of the Section, an Amateur Radio licensee of Technician class or higher and a full member of the League for a continuous term of at least two years immediately preceding receipt of a nominating petition. Petitions must be received at Headquarters by 4 PM Eastern Time on September 9, 2011. If more than one member is nominated in a single section, ballots will be mailed from Headquarters on or before October 3, 2011, to full members of record as of September 9, 2011, which is the closing date for nominations. Returns will be counted November 22, 2011. Section Managers elected as a result of the above procedure will take office January 1, 2012.

If only one valid petition is received from a section, that nominee shall be declared elected without opposition for a two-year term beginning January 1, 2012. If no petitions are received from a section by the specified closing date, such section will be resolicited in the January 2012 *QST*. A Section Manager elected through the resolicitation will serve a term of 18 months. Vacancies in any Section Manager's office between elections are filled by the Membership and Volunteer Programs Manager. — *David Patton, NN1N, Membership and Volunteer Programs Manager*

SM Resolicitation Notice: Since no nomination petitions were received for the West Texas Section Manager election by the March 4, 2011 deadline, nominations are hereby solicited.

Nominees Sought for ARRL Board of Directors

If you're a full ARRL member in one of the following five divisions and are interested in playing a part in the League's democratic organization, here's the opportunity. Nominations are open for the offices of director and vice director for the 2012-2014 term in the Atlantic, Dakota, Delta, Great Lakes and Midwest divisions.

ARRL Divisions

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

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

How to Nominate

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

Any full member residing in a division where there is an election may request an official nominating petition package. You don't need to be a candidate to request the forms. Your request for forms must be received by the Secretary *no later than noon Eastern Time on Friday, August 12, 2011*. There are separate forms for director and vice director nominations.

2. *Submit petition with statement of eligibility and willingness to serve*. Official forms bearing the *signatures of 10 full members of the division* and naming a full member of the division as a candidate for director or vice director, must be submitted, with a statement *signed by the candidate* attesting to his or her eligibility, willingness to run and willingness to assume the office if elected. These documents must be filed with the secretary *no later than noon Eastern Time on Friday, August 19, 2011*. The submission may be made by facsimile or electronic transmission of images (i.e. a PDF or JPEG attachment to an email) provided that upon request, the original documents are received by the Secretary within seven days of the request. On Monday, August 22, 2011, the secretary will notify each candidate of the names and call signs of each other candidate for the same office. Candidates will then have until Friday, September 2, 2011, to submit 300-word statements and photographs, if they desire these to accompany the ballot, in accordance with instructions that will be supplied.

3. *Ethics and Elections Committee to certify eligibility*. In accordance with the Bylaws, an Ethics and Elections Committee, composed of three directors not subject to election this year, is responsible for the conduct of the election. This year, the Ethics and Elections Committee consists of Greg Sarratt, W4OZK; Bob Vallio, W6RGG and Tom Frenaye, K1KI.

Call for Nominations

Nominations are open for director and vice director in the five divisions mentioned above for the three-year term beginning at noon January 1, 2012.

The nominee must be at least 21 years of age and have been licensed and a full member of the League for a continuous term of at least four years immediately preceding nomination. A nominee must provide the Ethics and Elections Committee with information concerning his or her employment, ownership and investment interests, and other financial arrangements so the Committee can determine whether the nominee has a pervasive and continuing conflict that would render him or her ineligible to be a Board Member (see Article 11 and Bylaw 46 of the ARRL Articles of Association and Bylaws).

Balloting Will Follow

If there is only one eligible candidate for an office, he or she will be declared elected by the Ethics and Elections Committee. Otherwise, ballots will be sent to all full members of the League in that division who are in good standing as of September 10, 2011. (You must be a licensed radio amateur to be a full member.) The ballots will be mailed not later than October 1, 2011 and, to be valid, must be received at HQ by noon Eastern Time on Friday, November 18, 2011. A group of nominators can name a candidate for director or vice director, or both, but there are no "slates," as such. Each candidate appears on the ballot in alphabetical order. If a person is nominated for both director and vice director, the nomination for director will stand and that for vice director will be void. A person nominated for both offices does have the option, however, of declining the higher nomination and running for vice director if he or she wishes. Because all the powers of the director are transferred to the vice director in the event of the director's death, resignation, recall, removal outside the division or inability to serve, careful selection of candidates for vice director is just as important as for director.

Absentee Ballots

All ARRL members licensed by the FCC, but temporarily residing outside the US, are eligible for full membership. Members overseas who arrange to be listed as full members in an appropriate division prior to September 10, 2011, will be able to vote this year where elections are being held. Members with overseas military addresses should take special note of this provision; in the absence of information received to the contrary, ballots will be sent to them based on their postal addresses. Even within the US, full members temporarily living outside the ARRL division they consider home may have voting privileges by notifying the Secretary prior to September 10, 2011, giving their current *QST* address and the reason that another division is considered home. If your home is in the Atlantic, Dakota, Delta, Great Lakes or Midwest division but your *QST* goes elsewhere, let the ARRL Secretary know as soon as possible, but no later than September 10, 2011, so you can receive a ballot from your home division.

The Incumbents

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

Atlantic — Bill Edgar, N3LLR and Tom Abernethy, W3TOM

Dakota — Greg Widin, KØGW and Kent Olson, KAØLDG

Delta — Mickey Cox, K5MC and David Norris, K5UZ

Great Lakes — Jim Weaver, K8JE and Gary Johnston, KI4LA

Midwest — Cliff Ahrens, KØCA and Rod Blocksome, KØDAS

For the Board of Directors:

May 19, 2011

David Sumner, K1ZZ
Secretary

Foxhunting Fire Prevention

Tim Urell, KF7FOX
kf7fox@arrl.net

The Knobby Knee Net is a 2 meter ragchew net that has been meeting daily in central Arizona for over 20 years. But on the morning of May 8, 2011, something was very wrong. As I tuned into the net all I heard was a stream of "kerchunks" coming from the repeater. Occasionally, a regular net denizen could be heard calling but, mostly, no one answered. Only a couple of stations could actually capture the repeater and talk to each other. The scheduled net control operator, Wayne Gilbertson, WA7IGI, could not be heard at all.

Switching my rig to reverse, I clearly heard WA7IGI calling, but not capturing the repeater. His calls indicated that he could not hear any of the other net traffic and no one else seemed to hear him. I tried to reach him but was unsuccessful.

The repeater is owned and operated by the Verde Valley Amateur Radio Association (VVARA) and resides on a peak between the cities of Cottonwood and Prescott in central Arizona, splitting its coverage area into east side and west side halves. At 7800 feet, this repeater provides coverage to around 10,000 square miles and is extremely reliable.

One of the operators on the east side, Tim Henriksen, KG7GCO, reported a very strong continuous carrier on the repeater's input frequency but with no modulation whatsoever. He and a west side operator, Steven Pearson, KC7TIL, reasoned that this carrier did not have the appropriate tone programmed and thus was being rejected by the repeater. That explained why the signal was not being retransmitted. But even without the tone it was still interfering so that only the strongest stations could override it and get to the repeater. It was a great bit of deduction and it later turned out that Tim and Steve were exactly correct. Now the questions became who and why?

A west-side VVARA member, Jack Crabtree, W7JLC, had direction finding equipment immediately available to him and promptly set out from Prescott to track down the offending transmitter. He met up with an east-side member, Bob Shipton, K8EQC, in Cottonwood and together they went foxhunting (see Figure 1). It took them only a bit over 90 minutes to positively identify the exact house from which the interference was coming. Knocking on the door, there was no answer.

TIM URELL, KF7FOX

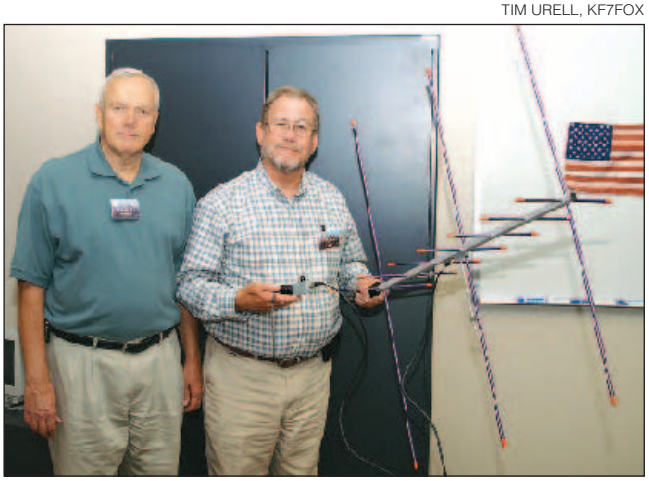


Figure 1 — Bob Shipton, K8EQC (left) and Jack Crabtree, W7JLC (holding the antenna) used their direction finding skills and equipment to save another ham's home.

By a stroke of luck, Bob, K8EQC, thought he might know who owned the house — and the interfering station. A little detective work and a couple of phone calls put him in contact with a fellow ham who had left the house on an out-of-town trip earlier that morning. Nonplussed at the situation, the other ham arranged for the direction-finding detectives to gain access to the house to see what was happening.

When they got into the shack, they found a transmitter had been left on — perhaps accidentally, perhaps for remote access — and its microphone had somehow fallen from the table and become wedged in such a way that it depressed the PTT. Perhaps the wind or a pet had knocked the microphone off the table. Whatever did it, that old RadioShack transmitter had been putting out a continuous carrier for about 12 hours before Jack, W7JLC, and Bob, K8EQC, found it. By their report, its case was too hot to touch! They immediately pulled out the microphone cable and the carrier stopped. After they disconnected the transmitter power and allowed it to cool down they were convinced that no further dangers existed, so they locked up the house and left. The VVARA repeater was back on the air without interference.

We will never know how much longer it would have been before that severely overheated transmitter started a fire in the house, but there's a good chance that is exactly what would have happened. In my opinion, at least, only the quick and skillful actions of W7JLC and K8EQC prevented a disaster.

Transmitter hunts are great fun, but the skills learned by transmitter hunting are useful for much more than just having a good time. You never know when or where such skills may be called upon to save property or even lives. In this case, the direction-finding skills and fast response of Jack, W7JLC, and Bob, K8EQC, saved a fellow ham's house from the ultimate overheating.

NO TONE, NO PHONE — A ONE HOSPITAL DISASTER

Joe Moell, KØOV
ARRL ARDF Coordinator
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When nurses and other caregivers picked up their phones at Children's Hospital of Orange County (CHOC) in California in the early morning on March 21, there was no dial tone. A power surge caused the central processor in the hospital's phone switch to fail. Following established procedures, the lead operator at the CHOC switchboard immediately activated the Hospital Disaster

Support Communications System (HDSCS) (**www.hdscs.org**), using an independent tie-line to reach April Moell, WA6OPS, head of this ARES® group that specializes in helping hospitals when their communications fail.

Moell established a 2 meter net and initiated a call-out of HDSCS members via telephone and pager. Ken Simpson, W6KOS, and Clay Stearns, KE6TZR, soon arrived at the hospital to help establish a link with the outside world. Soon, more operators were at the hospital to communicate for its most important units, including the emergency department, neonatal intensive care, pediatric intensive care and the pharmacy.

She then contacted the supervisor at Orange County Communications to report the outage and to provide her telephone number for incoming calls to CHOC. This resulted in Moell receiving several urgent messages for the hospital, including one regarding the transport of a young patient coming in for an appendectomy. Message handling continued through the morning, with some of the first-to-arrive operators being relieved by other HDSCS members when they had to leave for work or other commitments.

By 10:45 AM, some phones were working and spare parts were on their way from a supplier. HDSCS continued to provide unit-to-unit and hospital-to-community messaging as needed, including coordination of patient treatments and a request for blood. At 1:02 PM, the repair crew announced that the phone system was back to normal, except for some voice mail functions. HDSCS members remained on station for 30 more minutes, as they always do to insure that phone systems are stable before securing.

This is the 31st year of HDSCS service to medical facilities in Orange County and the 114th activation to provide communications support when telephones have failed or were overloaded. The reasons for HDSCS involvement have ranged from equipment failure, to cut cables, to natural disasters such as earthquakes, floods and wildfires. Each member has his or her own go-kit that is ready to take to any of the 36 supported hospitals to establish communications. The HDSCS is familiar with CHOC because the group has participated in drills and communications emergencies there before, including an external phone outage that lasted 22 hours in August 2006 when a construction accident severed fiber optic cables.

The following HDSCS members also participated in this activation: Paul Broden, K6MHD; Tom Hall, N6DGK; Bill Hegardt, K6WIL; Rebecca Katzen, KI6OEM; Joe Moell, KØOV; Dale Petes, KI6ANS; Sam Stratton, W5AGX, and Fred Wagner, KQ6Q.

Just 15 days later, HDSCS was activated again to another Orange County hospital. A group pager alert at 10:28 AM on April 5 brought hams to Saddleback Hospital in Laguna Hills after a digital equipment failure caused the inbound and outbound trunk lines to become inoperative. Again, the phone number of April Moell, WA6OPS, was given to the Orange County Communications agency so that ambulance companies and other hospitals could contact Saddleback Hospital via HDSCS. The outage lasted until 6 PM that day.

HDSCS members participating in this activation were Tom Hall, N6DGK; Scott Lolmaugh, WD8ICK; Jim McLaughlin, AB6UF; Pete Martinez, K2PTM; Joe Moell, KØOV; Dave Popko, AF6TN; Cheryl Simpson, KD6MWZ; Ken Simpson, W6KOS; John Walker, AC7GK, and Dave West, KI6EPI.

Of the 115 times that HDSCS has been activated for communications problems in Orange County hospitals, this was the 85th time that it was due to switchgear or cable failure. According to WA6OPS, who is an ARES DEC, "Many hams around the state and the country ask me why Orange County has so many phone system failures in hospitals. They seem to think that this doesn't happen in their own areas, but they're mistaken. We know from our own experience that phone equipment isn't 100% reliable. I know from talking to lots of hospital disaster planners around the country that they have plenty of failures, too. But far too often, hams think that Amateur Radio can only help in 'all else fails' disasters such as hurricanes, tornados and floods. Most ham emergency groups don't prepare and plan to help in these single-hospital incidents. They don't set up 24 hour alerting plans for the hospitals to use to contact them quickly when phones go down, so they never get the call."

Moell continues, "When a nurse on a hospital unit has an urgent need to contact a patient's physician at his office or home but the phones are down because switchgear has failed, that's just as severe an emergency as it would be in a widespread natural disaster. Orange County hospitals know and appreciate us because we come when they call and we connect their staff members to the outside, no matter the cause of the communications outage. We urge other ARES groups around the country to adopt our hospital support model, which includes robust alerting plans for each hospital, regular meetings with the hospital disaster planners, and ready-to-respond members who are trained in the special terminology and communications needs of medical facilities."

More information about HDSCS and its successful model for hospital communications support is at the group's website: **www.hdscs.org**.

HAMS ASSIST DURING MARCH FLOOD

Bob Javits, WB2AIU
wb2aiu@arrl.net

The Bergen Amateur Radio Association (BARA) provided communications for the American Red Cross of Northern New Jersey over 5 days in early March to support relief efforts for severe flooding. BARA hams leading the effort were Tony Izzo, K2AMI; Phil Barber, WA2LXE, and Bob Javits, WB2AIU.

BOB JAVITS, WB2AIU

Figure 2 — Phil Barber, WA2LXE, of BARA, handles Disaster Assessment messages for the Red Cross at the Ridgewood, New Jersey Disaster Relief Center.

Operating from a permanent station installed by BARA at Red Cross Disaster Relief Headquarters in Ridgewood, the hams maintained contact with the Disaster Assessment Teams (see Figure 2). They used the repeater of the 10-70 Repeater Association since it provided excellent coverage of the flood area.

Red Cross disaster-assessment volunteers who are also hams provided the input from the field. These included Barry Cohen, K2JV; Charles Irwin, KC2VYK; David Berkley, K2MUN; Barbara Flynn, KC2YJB; Hillary Zaenchik, KC2HLA; Vincent Lobosco, KC2IZK, and John Connors, KC2SRT. QST

DXCC Honor Roll

Bill Moore, NC1L
Awards Branch Manager

The DXCC Honor Roll is earned by DX Century Club members who submit confirmation for contacts reached within the numerical top 10 of the overall number of entities on The ARRL DXCC List. There were 338 entities on the DXCC list for this period with 329 being required for the Honor Roll. The period for this list is from January 1, 2010 through December 31, 2010. The **boldface** number indicates the total current DXCC credits. The number next to the call sign represents an individual's overall total. Note: This DXCC Honor Roll listing does not include the four new entities added officially by the 10/10/2010 date.

MIXED
338
(Top of the Honor Roll)
4X1FQ/378
4X4DK/389
4X6KA/345
4X6UO/344
7L1WII/342
9A1CCY/338
9A1R/344
9A2AA/367
9A2EU/344
9A4A/371
9A7V/344
9A7W/338
9A8A/344
AA1K/349
AA1V/351
AA4H/349
AA4V/358
AA4Z/361
AA5AT/344
AA5AU/345
AA6G/352
AA6YQ/343
AA7A/351
AA8BN/342
AA8EY/361
AA9AA/343
AB0X/351
AB5C/349
AB8K/355
AB9V/347
AC8G/349
AD1C/348
AD5A/343
AE6Y/350
AF2C/348
AG9S/347
AI0O/346
AI9Y/343
AJ3K/347
AJ6V/349
AK0A/348
AK1N/347
AL7R/344
CT1BH/366
CT1BOH/344
CT1BWW/342
CT1EEB/342
CT1ZW/357
CT3BM/347
DF2NS/346
DF2UH/343
DF3CB/345
DF3GY/346
DF3UB/344
DF4PL/345
DF9ZP/345
DF9ZW/344
DJ0MCH/342
DJ1ND/348
DJ2BW/387
DJ2RB/351
DJ2TI/356
DJ2YA/376
DJ3AS/347
DJ3IW/346
DJ4AX/369
DJ4GJ/346
DJ4PI/364
DJ4SO/352
DJ4TZ/377
DJ4XA/367
DJ5AV/347
DJ5JH/365
DJ5JK/357
DJ6DU/346
DJ6NI/362
DJ6OV/351
DJ6RX/366
DJ6TK/364
DJ6VM/362
DJ7ZG/372
DJ8CG/345
DJ8FW/356
DJ8NK/360
DJ9HX/346
DJ9KG/350
DJ9ON/352
DJ9RQ/355
DJ9RR/347
DJ9WH/339
DJ9ZB/360
DK0EE/344
DK1BX/344
DK1FW/361
DK1RV/347
DK2GZ/343
DK3HL/355
DK3KD/352
DK3SF/355
DK5AD/353
DK5PR/358
DK6IP/350
DK8DB/346
DK8FS/347
DK8UH/343
DK9KX/354
DLØBMW/342
DLØWW/355
DL1EY/360
DL1FWN/342
DL1YD/356
DL2FAG/344
DL3IE/366
DL3MF/341
DL3MGK/342
DL3OH/368
DL3ZI/378
DL4MCF/344
DL4MDO/344
DL5KAT/344
DL6ATM/348
DL6JGN/350
DL6QW/366
DL6RAI/344
DL7AFS/344
DL7AV/372
DL7HU/379
DL7MAE/344
DL7VEE/349
DL8NU/367
DL8YR/354
DL9ZAL/344
DU9RG/345
EA1AUS/344
EA1RT/346
EA3BT/343
EA3NA/363
EA4DO/367
EA4DX/344
EA4KD/344
EA5BM/343
EA5BY/343
EA5KY/339
EA6BH/357
EA6NB/344
EA7LQ/350
EA8AK/338
EA8AKN/344
EA8BYR/342
EA8ZS/344
EI6FR/341
ES1AR/381
ES1RA/351
EY8MM/342
F2VX/360
F3AT/383
F3SG/349
F5II/366
F5IL/345
F5JQI/343
F5NBU/344
F5NBX/343
F5NTV/344
F5OZF/344
F5QF/348
F5XX/341
F6AOI/362
F6BEE/352
F6BFH/357
F6BKI/353
F6BWJ/351
F6DLM/349
F6DYY/346
F6DZO/345
F6EXV/349
F6FHO/346
F6FWW/344
F6FXU/343
F9CZ/347
F9GL/377
F9LX/355
F9RM/380
F9XL/357
GØCGL/344
GØDBE/343
GØDQS/344
GØJHC/344
G3GAF/350
G3GIQ/371
G3HTA/366
G3KHZ/362
G3KMA/373
G3KWK/353
G3LQP/363
G3NDC/361
G3NLY/370
G3OAG/346
G3PJT/342
G3PLP/347
G3RTE/350
G3RUV/360
G3SJX/347
G3SNN/349
G3UML/369
G3VKW/353
G3VXJ/345
G3XTT/347
G4BWP/347
G4ELZ/345
G4IUF/346
G4OBK/344
G4PTJ/344
G4SOJ/338
G4ZCG/344
GJ3LFJ/344
GM0AXY/345
GM3ITN/379
GM3WIL/347
GM3YTS/345
GM4FDM/341
GM4YMM/343
GW3JXN/339
GW4BLE/351
HAØDU/355
HA5KG/342
HA5WA/344
HA8IE/344
HA8UT/346
HA9PP/340
HBØLL/362
HB9AAA/365
HB9AFI/356
HB9ANK/353
HB9AQW/358
HB9BGV/345
HB9BLQ/345
HB9BZA/345
HB9DDM/344
HB9DDZ/344
HB9KT/347
HB9MX/380
HB9PL/379
HB9QR/376
HB9RG/353
HB9US/361
HC1HC/347
HL3IUA/343
IØDJV/352
IØEKY/345
IØKRP/353
IØMWI/352
IØOLK/364
IØTCA/349
IØWDX/356
I1AGC/358
I1APQ/360
I1CAW/357
I1FNX/350
I1WXY/348
I1ZL/382
I2KMG/371
I2MQP/351
I2PEI/351
I2PJA/355
I2PNB/355
I2YBC/355
I2ZGC/353
I4ACO/347
I4AVG/347
I4DZ/349
I4EAT/351
I4EWH/344
I4FTU/365
I4IZZ/343
I4LCK/363
I4MKN/364
I4WZT/344
I5ARS/375
I5CRL/352
I5FLN/362
I5ICY/345
I5IGQ/345
I5JHW/348
I5KG/344
I5KKW/349
I5OYY/338
I5RFD/349
I5SDG/356
I5ZGQ/349
I5ZJK/344
I6FLD/378
I6FYR/347
I6NO/363
I8ACB/352
I8DVJ/344
I8IHG/347
I8KNT/351
I8MTQ/348
IKØAZG/344
IKØDWN/344
IKØFVC/343
IK1ADH/342
IK1GPG/344
IK1JJB/342
IK1RLI/342
IK2ABJ/344
IK2ANI/344
IK2BLA/344
IK2GNW/344
IK4BHO/344
IK4CIE/344
IK4FNF/341
IK4HLO/344
IK4NQL/343
IK5BAF/344
IK5CBE/343
IK5CQV/344
IK5EKB/343
IK5HHA/345
IK5MEN/343
IK5ORP/339
IK6DLK/344
IK6GPZ/343
IK7FPV/344
IK8BQE/345
IK8CNT/344
IK8HJC/340
IK8JVG/342
IT9GCQ/352
IT9HLR/344
IT9PKO/343
IT9SVJ/344
IT9UCS/349
IV3TQE/348
JAØAXV/356
JAØBKX/349
JAØCRG/345
JAØDAU/340
JAØDWY/352
JAØEKI/338
JAØGRF/356
JAØGZZ/356
JAØHXV/346
JAØLXP/352
JAØRYN/346
JAØUH/352
JAØUUA/344
JA1ADN/377
JA1BK/377
JA1BLC/368
JA1BNL/347
JA1BRK/375
JA1BWA/371
JA1CNM/349
JA1CQK/345
JA1CZI/354
JA1DFK/343
JA1DIO/352
JA1DJO/341
JA1DOF/346
JA1EOD/365
JA1FGB/352
JA1FNA/358
JA1FQI/339
JA1GRM/343
JA1GV/368
JA1HGY/364
JA1IFP/366
JA1IOA/349
JA1JAN/363
JA1KQX/351
JA1LSP/355
JA1MLV/354
JA1MRM/351
JA1OCA/364
JA1OND/355
JA1PEJ/349
JA1QVC/346
JA1RJU/359
JA1SGU/352
JA1SHE/343
JA1SKE/353
JA1SVP/353
JA1SYY/351
JA1TRL/355
JA1UQP/363
JA1VLK/351
JA1WPX/350
JA1WSK/356
JA1WSX/357
JA1XQC/342
JA2ADY/347
JA2AH/363
JA2AHH/347
JA2AO/349
JA2AXB/351
JA2BAY/354
JA2CXH/352
JA2CY/348
JA2DSY/360
JA2FJP/347
JA2IVK/354
JA2JNA/347
JA2JPA/349
JA2JW/380
JA2KVD/354
JA2MNB/344
JA2QPY/345
JA2TBS/345
JA2VMU/343
JA2VPO/350
JA2WYN/345
JA2XYO/356
JA3AZD/365
JA3CSZ/351
JA3EMU/358
JA3FYC/356
JA3GN/349
JA3LDH/344
JA3MF/356
JA3MHA/342
JA3PIS/347
JA3THL/358
JA3TJA/346
JA4AFT/363
JA4DEN/347
JA4DLP/358
JA4DND/355
JA4IYL/347
JA4LKB/347
JA4LXY/355
JA4ZA/371
JA5AUC/351
JA5BEN/346
JA5IU/355
JA5XAE/340
JA6BDB/347
JA6BZA/343
JA6BZI/363
JA6CBG/346
JA6CDA/353
JA6GXP/355
JA6HUG/350
JA6LCJ/352
JA6MWW/343
JA6TMU/349
JA6VQA/345
JA6VU/347
JA7AQR/356
JA7AYE/347
JA7BJS/352
JA7BWT/345
JA7EMH/347
JA7FWR/347
JA7IC/346
JA7JI/358
JA7JM/358
JA7JWF/353
JA7LMZ/345
JA7MA/365
JA7MFL/344
JA7MSQ/344
JA7PLJ/354
JA7XBG/345
JA7ZF/358
JA7ZP/350
JA8ADQ/369
JA8AWH/356
JA8BAR/360
JA8CDT/358
JA8DNV/356
JA8EJO/347
JA8EKU/338
JA8EOT/339
JA8FKO/352
JA8GSN/345
JA8JL/366
JA8JO/358
JA8MS/362
JA8NFV/349
JA8OW/355
JA8RJE/345
JA9AA/375
JA9BEK/346
JA9CGW/349
JA9LJS/347
JA9TWN/348
JD1AMA/344
JE1HPM/345
JE1PNX/343
JE1SYN/343
JE2HCJ/345
JE2LPC/345
JE2LUN/347
JE2URF/344
JF1KKV/349
JF1SEK/349
JF1UVJ/345
JF2MBF/344
JF2OWA/344
JF7XKY/350
JG1WSC/344
JG3QZN/345
JH0BBE/345
JH1AFD/346
JH1AGU/352
JH1GZE/357
JH1HGC/354
JH1SJN/345
JH1TWT/346
JH2FXK/343
JH2RMU/344
JH2SON/344
JH2UVL/351
JH3AEF/346
JH3GRO/343
JH3VNC/349
JH4IFF/349
JH4JNG/344
JH4UYB/345
JH5FTY/344
JH6CDI/351
JH6JMN/344
JH7FMJ/350
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IARU Addresses PLT, MF Allocation in May Meetings

Brennan Price, N4QX
ARRL Chief Technology Officer

Peter Chadwick, G3RZP, Presents at ITU PLT Forum

Access Broadband over Power Lines (BPL) is but one of several applications of the broader realm of Power Line Telecommunications (PLT). Even as BPL has fizzled as a third pipe to the home for consumer Internet access, interest in PLT for home networking and utility metering and control applications remains high. The Telecommunication Standardization Sector of ITU (ITU-T) is one of several organizations seeking to set standards for existing and future PLT applications.

Attendees at the May 27 ITU meeting discussed PLT and its impact on radiocommunication services, including Amateur Radio.

Within the ITU structure, wireline technologies are ordinarily the exclusive domain of ITU-T; however, because PLT inherently involves the injection of RF energy into unshielded wires, radiocommunication is necessarily affected by PLT work. Some early ITU-T work on PLT-based home networking was conducted without the participation of the Radiocommunication Sector of ITU (ITU-R). Once this work came to the attention of ITU-R, arrangements were made to ensure that the radiocommunication services — including the Amateur Radio Service — would participate in standardization work in the future. Amateur Radio has been actively involved in subsequent work, with IARU Technical Consultant Peter Chadwick, G3RZP, and ARRL Technical Relations Specialist Jonathan Siverling, WB3ERA, representing amateur interests at most meetings.

In order to strengthen the collaboration between ITU-T and ITU-R participants, the ITU hosted a forum on PLT and its impact on radiocommunication services on May 27. Chadwick delivered a presentation in a session focused on achieving compatibility. While offering some helpful suggestions for situations where PLT and radio users must coexist, Chadwick pulled no punches when describing PLT's impact on radio users. "PLT is pollution, but is short lived — remove the offending device and pollution disappears," he told the group. Noting, however, that certain levels of pollution are sometimes tolerated for economic reasons, Chadwick advocated that "radio communication stakeholders must take an active part in establishing EMC standards for PLT, as well as in attempting innovative approaches to mitigation techniques."

Representing the PLT industry in the same panel ASSIA's Stefano Galli said that the primary customers of PLT applications — wireline operators and power utilities — need to understand that PLT will inherently impact radiocommunication services. As a result, manufacturers should go beyond simply complying with national regulations, given the present lack of international standards.

Despite the suggestions of Chadwick and Galli, the forum participants clearly had a stark divergence of opinion on several issues. Several PLT industry participants suggested that radio services were insisting on unreasonable protection levels, and that users should simply learn to deal with it because PLT technology is not going away. Representatives of several radio services — including aeronautical, broadcast and amateur — countered that the functioning of radio systems requires a certain level of protection, and that the requirement of PLT systems to comply with those levels is clearly stated in ITU regulations.

Support for MF Allocation Advances in CITEL

Meeting May 17-20 in Santo Domingo, Dominican Republic, the Second Permanent Consultative Committee of the Inter-American Telecommunication Commission (CITEL PCC.II) advanced preparatory work for the 2012 World Radiocommunication Conference (WRC-12), scheduled for January 23-February 17, 2012, in Geneva. Much of the meeting was focused on developing Inter-American Proposals (IAPs) for the various WRC-12 agenda items, including Agenda Item 1.23, considering a secondary allocation to the Amateur Radio Service of about 15 kHz in the range 415-526.5 kHz.

CARLOS FLORES

ARRL Chief Technology Officer Brennan Price, N4QX (right), and IARU Region 2 Vice President Jose Arturo Molina, YS1MS (left), met with CITEL Executive Secretary Clovis Baptista during the May 17-20 meeting of CITEL PCC.II.

At a meeting of PCC.II in late 2010, an affirmative proposal for Agenda Item 1.23, calling for a two-band allocation at 461-469 and 471-478 kHz, became an IAP. Persuaded in substantial part by the work of Siverling, the CITEL Coordinator for Agenda Item 1.23, eight countries — Argentina, Brazil, Canada, Colombia, the Dominican Republic, the United States, Uruguay and Venezuela — supported this proposal in 2010.

In May, with IARU Region 2 Vice President Jose Arturo Molina, YS1MS, in attendance, three more countries — Costa Rica, Ecuador and El Salvador — added formal support to the IAP. Compared with other WRC-12 agenda items, the regional position of CITEL is established and strong for Agenda Item 1.23. This strength increases the possibility of a favorable outcome at WRC-12, although the outlook is inherently uncertain. QST

CONTEST CORRAL

in association with the *National Contest Journal*

AUGUST 2011

Start and Finish	HF	VHF+	Contest Title	Phone	CW	Digital	Exchange	Sponsor's Web Site or Contact
Aug 5, 0200Z - Aug 5, 0300Z	1.8-14		SNS and NS Weekly Sprints		✘		Serial, name, and S/P/C	www.ncccsprint.com/rules.html
Aug 6, 0000Z-Aug 7, 2359Z	1.8-28		Lighthouse-Lightship Weekend	✘	✘	✘	Serial or ARLHS mbr/light nr and name, S/P/C	illw.org
Aug 6, 0000Z - Aug 6, 2359Z	160-28	50	TARA Grid Dip Shindig			✘	Name and 4-char grid square	www.n2ty.org/seasons/tara_grid_rules.html
Aug 6, 0001Z - Aug 7, 2359Z	28		10-10 Summer Phone QSO Party	✘			Call, name, 10-10 number, S/P/C	www.ten-ten.org
Aug 6, 1200Z - Aug 6, 2359Z	1.8-28		European HF Championship	✘	✘		RS(T), last two digits of 1st year licensed	lea.hamradio.si/~scc/euhf/euhfc.htm
Aug 6, 1800Z - Aug 7, 1800Z		**222+**	**ARRL UHF Contest**	✘	✘	✘	**4-char grid square**	arrl.org/contests
Aug 6, 1800Z - Aug 7, 0600Z	**1.8-28**		**North American QSO Party**		✘		**Name and state**	ncjweb.com
Aug 7, 1300Z - Aug 7, 1630Z	3.5-14		South Africa DX Contest	✘			RS and serial	www.sarl.org.za
Aug 10, 0030Z - Aug 10, 0230Z	3.5-14		NAQCC Monthly QRP Sprint		✘		RST, S/P/C, and NAQCC mbr nr or power	naqcc.info
Aug 10, 1300Z - See website	3.5-14		CWops Monthly Mini-CWT Test		✘		Name and member number or S/P/C	www.cwops.org/onair.html
Aug 13, 0000Z - Aug 14, 2359Z	3.5-28		Worked All Europe		✘		RST and serial (see web for QTC rules)	www.waedc.de
Aug 13, 1600Z - See website	1.8-28	50-440	Maryland-DC QSO Party	✘	✘	✘	Maryland County/City or S/P/C	mdcqsoparty.w3vpr.org
Aug 13, 0000Z - Aug 14, 0000Z	3.5-14		Dominican Republic Contest	✘			RS and serial	www.hi8ud.es.tl
Aug 14, 0000Z - Aug 14, 2359Z	1.8-28	50	Straight Key Weekend Sprint		✘		RST, QTH, name, member number	www.skccgroup.com/sprint/wes
Aug 20, 6 AM - Aug 21, 12 AM		**10G+**	**ARRL 10 GHz and Up Contest**	✘	✘	✘	**6-character grid locator**	arrl.org/contests
Aug 20, 0000Z - See website	3.5-28		SARTG WW RTTY Contest			✘	RST and serial	www.sartg.com/contest/wwrules.htm
Aug 20, 0800Z - Aug 21, 0800Z	1.8-28		Russian District Award Contest	✘	✘		RS(T), serial or Russian district	rdaward.org/rdac1.htm
Aug 20, 1200Z - See website	1.8-28		CWops CW Open		✘		Serial and name	www.cwops.org/onair.html
Aug 20, 1200Z - Aug 21, 1200Z	1.8-28	50	Keymen's Club of Japan Contest		✘		RST and JA pref/dist or continent	www.kcj-cw.com
Aug 20, 1800Z - Aug 21, 0600Z	**1.8-28**		**North American QSO Party**	✘			**Name and state**	ncjweb.com
Aug 20, 2000Z - Aug 20, 2200Z	1.8-28		Feld-Hell New Member Sprint			✘	RST, Feld-Hell mbr nbr, grid sq, S/P/C	www.feldhellclub.org
Aug 21, 1300Z - Aug 21, 16009Z	3.5-14		SARL Digital Contest			✘	RST and serial	www.sarl.org.za
Aug 21, 1800Z - Aug 21, 2359Z	**3.5-28**	**50**	**ARRL Rookie Roundup**			✘	**Both calls, name, check, S/P/XE or "DX"**	www.arrl.org/contests
Aug 22, 0100Z - Aug 22, 0300Z	1.8-28		Run For the Bacon		✘		RST, S/P/C, Flying Pig nr or power	www.fpqrp.org/pigrun
Aug 27, 0400Z - See website	3.5-28	144,440	ALARA Contest	✘	✘		RS(T), serial, ALARA nr, name	alara.org.au
Aug 27, 0400Z - Aug 28, 2200Z	1.8-28		Hawaii QSO Party	✘	✘	✘	RS(T) and HI county/island or S/P/C	www.karc.net
Aug 27, 1200Z - Aug 28, 1159Z	3.5-28		SCC RTTY Championship			✘	RST, 4-char year first licensed	lea.hamradio.si/~scc/rtty/rtty.htm
Aug 27, 1200Z - Aug 28, 1159Z	3.5-28		YO DX Contest	✘	✘		RS(T), serial or YO district	www.hamradio.ro
Aug 27, 1400Z - See website	3.5-28	50,144	Kansas QSO Party	✘	✘	✘	RS(T) and KS county or S/P/"DX"	www.ksqsoparty.org
Aug 27, 1600Z - Aug 28, 0400Z	3.5-28		Ohio QSO Party	✘	✘		Serial and S/P or "DX"	www.ohqp.org
Aug 28, 1400Z - Aug 28, 1600Z	3.5-14		South Africa DX Contest		✘		RST and serial	www.sarl.org.za

All dates refer to UTC and may be different from calendar date in North America. Times given as AM or PM are local times and dates.
Refer to the contest 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

August 2011 W1AW Qualifying Runs

W1AW Qualifying Runs are 10 PM EDT Wednesday, August 3 (0200Z August 4) and 4 PM EDT (2000Z) Thursday, August 18. The West Coast Qualifying Run will be transmitted by station K9JM on 3590 and 7047.5 kHz at 9 PM PDT Wednesday, August 10 (0400Z August 11)(10-40 WPM). Unless indicated otherwise, speeds are from 10-35 WPM.

In the July/August "Contesting 101"

"Following the sun — The Art of the Possible." Kirk, K4RO, hears from guys who say "what's the point? It's all super stations and megawatt amps nowadays." He'll try to give some perspective on the whole game, and examine some realities about the field of competition. Contesting 101 can be found in the *National Contest Journal*, published six times per year. For subscription information, visit **www.arrl.org/ncj**.

2011 ARRL DX CW Contest Results

With Cycle 24 underway, the DX is pouring in!

Nate Moreschi, N4YDU
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Enhanced solar conditions bring more fun to ham radio, especially when contesting. Better conditions also force competing stations to pay close attention to their operating strategy. There's little doubt that it was an intense weekend of competition in the 2011 ARRL International DX Contest as several records were broken and there were many tight races. Let's get down to business and see which strategies worked the best.

W/VE Single Operator

It was another close finish in the annual Single Operator, High Power race. Much like last year, VY2ZM (MAR) rallied for another tight win with a score nearly 500K higher than last year with 5.94 million points and a new record from Canada. Second-place finisher Scott, KØDQ (NH) earned 5.723 million. Just behind in third place was Alex, K3CR in Pennsylvania.

N1UR in New Hampshire set a personal best record in the Single Operator, Low Power category of 3.46 million to win his sixth consecutive trophy in this event. Maury, W3EF didn't let a hectic international flying schedule stop him from putting 42 hours in one of his favorite contests; he finished two spots better than last year with an impressive 2.47 million — a new record for the third call district Taking the third spot was N4TZ/9 (IN) with 2.03 million.

Improving high-band conditions make events a lot more manageable for Single Operator, QRP buffs. After finishing in second place last year, Bob, K3PH is king of the QRP mountain this year with 838K. In the "Battle of the Dougs," VA3DF claimed second place with 662K followed by third-place from W9WI in Tennessee, who scraped up 563K.

W/VE Single-Operator, Assisted

Make it four in a row for Chas, K3WW. He edged out Joseph, AA3B in the expanding Single Operator, Assisted High Power category. Chas' 6.54 million got the job done against Bud's 6.24 million. Noah, K2NG powered special call K2M to third place with 4.64, finishing two places higher than 2010.

2011 marked the first year the SOA category was broken down by power level, making it an interesting fight for more stations. For Low Power in SOA, Jamie, WW3S earned the top spot with 1.5 million points, followed by 1.26 million from Brad, W1NT. WW3S managed 1,316 contacts to the 1,181 of W1NT. From zero-land, Mark, KØKX produced 1.21 million for third place.

W/VE Multi Operator, Multi Transmitter

The team at K3LR (WPA) held off another fierce effort from team W3LPL (MDC) for its second-straight ARRL CW M/M victory. Tim and his troupe finished with 14.298 million as Frank's team combined for a total of 14.042 million. Over the 48-contest period, the super charged stations were less than 2 percent apart. Not too far behind was the improving team of John, WE3C and his ops from Pennsylvania with 12.29 million for third place.

W/VE Multi Operator, Two Transmitter

The KC1XX superstation manufactured a convincing triumph in this year's Multi-Two race. With 12.1 million, Matt and his team powered past strong efforts from second-place finishing Team N3RS with 10.52 million. West of the Mississippi, Stan, K5GO and his band made a big statement from Arkansas by taking third place with 8.08 million points.

COURTESY MARV BLOOMQUIST, N5AW

2010 WRTC participant Marv, N5AW, in front of his Burnett, TX station. Marv earned just under 2M points, good for 4th place in the Single Operator, Low Power category for W/VE.

W/VE Multi Operator, Single Transmitter

K9RS (EPA), operated by W2ID, W2GD and N3DXX, dominated the High Power Multi-Single category from USA this year with 6.57 million points. Perennial M/S power K8AZ (OH) was second with 5.57 million, while K2QMF (NLI) took third with 4.96 million.

This also marked the first year M/S was split into High and Low Power categories. Winning the Low Power race was W1TM (EMA) with 831K behind the operating of W1TM and AK1Q. They were followed by 772K from W3CF (EPA) and 386K from W4AUB (NFL).

W/VE Single Band

Single band efforts can produce some thrilling action. On 10 meters, Cort, K4WI toughed it out with 22K points for the top spot. Dave, K1WHS and Emil, W3EP tied for second place with 14,994 points.

Despite a rise in solar activity, 15 meters was still the highest band with sustainable openings during the contest. Brian, N2MF was first with 333K, while Paul, N4PN took second with 327K. Steve, K4FJ was third with 228K.

In the 20 meter camp, Gene, N2AA guided his Virginia station to 496K for first place, followed by 331K from Bob, N6TV on the Left Coast and 326K from the North Jersey Contest Club station W2AW, piloted by George, N2GM.

Rick, KI1G in Rhode Island took advantage of a lively 40 meter band, scoring 582K points for first place. George, N4UA in Virginia was second with 322K, followed by Rich, W2EG in New York with 264K.

On 80 meters, N8BO operated the K6ND station in Massachusetts for top honors on 80

W/VE

Single Operator, High Power

VY2ZM (K1ZM, op)	5,942,349
KØDQ	5,723,388
K3CR (LZ4AX, op)	5,713,920
K5ZD (KM3T, op)	4,509,240
W9RE	4,352,238
VC3E (VE3AT, op)	4,336,080
K8PO	4,334,904
VY2TT (K6LA, op)	4,152,006
K1RX	4,133,085
AA1K	3,971,670

Single Operator, Low Power

N1UR	3,469,734
W3EF	2,470,752
N4TZ	2,032,344
N5AW	1,996,620
WØUO	1,724,580
N8AA	1,411,488
KU2M	1,409,967
N9CK	1,385,280
K3NK	1,314,864
W1JQ	1,264,509

Single Operator, QRP

K3PH	838,368
VA3DF	662,904
W9WI	563,604
N7IR	468,996
N1TM	456,036
K8CN	430,047
W6JTI	404,826
NØKE	355,746
AA1CA	328,536
NØUR	304,425

Single Operator Assisted, High Power

K3WW	6,540,558
AA3B	6,244,308
K2M (K2NG, op)	4,648,050
N1IW	3,391,080
K5NA	3,343,464
K9NW	3,299,049
N2MM	2,958,927
N1EU	2,886,060
K5WA	2,852,436
W3UA	2,779,110

Single Operator Assisted, Low Power

WW3S	1,508,637
W1NT	1,261,440
KØKX	1,216,224
W3KB	1,187,844
VE2XAA	1,181,244
WO1N	1,160,628
KU8E	1,045,125
KA2D	956,592
K1LD	927,693
K4FPF	880,854

Single Operator, 10 Meters

K4WI	22,152
K1WHS	14,994
W3EP	14,994
N5DO	6,732
WB2AMU	6,090
VE3FDT	5,481
WO2N	4,536
KG9Z	4,293
AD6WL	3,240
K1MC	2,142

Single Operator, 15 Meters

N2MF	333,072
N4PN	327,000
K4FJ	228,600
N4ZZ	199,626
WB4TDH	178,560
VE3KZ	142,884
K5FP	112,203
WA7LT	108,135
K2UR	95,697
N7DR	71,040

Single Operator, 20 Meters

N2AA	496,080
N6TV	331,038
W2AW	326,016
VE6WQ	315,228
AD4EB	244,776
N7IV	210,588
N8AGU	191,805
KR2AA	181,917
N4IJ	154,440
K7FA	99,360

Single Operator, 40 Meters

KI1G	582,426
N4UA	322,335
W2EG	264,195
N2WQ/VE3	252,000
N6MA	196,560
N5IA	167,010
WA1FCN	158,760
K5TDA	85,008
W6PU	81,345
K3TW/4	78,012

Single Operator, 80 Meters

K6ND (N8BO, op)	261,318
K2XA	256,347
K9OM	222,411
W5ZN	221,970
K2EK	152,457
WØUCE	141,960
NA8V	99,792
WØPV	66,759
KØKT	58,515
W9OP	55,890

Single Operator, 160 Meters

W4ZV	81,450
K4PI	57,498
W2MF	44,472
KVØQ	41,040
K5RX	39,528
W8TOP	38,664
WJ9B	32,178
N2GC	22,134
NØTT	17,442
W2VO	17,304

Multioperator, Single Transmitter, High Power

K9RS	6,572,328
K8AZ	5,573,880
K2QMF	4,964,190
NØNI	4,871,556
K5TR	4,362,876
N1FD	3,149,784
N4WW	2,892,780
KX9X	2,595,096
NK7U	2,562,390
W1DX	2,318,103

Multioperator, Single Transmitter, Low Power

W1TM	831,735
W3CF	772,260
W4AUB	386,781
KØUK	341,220
VA7DZ	312,759
N7DS	248,385
K4FT	193,230
KØJE	177,600
N9FN	99,603
W3WN	39,627

Multioperator, Two Transmitter

KC1XX	12,145,458
N3RS	10,529,847
K5GO	8,098,926
KB1H	7,746,690
W4RM	7,584,546
WW4LL	6,667,830
K5KG	4,996,986
N7AT	4,152,912
VE3YAA	3,815,532
NØIJ	3,437,964

Multioperator, Multi Transmitter

K3LR	14,298,120
W3LPL	14,042,880
WE3C	12,295,554
NR4M	11,672,115
KM1W	11,520,930
NQ4I	11,330,142
W2FU	11,263,596
K1AR	10,931,706
K1TTT	10,065,240
NY4A	9,094,554

DX

Single Operator, High Power

PJ4A (RD3A, op)	7,477,128
ZF2AM (K6AM, op)	6,591,912
8P3A (VE3DZ, op)	5,715,183
PZ5P	5,255,892
FM5BH	4,794,984
VP2MMM (N3AD, op)	4,625,370
KH7X (KH6ND, op)	4,618,548
CS2C (OK1RF, op)	4,092,795
EF8R (EA8CAC, op)	3,840,144
PY2NDX	3,837,936

Single Operator, Low Power

WP3C	4,527,576
VP9/W6PH	3,284,715
J88DR (G3TBK, op)	3,139,218
6W/WJ2O	2,368,560
KP2CW (K6VVA, op)	1,930,896
J38A (K4LTA, op)	1,900,464
IR1Y	1,770,273
S5ØA	1,498,068
TG7/N6HD	1,465,026
PY2NY	1,271,940

Single Operator, QRP

HB9BMY	181,959
AY9F	178,770
EA7AAW	119,460
UU2CW	102,690
LZ2RS	92,400
JR4DAH	83,661
G3R (GØDCK, op)	64,680
IV3AOL	55,890
F5UKL	54,720
E74A	50,895

Single Operator Assisted, High Power

PW7T (PY8AZT, op)	3,477,669
OK7M (OK1DIG, op)	1,972,542
DF9ZP (DK8ZB, op)	1,806,000
LU5FB (LU1AEE, op)	1,791,204
S59ABC (S51DS, op)	1,779,330
S57DX	1,645,665
HG7T (HA7TM, op)	1,494,801
MD2C (MDØCCE, op)	1,481,922
UW2M (URØMC, op)	1,396,980
OQ5M (ON5ZO, op)	1,389,204

Single Operator Assisted, Low Power

V31RR (AA4NC, op)	5,286,978
PY2SEX	1,751,640
IK2HDF	634,266
KP2B (WP3A, op)	602,820
JH1EAQ	517,545
GIØRQK	496,800
EC4CBZ	473,760
OK2PAY	460,209
KP2DX (KP2BH, op)	384,615
DF1LON	318,720

Single Operator, 10 Meters

LU1HF	298,953
CE3/VE7SV	286,032
LU7HN	210,504
P43JB	155,520
J39BS	146,574
HK1AA	139,776
PY2MTS	129,924
LW8DQ	114,240
J5NAR (HAØNAR, op)	112,896
HD2B (HC2SL, op)	106,362

Single Operator, 15 Meters

D4C (YL2GM, op)	439,137
TI5KD (N2BA, op)	417,012
HK1R	416,658
CE1/K7CA	399,489
CR2A (OH2MM, op)	350,991
CX5BW	284,616
PY2YU	275,412
PY1ZRT (IV3NVN, op)	213,498
EA8NC	160,911
GW3YDX	139,602

Single Operator, 20 Meters

D44AC (YL2GM, op)	418,959
EF8S	407,100
HK1N	357,717
E73W	232,047
S52AW	216,108
DK9TN	215,760
TF3CW	211,758
G3AB	211,356
OH8L (OH8LQ, op)	201,492
KL8DX	195,576

Single Operator, 40 Meters

C6APG (K4PG, op)	370,107
HK1X	338,220
EF8N	292,758
LX7I (HB9CVQ, op)	262,914
HB9FAP	243,000
HA6P (HA6PX, op)	238,392
YU1LA	238,032
EA7KW	223,839
CR6K (CT1CJJ, op)	222,198
S51F	209,670

Single Operator, 80 Meters

C6AKQ (N4BP, op)	258,552
KH6MB	176,760
F2DX	163,476
SN3A (SP3HLM, op)	155,439
HK1MW	141,930
SN7Q	137,940
DJØMDR	94,668
G6MC (G3WW, op)	91,341
D44CA (YL2GM, op)	86,112
SN2M (SP2XF, op)	85,305

Single Operator, 160 Meters

CR2X (OH2BH, op)	140,892
KV4FZ	117,450
HQ9R	113,100
KH6ZM	91,314
XE2WWW	81,090
D44TD	76,950
RA2FA	63,357
S51V	61,548
M5O (G3LET, op)	52,560
I2WIJ	24,252

Multioperator, Single Transmitter, High Power

TI5A	6,759,600
P4ØL	6,669,000
PJ6A	5,586,168
C6AGU	5,194,800
XE7S	5,167,248
CN3A	4,481,118
CW5W	4,329,369
TM6M	4,032,480
LS1D	3,132,360
IR4M	2,966,406

Multioperator, Single Transmitter, Low Power

VQ5D	4,780,215
HI3CC	3,028,530
T3ØYA	1,909,230
S5ØXX	559,674
OL1C	374,535
LU5UBI	265,716
HA6KZS	52,851
DLØMI	38,925
YO6KNY	7,812
SN9K	5,100

Multioperator, Two Transmitter

V48M	7,614,495
CR3L	6,540,891
OL4A	3,969,225
RL3A	1,442,808
7J1YAJ	1,275,552
JA1YPA	1,169,721
JA1ZGP	720,606
RT5G	564,018
RK3XWO	44,325

Multioperator, Multi-Transmitter

PJ2T	10,633,140
KH6LC	7,258,608
9A1A	4,595,790
HG2Ø11N	2,908,068
JA3YBK	2,152,434
LZ5R	2,118,468
UU5A	2,304
OK1JOK	882

this past February. His 261K edged out the 256K from Saul, K2XA (ENY) and 222K from Dick, K9OM at his Edgewater, Florida QTH.

Top Band warrior Bill, W4ZV in North Carolina propelled his station to first place on 160 meters again this year. Bill's 81,450 points proved best. Mike, K4PI in Georgia was second with 57K points followed by 44K points from Manny, W2MF.

DX Single Operator

There's little doubt that the Caribbean is the place to be if one is interested in capturing a title in the ARRL DX CW Single Operator race. The rates are spectacular, all of the bands produce good openings, and there's always a beach to hit after the contest is over. A Radioman's paradise!

In Single Operator, High Power, Valery, RD3A drove the PJ4A station to a stellar 7.477 million points for the win and an all-time record. This monster score featured nearly 900 contacts on 80 and more than 300 on 160. John, K6AM captained ZF2AM to second place with 6.59 million. Yuri, VE3DZ took another trip to Barbados this year, finishing third from 8P3A with 5.7 million.

Alfredo, WP3C took the DX Single Operator Low Power trophy with 4.57 million points. Alfredo was particularly pleased to see 10 meters come to life. VP9/W6PH was second with 3.28 million. David, J88DR (G3TBK) was third with 3.13 million points.

Braving a QRP entry for 48 hours requires a lot of patience. Topping the category from the DX side this year was HB9BMY with

181K points. Gabriel, AY9F in Argentina was a close second with 178K. Emilio, EA7AAW collected 119K for third spot.

DX Single Operator Assisted

Assisted categories are becoming more and more competitive each year, but it was a runaway in the DX High Power column this time around. Luc, PY8AZT throttled the competition by steering PW7T to 3.47 million points. Daniel, OK1DIG guided OK7M to second place with 1.97 million points. Barney, DK8ZB piloted DF9ZP to third with 1.8 million.

AA4NC took the new SOA title as V31RR. This year, just minutes prior to the start of the contest his amplifier quit working, so Will was forced to enter the new Low Power category as V31RR. His score was higher than last year despite running low power and finished first in the new Single Operator Assisted, Low Power category with 5.28 million points. Alex, PY2SEX was second with 1.75 million, followed by 634K from Massimo, IK2HDF.

DX Multi Operator

Leading the DX Multioperator, Single Transmitter, High Power race this year was the team of TI5A with 6.75 million points. Just behind in second place was P4ØL with 6.66 million and PJ6A with 5.58 million. C6AGU was fourth overall with 5.19 million, while XE7S rounded out the top five with 5.16 million.

In the M/S Low Power category, VQ5D raced to 4.7 million points for first place. Their performance was in honor of their friend and excellent operator Hank Kohl, K8DD who became a silent key shortly before the contest. In second place was HI3CC with 3.02 million. Team T3ØYA made many contesters happy with a rare mult. The group scored 1.90 million

W/VE Region Leaders By Category

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

Northeast Region (New England, Hudson and Atlantic Divisions; Maritime and Quebec Sections)			Southeast Region (Delta, Roanoke and Southeastern Divisions)			Central Region (Central and Great Lakes Divisions; Ontario Section)			Midwest Region (Dakota, Midwest, Rocky Mountain and West Gulf Divisions; Manitoba and Saskatchewan Sections)			West Coast Region (Pacific, Northwestern and Southwestern Divisions; Alberta, British Columbia and NWT Sections)		
VY2ZM (K1ZM, op)	5,942,349	C	NK4RO	2,514,600	C	W9RE	4,352,238	C	KØSR	2,367,114	C	W6YI (N6MJ, op)	3,378,954	C
KØDQ	5,723,388	C	K1TO	1,796,691	C	VC3E (VE3AT, op)	4,336,080	C	K7KU (KØKR, op)	1,556,862	C	K6XX	2,318,682	C
K3CR (LZ4AX, op)	5,713,920	C	K5EK	1,795,218	C	K8GL	2,615,718	C	N7VM	1,532,700	C	VE7CC	2,128,113	C
K5ZD (KM3T, op)	4,509,240	C	K4AB	1,573,650	C	K9CT	2,502,027	C	NEØU	1,031,058	C	K7RL	2,070,405	C
K8PO	4,334,904	C	W3GQ	1,492,344	C	N8BJQ	2,060,400	C	K5BG	1,016,334	C	NR6O (K7GK, op)	1,909,941	C
N1UR	3,469,734	B	N2WN	1,237,650	B	N4TZ	2,032,344	B	N5AW	1,996,620	B	N7ZG	893,628	B
W3EF	2,470,752	B	N4YDU	1,218,402	B	N8AA	1,411,488	B	WØUO	1,724,580	B	KE7X	838,350	B
KU2M	1,409,967	B	NA4K	1,098,342	B	N9CK	1,385,280	B	WØETT	592,416	B	N6RV	679,098	B
K3NK	1,314,864	B	K5KLA	954,750	B	WB8JUI	865,368	B	W5RYA	503,880	B	W7IJ	520,380	B
W1JQ	1,264,509	B	W4AA	952,902	B	KV8Q	815,670	B	KØBJ	476,556	B	WU9B	491,556	B
K3PH	838,368	A	W9WI	563,604	A	VA3DF	662,904	A	NØKE	355,746	A	N7IR	468,996	A
N1TM	456,036	A	K4CNW	209,241	A	K8ZT	271,998	A	NØUR	304,425	A	W6JTI	404,826	A
K8CN	430,047	A	K4ORD	176,958	A	VE3GTC	159,318	A	NDØC	226,164	A	W7GB	238,632	A
AA1CA	328,536	A	KS4X	110,079	A	KC8LTL	121,986	A	KIØG	102,240	A	NN7SS (K6UFO, op)	188,940	A
K2JT	175,896	A	NU4B	66,300	A	KT8K	104,394	A	K5ND	75,648	A	VA7DER (VE6BIR, op)	31,284	A

Continental Leaders By Category

Continents/Category Name	*Call*	*Score*
Africa		
Single Operator, High Power	EF8R (EA8CAC, op)	3,840,144
Single Operator, Low Power	6W/WJ2O	2,368,560
Single Operator, 10 Meters	J5NAR (HAØNAR, op)	112,896
Single Operator, 15 Meters	D4C (YL2GM, op)	439,137
Single Operator, 20 Meters	D44AC (YL2GM, op)	418,959
Single Operator, 40 Meters	EF8N	292,758
Single Operator, 80 Meters	D44CA (YL2GM, op)	86,112
Single Operator, 160 Meters	D44TD	76,950
Multioperator, Single Transmitter, High Power	CN3A	4,481,118
Multioperator, Two Transmitter	CR3L	6,540,891
Asia		
Single Operator, High Power	JR1AIB (JE1CKA, op)	986,040
Single Operator, Low Power	JH4UYB	726,300
Single Operator, QRP	JR4DAH	83,661
Single Operator Assisted, High Power	JS3CTQ	1,095,480
Single Operator Assisted, Low Power	JH1EAQ	517,545
Single Operator, 10 Meters	JA7OWD	612
Single Operator, 15 Meters	JA7NVF	87,216
Single Operator, 20 Meters	JR8VSE	132,012
Single Operator, 40 Meters	7J1AAI (W1NN, op @ JH1GTV)	116,865
Single Operator, 80 Meters	JH1AEP	45,816
Single Operator, 160 Meters	JH2FXK	8,586
Multioperator, Single Transmitter, High Power	RWØCWA	1,304,100
Multioperator, Two Transmitter	7J1YAJ	1,275,552
Multioperator, Multi-Transmitter	JA3YBK	2,152,434
Europe		
Single Operator, High Power	CS2C (OK1RF, op)	4,092,795
Single Operator, Low Power	IR1Y	1,770,273
Single Operator, QRP	HB9BMY	181,959
Single Operator Assisted, High Power	OK7M (OK1DIG, op)	1,972,542
Single Operator Assisted, Low Power	IK2HDF	634,266
Single Operator, 10 Meters	EA7GV	11,811
Single Operator, 15 Meters	CR2A (OH2MM, op)	350,991
Single Operator, 20 Meters	E73W	232,047
Single Operator, 40 Meters	LX7I (HB9CVQ, op)	262,914
Single Operator, 80 Meters	F2DX	163,476
Single Operator, 160 Meters	CR2X (OH2BH, op)	140,892
Multioperator, Single Transmitter, High Power	TM6M	4,032,480
Multioperator, Single Transmitter, Low Power	S5ØXX	559,674
Multioperator, Two Transmitter	OL4A	3,969,225
Multioperator, Multi-Transmitter	9A1A	4,595,790

Continents/Category Name	*Call*	*Score*
North America		
Single Operator, High Power	ZF2AM (K6AM, op)	6,591,912
Single Operator, Low Power	WP3C	4,527,576
Single Operator Assisted, High Power	V31YN	74,094
Single Operator Assisted, Low Power	V31RR (AA4NC, op)	5,286,978
Single Operator, 10 Meters	J39BS	146,574
Single Operator, 15 Meters	TI5KD (N2BA, op)	417,012
Single Operator, 20 Meters	KL8DX	195,576
Single Operator, 40 Meters	C6APG (K4PG, op)	370,107
Single Operator, 80 Meters	C6AKQ (N4BP, op)	258,552
Single Operator, 160 Meters	KV4FZ	117,450
Multioperator, Single Transmitter, High Power	TI5A	6,759,600
Multioperator, Single Transmitter, Low Power	VQ5D	4,780,215
Multioperator, Two Transmitter	V48M	7,614,495
Oceania		
Single Operator, High Power	KH7X (KH6ND, op)	4,618,548
Single Operator, Low Power	VK2IM	463,287
Single Operator, QRP	N7ET/DU7	18,576
Single Operator Assisted, High Power	NH2T (N2NL, op)	741,195
Single Operator Assisted, Low Power	DU1/JJ5GMJ	24,897
Multioperator, Single Transmitter, High Power	ZM1A	2,067,576
Multioperator, Single Transmitter, Low Power	T3ØYA	1,909,230
Multioperator, Multi-Transmitter	KH6LC	7,258,608
Single Operator, 10 Meters	YC1BJX	60
Single Operator, 15 Meters	KH6CW (K7GQ, op)	127,995
Single Operator, 40 Meters	ZL2AGY	84,975
Single Operator, 80 Meters	KH6MB	176,760
Single Operator, 160 Meters	KH6ZM	91,314
South America		
Single Operator, High Power	PJ4A (RD3A, op)	7,477,128
Single Operator, Low Power	PY2NY	1,271,940
Single Operator, QRP	AY9F	178,770
Single Operator Assisted, High Power	PW7T (PY8AZT, op)	3,477,669
Single Operator Assisted, Low Power	PY2SEX	1,751,640
Single Operator, 10 Meters	LU1HF	298,953
Single Operator, 15 Meters	HK1R	416,658
Single Operator, 20 Meters	HK1N	357,717
Single Operator, 40 Meters	HK1X	338,220
Single Operator, 80 Meters	HK1MW	141,930
Multioperator, Single Transmitter, High Power	P4ØL	6,669,000
Multioperator, Single Transmitter, Low Power	LU5UBI	265,716
Multioperator, Multi-Transmitter	PJ2T	10,633,140

Sponsored Plaque Winners

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

Plaque Category	*Plaque Sponsor*	*Winner*
W/VE Single Operator High Power CW	Frankford Radio Club	VY2ZM (K1ZM, op)
W/VE 1.8 MHz CW	Jerry Rosalius, WB9Z	W4ZV
W/VE 21 MHz CW	Carl Luetzelschwab, K9LA	N2MF
W/VE 28 MHz CW	Green River Valley, IL ARS	K4WI
W/VE Single Operator Low Power CW	Andy Faber, AE6Y	N1UR
W/VE Single Operator QRP CW	Tod Olson, KØTO	K3PH
W/VE Single Operator Assisted, High Power CW	Harold Ritchey, W3WPG Memorial	K3WW
W/VE Multioperator Unlimited Transmitter CW	Wilson Electronics, N7JW	K3LR
World Single Operator High Power CW	North Jersey DX Association	PJ4A (RD3A, op)
Europe Single Operator High Power CW	Jim George, N3BB	CS2C (OK1RF, op)
North America Single Operator High Power CW	Potomac Valley Radio Club	ZF2AM (K6AM, op)
World 1.8 MHz CW	Fred Race, W8FR, In Memory of DL1FF	CR2X (OH2BH, op)
World 14 MHz CW	Jeff Hartley, N8II	D44AC (YL2GM, op)
World 21 MHz CW	Caribbean Contesting Consortium - PJ2T	D4C (YL2GM, op)
World 28 MHz CW	W7EW / W7AT	LU1HF
World Single Operator QRP CW	Jerry Griffin, K6MD	HB9BMY
World Single Operator Assisted, High Power CW	Southern California DX Club	PW7T (PY8AZT, op)
World Multioperator Single Transmitter, High Power CW	John Patterson WCØW/V31TP	TI5A
Asia Multioperator Single Transmitter High Power CW	Yankee Clipper Contest Club	RWØCWA
World Multioperator Two Transmitters CW	Tom De Meiss K2TD Memorial	V48M
World Multioperator Unlimited CW	H Stephen Miller NØSM	PJ2T
Great Lakes Division Single Operator CW	North Coast Contesters	K8GL
Japan Single Operator Low Power CW	Western Washington DX Club	JH4UYB
Seventh Call Area Single Operator High Power CW	Willamette Valley DX Club	KO7AA
Canada Single Operator Low Power CW	Contest Club Ontario	VE1RGB
Pacific Division Single Operator Low Power CW	Central California DX Club, Inc., W6MEL	W6IYS
North America Single Operator Low Power CW	John Patterson WCØW/V31TP	WP3C
Hudson Division Single Operator High Power CW	HVCDX & AARA John Naberezny, WE2F Memorial	N2LT
Central Division Single Operator High Power CW	Northern Illinois DX Association	W9RE
Pacific Division Single Operator 20 Meters CW	Jim Davis, NN6EE	N6TV

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

points for third place.

The Multi Operator, Two Transmitter Category was paced by an outstanding performance from V48M The team tallied 7.6 million points, holding off a 6.5 million point performance from CR3L. Team OL4A was third with 3.9 million,

In the DX Multi-operator, Multi Transmitter category, it was another stunning performance from PJ2T this year. The heavy-hitting group fashioned a consecutive triumph for a new world M/M record of 10.6 million. Finishing second, with a new Oceana record was KH6LC with 7.2 million, followed by the Croatian team of 9A1A with 4.5 million.

DX Single Band

Juan, LU1HF was a beacon into the U.S. this year on 10 meters. His 298K score took was the best in the world. Dale, CE3/VE7SV was second with 286K and Rene, LU7HN captured third with 210K.

On 15 meters, D4C (Girts, YL2GM, op) raced to 439K for first place. Brooke, N2BA operated from TI5KD for second place with 417K followed by Jorge, HK1R with 399K.

On 20 meters, Girts was at it again, although signing D44AC. He was first this time with 418K and a new 20 meter African record. Mauri, OH2BS at EF8S tallied 407K for second and Jaime, HK1N scored 357K for third spot.

Forty meters can be a bottomless sea of QSOs from the Caribbean. Kevin, K4PG scored 370K from C6APG for top honors en route to setting a new record from North America. Pedro, HK1X was second with 338K followed by 292K from EF8N (Andy EA8CN, op), which is a new African record.

Bob, N4BP outlasted everyone on 80M with a fine 258K total from C6AKQ. Taking second place, and setting a new record from Oceana, was Martin, KH6MB with 176K followed by 163K from Patrick, F2DX.

There were plenty of veteran DX operators to be found on top band this year. Martti, OH2BH led the way with his 140K from CR2X. Martti's hard work also netted a new record on 160 meters from Europe. John, ON4UN held the old top band record of 79K set in 2010. The Low-band Voice of KP2, Herb, KV4FZ was second with 117K and Ray, WQ7R at HQ9R sailed to third spot with 113K.

Continental Roundup

In Africa, EF8R (Juan, EA8CAC, op) was the best in the SOABHP category with 3.84M. 6W/WJ2O captured the same honor in SOABLP class with 2.36M. A mostly Italian team of ops at CN3A was unstoppable in Africa with 4.48M in the M/S HP class. The German team at CR3L was also first in the M/2 class from Africa with 6.54 million.

Increased high-band conditions leads to more excitement from operators from Asia. This year was no exception as JR1AIB (JE1CKA, op) led the way in the SOABHP class with 986K points. Jin, JH4UYB was the top Asian station in the SOABLP class with 724K. For SOA, Hiro, JS3CTQ won the High Power battle with 1.09 million points, as Nob, JH1EAQ claimed the Low Power title with 517K. North of Khabarovsk, team RWØCWA was first in the M/S HP class with 1.3M. In the M/2 category the team at 7J1YAJ was first with 1.27 million. The Mount RF group at JA3YBK cruised to a M/M win for Asia with 2.1 million points.

Europe is the area of concentration for many US operators. Leading the way in Europe and setting a new European record in the SOABHP category, was CS2C (Jiri, OK1RF, op) with a stout 4.09 million points. Carlo, IR1Y was first in the SOABLP race with 1.77 million points. Peter, HB9BMY pocketed the Single Operator, QRP fight with 181K points. The TM6M team was first in the M/S HP category with 4.03 million, with S5ØXX took the Low Power category. For M/2in Europe the crown went to OL4A with 4.96 million points. Long-time M/M entrant 9A1A sailed to the top spot in Europe with 4.59 million.

John, ZF2AM set the pace in SOABHP category from North America with 6.5M. Alfredo, WP3C was tops in SOABLP with 4.5M. In the SOA, High Power category, Gerd, V31YN was first with a mere 74K. Will, AA4NC was first in NA in the SOA, Low Power column with 5.2M as V31RR. Derek, J39BS was first from NA on 10 meters with 146K. Team TI5A finished first in the M/S HP race with 6.7M, a new record from South America. VQ5D earned first place in the M/S LP, category, while V48M was tops in M/2.

There were several noteworthy efforts from Oceana this year. KH7X (Mike, KH6ND, op) was the top SOABHP entry after scoring 4.6M, while VK2IM was first in the SOABLP with 463K. Dale, N7ET/DU7 earned recognition in SOQRP with 18K points. David, N2NL scored 741K from NH2T in the SOA, High Power class for the top spot. It was Hiro, DU1/JJ5GMJ winning the SOA, Low Power spot with 24K. ZM1A set the pace from Oceana in M/S HP with 2.06 million points, while T3ØYA was first in M/S LP with 1.90M. KH6LC amassed an impressive score: 7.25M for top OC honors in M/2 for a new Oceana record.

In South America, Valery, RD3A's performance from PJ4A (7.47M) was the best in the SOABHP class. For SOABLP, it was Vitor, PY2NY earning the first place with 1.27M. Gabriel, op at AY9F was first in the SOQRP race with 178K. Luc, PY8AZT led all South Americans with 3.4M from PW7T in the SOA, High Power category, while SOA, Low Power was Alex, PY2SEX in first with 1.75M. Finishing the South American roundup is the impressive 6.66M score from P4ØL in the M/S HP class for first place, 265K points from the LU5UBI group in the M/S LP class and 10.6M from the PJ2T super team in the M/M class.

Next Year

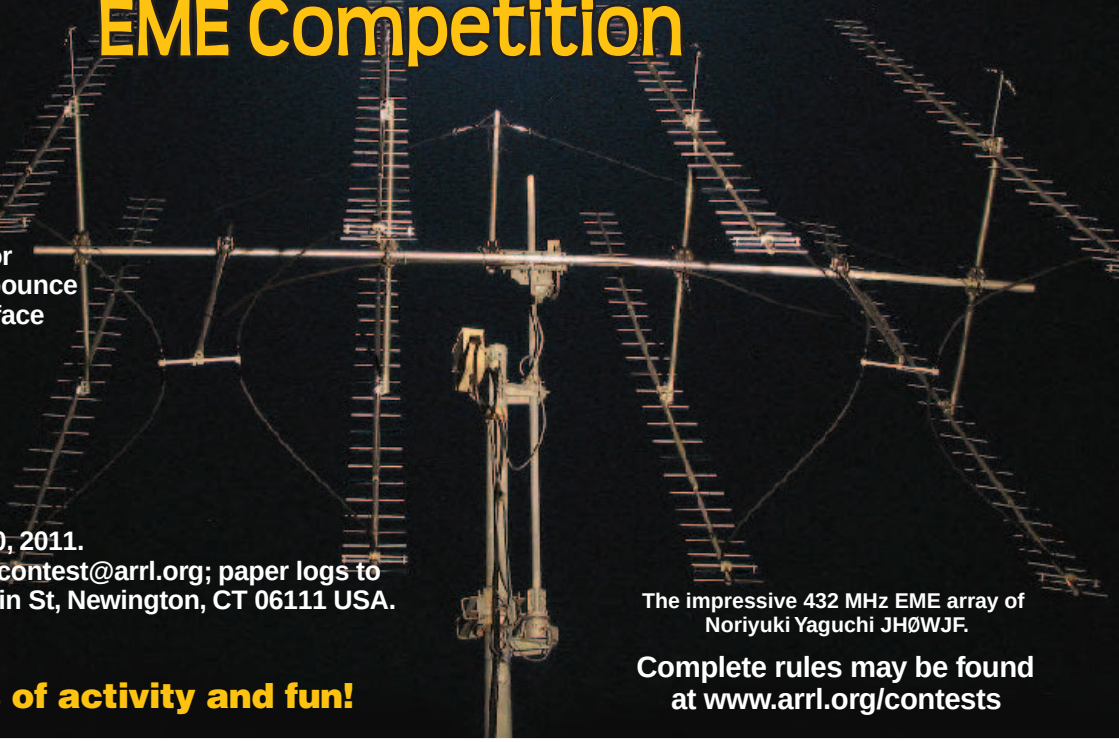
At the current rate, expect more positive solar impact for next year's ARRL CW contest. So it may be time to start thinking about improving your signal on the high bands or even time to finally take the leap and go on a contest expedition. Be sure to be active for the 2012 ARRL DX CW Contest the weekend of February 18-19; it'll be too great to pass by. QST

COURTESY NORIYUKI YAGUCHI, JHØWJF

The 2011 ARRL International EME Competition

■ Many stations are successfully making QSOs on 2 meters and up with only 100 W and a single long-boom Yagi. Using CW or digital modes, you too can bounce your signal off the lunar surface and work DX! Certificates awarded to all stations that submit a log with at least one QSO!

■ Log must be received at ARRL HQ no later than 2359Z Tuesday, December 20, 2011. Send electronic logs to emecontest@arrl.org; paper logs to EME Contest, ARRL, 225 Main St, Newington, CT 06111 USA.



The impressive 432 MHz EME array of Noriyuki Yaguchi JHØWJF.

Three weekends of activity and fun!

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

September 24-25: 2.3+ GHz ♦ October 22-23: 50-1296 MHz ♦ November 19-20: 50-1296 MHz
0000 UTC Saturday – 2359 UTC Sunday each weekend

The August 2011 Rookie Roundup — RTTY

1800 UTC – 2359 UTC Sunday, August 21

■ Digital modes come to the August Rookie Roundup! RTTY will be the mode for the first time in this new contest aimed at amateurs licensed for three years or less. Old-timers work the Rookies and are encouraged to mentor the Rookies in person as well.

■ It's easy and fun to get on RTTY; all it takes is a PC, a rig and an interface to connect your PC's sound card to your favorite HF transceiver. If you are new to RTTY, champion RTTY contester Don Hill, AA5AU, has a great beginners' guide to RTTY on his website at **www.aa5au.com/rtty**.

■ Submit your score summary online using the Rookie Roundup Score submission form within 72 hours. All Rookie participants get a certificate via e-mail.

■ CU on the bands!

Complete rules and score reporting can be found at **www.arrl.org/rookie-roundup**.

W1AW Station Manager Joe Carcia, NJ1Q, shows off a simple RTTY station: a rig, a netbook PC and a homebrew soundcard interface. Don Hill, AA5AU talks about sound card interfaces on his RTTY website at www.aa5au.com/rtty.

2011 ARRL 10 GHz and Up Contest

August 20-21 (first weekend) and September 17-18 (second weekend).
6 AM local time Saturday through 12 Midnight local time Sunday

BRUCE RICHARDSON, W9FZ

Jon Platt, WØZQ, is a 10 GHz Contest "regular" every August from the EN family of grids in Minnesota.

One of the most challenging events on the contest calendar, the 10 GHz and Up Contest tests your ability to communicate over hundreds of miles on the microwave bands. Portable operation is not only allowed, it's encouraged! If you're an experimenter, this event is definitely for you! If you're interested, hook up with one of the regional microwave clubs and ask to tag along; there's a list of them at **www.arrl.org/v-u-shf-clubs**.

E-mail logs to **10ghz@arrl.org**, or send paper logs to 10 GHz Contest, ARRL, 225 Main St, Newington, CT 06111. All logs must be received by 2359 UTC on Tuesday, October 18, 2011.

Be sure to post your 10 GHz stories, photos and other interesting information about your contest experience at **www.arrl.org/soapbox**; high-resolution photos are encouraged!

Complete rules for both contests are at www.arrl.org/contests.

2011 ARRL September VHF QSO Party

1800 UTC Saturday, September 10 through 0300 UTC Monday, September 12

Do you want to work stations hundreds of miles away on the VHF+ bands? Do you have a "DC-to daylight" radio with 6 meters, 2 meters or even 432 MHz? Have you ever used those bands? All amateurs, from experienced HF contesters and DXers to newly licensed Technicians, can get in on the fun on the ARRL September VHF QSO Party! *It's EASY!*

VHF antennas are smaller than their HF counterparts. They're ideal for setting up in the back yard, at a campsite or hilltop. You can even pack them in your vehicle and operate from multiple locations during the contest period. The contest exchange is simply your Maidenhead grid square; learn more about grid squares at **www.arrl.org/grid-squares**.

If you want to learn more about VHF+ contesting, go to the ARRL's list of VHF clubs at **www.arrl.org/v-u-shf-clubs**; they'll be happy to help you!

Don't sit on the sidelines the second weekend in September…get in on the VHF fun!

MICHAEL FAHMIE, WA6ZTY

The WB6W Multioperator team set up on 50-1296 MHz at a remote Sierra Nevada fire lookout in the Sacramento Valley Section in the 2010 September VHF QSO Party.

Logs must be received by 1800 UTC Wednesday, October 12, 2011
E-mail Cabrillo-formatted electronic logs to septembervhf@arrl.org.

W3UR

HOW'S DX?

TO2FH — 2011 Mayotte Island DXpedition

Alex Dalmasso, PY2WAS

The thought of a DXpedition to Mayotte Island began in 2009 amongst Anderson, PY2TNT; Alex, PY2WAS; Fred, PY2XB, and Fabio, PY2AAZ. It was to take place in September 2010. Mayotte is a French territory located in the southeast of Africa, between Mozambique and Madagascar. Due to several problems with PY2WAS and then with other team members, the DXpedition was postponed even though the TO2FH license was already in place for September 2010.

Finally it was agreed that Alex, PY2WAS; Anderson, PY2TNT; Rick, PY2PT; Fernando, PY4BZ, and Jose, PT9ZE, would team up for a DXpedition to Mayotte Island in April 2011. Alain, F6ENO, was the one to support the team with all information and requirements submitted to the French government. For 8 months several teleconferences via *Skype* were held to discuss checklists, capital expenditures and all details related to the DXpedition. One week before our departure PY2TNT and PT9ZE had to drop out of the team because of personal issues so our final team was reduced to PY2PT, PY2WAS and PY4BZ.

The team left Brazil on April 15, 2011 headed toward Paris. The flight to Mayotte would leave Paris on Sunday night from the Paris-Orly Airport, while the flight from Brazil had arrived at Charles de Gaulle Airport. It was very hard to travel with all our baggage in Paris. We could take two bags weighing 32 kg from Brazil to France, but only 1 bag weighing 25 kg from France to Mayotte. Consequently, our charges for extra weight were unbelievable. Additionally, we had to buy tubes on the island to serve as poles for the antennas.

We finally reached the Hotel Trevani at the north shore of the big island at around 1:30 PM on Monday (April 18), after crossing from the small island by boat. Hotel Trevani is a really pleasant venue with many palm trees and bungalows right on a dazzling and quiet beach. Anyway, the heat was a big problem for us, just arriving carrying those heavy bags. Surprisingly, Trevani had air conditioning in all rooms, which made for a pleasant stay during the entire week.

Our first step was to choose the location for each station and then start assembling the equipment and antennas. We decided that each of us should prepare a station alone but the antennas would be assembled by the team. Station 3 (led by Fernando, PY4BZ) was the first one to install the PY1YB 20 meter vertical and 10 meter 5/8 vertical antennas, and the Alpha Delta 80/40 meter dipole antenna. Next, station 2 (led by Alex, PY2WAS) was prepared with an S9 multiband vertical antenna and a PY1YB 17 meter vertical. Finally, station 1 (led by Rick, PY2PT) was prepared with an S9 multi-band vertical antenna and a Super Antennas 3 element beam.

The first operation started around the end of the afternoon with big pileups right from the beginning. Each day we found a band that was open to Europe. In general, Russia and Italy arrived with very strong signals. US stations were heard loudly only during our night time but with strong signals also.

Curious for us was the propagation to Asia and especially to Japan. At some times of the year, it is hard to contact Japan from Brazil, but from Mayotte, you may contact Japan

The April 2011 TO2FH Mayotte Island DXpedition team included (l-r) Fernando, PY4BZ; Alex, PY2WAS, and Ricardo, PY2PT.

COURTESY ALEX DALMASSO, PY2WAS

The TO2FH bungalow was located right on the beach.

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

on 10 meters at around 12 PM (0900 UTC). Then, if you move from 10 to 12 meters and so on, you may contact Japan until night time. Japanese stations arrived with strong signals in Mayotte. Middle East stations were another welcome surprise.

During our free time, it was amazing to admire the huge bats hanging on the trees, the monkeys spread around the hotel and the beauty of the sunset and sunrise on the beach.

We did have our problems. The brand new MicroKeyer II was affected by Murphy's Law and did not work well, making it impossible to operate digital modes such as RTTY and PSK31. Propagation on the low bands (80 and 160 meters) was terrible and it was almost impossible to make any contacts there.

At the end of Sunday (April 24) the team started to disassemble the antennas and operations were interrupted at 12 PM (0900 UTC), to allow enough time to pack all devices properly. We were not able to sleep that night, as we finished the packaging of the materials at 5 AM (local time) and our flight was leaving at 9:15 AM. We experienced an apprehensive moment at the end of the DXpedition as we almost missed our ferry, as it was full of cars and we thought we would miss our plane. If that had happened, we would have had to stay on the island for an additional week, as it is a weekly flight. Fortunately, our car was the last one to enter the ferry at 7:45 AM, so we arrived on time at the airport.

We reached Paris at 11 PM Monday (April 25) in time for our flight to Brazil, which left Paris at 11:30 PM on April 26 and arrived in Brazil at 6:30 PM on April 27.

That DXpedition will be in our memories and our hearts for the rest of our lives. We won't ever forget the astonishing pileups, the support of many people, the commitment of the team to make it happen, the team building and the friendship. We want to express our deepest thanks to all those who participated in this unforgettable experience.

DX NEWS FROM AROUND THE GLOBE

CEØY — EASTER ISLAND

CEØY/I2DMI July 30-August 8 will be RTTY only from Easter Island. Frank says the license is in hand. He has requested special permission to operate on 30 meters, as this is needed for Chile and its possessions. QSL via I2DMI.

E4 — PALESTINE

Peri, HB9IQB, will be in Palestine during the middle of December of this year. The Deputy Minister of the Ministry of Telecommunications and Technology in Ramallah has issued his license for activity on 1.8-28 MHz on CW, SSB and digital modes during the second and third weeks of December as E4/HB9IQB. He'll be operating mostly CW using a K2/100 into wire verticals on 12, 17 and 30 meters with an emphasis on W6/W7 and Japan. He will be posting his logs to LoTW 1 month after returning home. He has a web page at **www.hb9iqb.ch/palestine.html**, which will also host a log search, possibly to be updated periodically during the operation. QSL via HB9IQB, either direct or via the bureau. Direct cards can go to Perikles Monioudis, Hohlstr 86 B, CH-8004 Zurich, Switzerland.

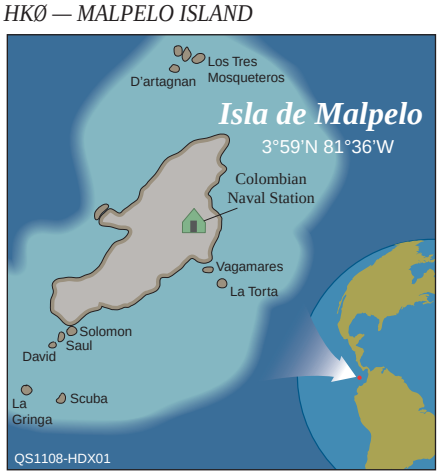
E5 — SOUTH COOK ISLANDS

Andy Duncan, AB7FS, from Oregon, will be on CW from Rarotonga, South Cooks, as E51AND, August 15-September 3 and again December 19-31. He plans to operate straight key slow CW around 14.050 MHz. His location will be on the beach at the villages of Arorangi in August and Nikao in December, with his FT-857D transceiver and "lagoon mounted vertical." He says these are not DXpeditions but fun ham vacations, "so frenetic issuing of signal reports will be a low priority, though I will try to make contacts with those who want them." He notes the ANZA net on 14.183 MHz at 0515Z is a good place to find stations in the Pacific. QSL via AB7FS.

FW — WALLIS AND FUTUNA ISLANDS

FWØR, Wallis Island, by HAØNAR, is planned for early next year. With three other operators, Laci will fly from Budapest to Los Angeles, then to Nadi on Fiji starting January 21, 2012. The operation itself is January 25-February 23. There will be two stations on 160-6 meters with solid state amplifiers, operating on CW, SSB and RTTY. They will focus on the low bands 160, 80, 40 and 30 with 18-meter-tall Spider verticals. There will be a week-long side trip to Futuna Island, OC-118, in early February. QSL via HAØNAR. Club and individual sponsors are being sought. Details will be posted at **www.ha0nar.hu**.

HKØ — MALPELO ISLAND



Malpelo Island DXpedition team leader Jorge Luis Prieto, HK1R, established contact with a ship that makes "frequent authorized" diving expeditions off the coast. The *Sea Wolf* is capable of accommodating 16 people. "Based on the conversations with them and the visits schedule by the Environmental Authority, which controls the island access, our most probable sailing date will be February 15, 2012," says Jorge. The team also announced that team member Jim, HK1N, will be responsible for 6 meters, with an emphasis on EME. The HKØNA team will be QRV on 160-6 meters on CW, SSB and RTTY with at least three stations. As of press time other team members include HK1MW, HK1N, HK1T, HK1X, HK3JJH, DJ9ZB, OHØXX, W6IZT and YV5SSB. There are a few openings still available for this one. The February 2012 Malpelo Island DXpedition team has a website at **hk0na.wordpress.com**.

KH4 — MIDWAY ISLANDS

In early May Joe, W5FJG, arrived on Midway Island as the island's Chief Communications Officer. He'll be there for at least a year and is planning to be QRV as KH4/W5FJG on 7-50 MHz on SSB, CW and the digital modes. His operating times will be weekends and off-duty times on weekdays. QSL via N7RO.

OJØ — MARKET REEF

The group, called the United Radio DX Team (ON5UR, PA5R, PD9DX and ON8AK), plan to be on Market Reef as OJØUR from August 13-20. They will travel on a small private boat and will "cross their fingers for good weather so the boat trip is possible and that we will have a safe landing." If weather permits, they will be picked up on Saturday, the 20th. They have a website at **www.united-radio.be**. QSL via MØURX.

V2 — ANTIGUA AND BARBUDA

Your editor will be going on a mission trip with his church to Antigua August 6-13. I've applied for the call V25UR and, if there is time available, plan to be QRV on 20 meters with the K3 and a dipole. Again this is a "mission trip" so probably my only activity will be around local sunrise and after sunset. QSL via W3UR.

V6 — FEDERATED STATES OF MICRONESIA

V63FAA will be active from Kosrae (OC-059), Micronesia from July 26-29 and from Pohnpei (OC-010) from July 30-August 4. The single operator will focus on 40 and 20 meters phone and CW. Use **QRZ.com** to request a scheduled contact on any HF band. QSL via LoTW or direct to W6ANM; please include SASE.

VK9/L — LORD HOWE ISLAND

The Hellenic Amateur Radio Association of Australia plans a major DXpedition to Lord Howe Island, July 23-August 2. They will be operating as VK9HR, on "multiple bands simultaneously to give everyone the chance to contact Lord Howe Island." Check out the VK9HR website at **www.lordhowe2011.com**. QSL via EB7DX.

ZD8 — ASCENSION ISLAND

Five German operators will activate Ascension Island as ZD8D, July 24-August 9. They plan to be on 160-6 meters and be in the IOTA Contest the last weekend of July. They will focus on digital modes and CW but will do some phone also. Team members are DK1IP, DL7OR, DJ4KW, DL1CW and DJ9KH as team leader. They will have two stations on the air with Yagis, quads and verticals. They are still looking for a sponsor for amplifiers; their rigs will be Elecraft K3s, 100 W. They have a website at **www.zd8d.de**.

NØJK

THE WORLD ABOVE 50 MHz

Welcome to the Next Chapter of WA50

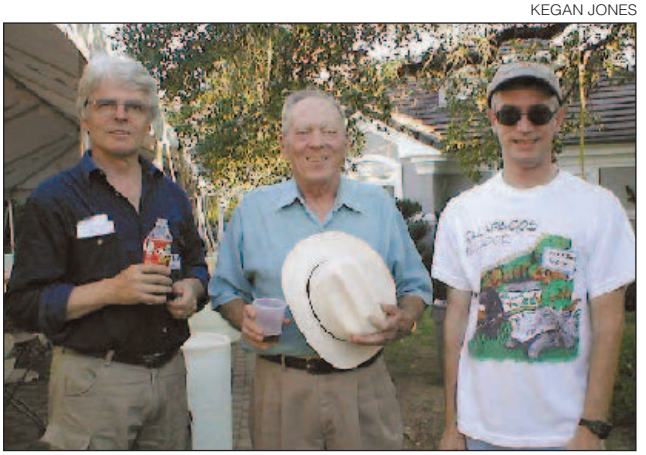
I am deeply honored to become the next columnist for "The World Above 50 MHz." Over the years I would look forward to the next issue of *QST* in the mail and open it first to WA50. Gene has done an outstanding job and I hope to continue in the tradition of Gene, W3ZZ; Emil, W3EP; Bill, KØCER; Bill, W3XO, and Ed Tilton, W1HDQ, the first WA50 columnist.

Those who are active on 6 meters and in the Midwest on 144 MHz and up are probably familiar with my call. I have operated 50 MHz on the DX side as FG/NØJK, HC8/NØJK, HC8N, KH8/NØJK, VP9/NØJK and 8P9JO. My wife Pat is NØHKT. She is active occasionally on 6 and worked Al, KL7NO, back in cycle 22. I am an emergency physician and currently work in Salina, Topeka and Wichita. Traveling back and forth gives me the opportunity for portable work on the VHF bands.

I was first licensed in 1968 as WNØVJF and 2 years later made my first 50 MHz sporadic E (E_s) contact. My dad, WØFN, had a little Heathkit "Sixer" and a ground plane antenna for a local civil defense and weather net in Kansas City.

On the crisp fall evening of November 8, 1970 I turned it on while doing homework. I was in junior high school. Usually I could hear a few local stations out to 20 miles or so. More often it was dead. This time it was different. The band was full of voices and loud squeals of heterodynes. Six meters was a madhouse. There was "Donald Duck" quacking at the low end from the SSB operators. The "Sixer" was crystal controlled AM on 50.400 MHz (or megacycles back then). I started calling a CQ, not knowing what to expect. A loud signal from Michigan answered me — K8ZJR! It was magic. We completed our contact and I went on to fill a log page with stations from New York to Arizona. I was hooked. At the time I didn't know that E_s openings are relatively rare in November and I had stumbled upon an extremely rare E_s and F2 event associated with a major geomagnetic storm.

KEGAN JONES



Tom, DL7AV; Pat, W5OZI, and Jon, NØJK, carbing up for the next opening at one of James', W6JKV, BBQs.

KEGAN JONES

Jon, NØJK, with the homebrew 2 element Yagi he uses for portable work. With it he worked Tac, JA7QVI, via multihop E_s (or PSME) June 2006 on 6 meters.

In "The World Above 50 MHz" column Bill Smith, KØCER, said "The weekend of November 7 and 8, 1970 will be remembered 20 years from now. It was the occasion of the first confirmed US to Japan 50 MHz contacts of solar cycle 20 and one of the wildest E_s events in history. Sporadic E on 2 meters covered distances exceeding 1300 miles and at the same time KH6NS, Hawaii, was working east to West Virginia on 50 MHz multihop E_s and F2."[1] The event that triggered this opening was a solar flare on November 5, 1970.

Forty-six hours later the coronal mass ejection (CME) reached Earth and aurora began. Visual red aurora was seen across the northern half of the United States. F2 began on 50 MHz around 1800Z on the 7th. Stations in California worked Japan and ZK1AA. WA5IYX heard LU2BN. On the second day, November 8, conditions were even better. The F2 MUF rose above 50 MHz early in the morning for VE2. E_s was worked all day across the country. That evening K5HVC Texas reported working KH6IJ and KH6NS at 0000Z. At 0350Z K1IKN was into California and KH6NS logged West Virginia. There were reports of KL7FLA being worked. An astute operator could have perhaps logged all 50 states on 6 meters that evening.

I learned later some of the KC locals who were on sideband worked KH6NS during this opening. Hearing that SSB or CW was the way to work DX, I was determined to upgrade my station and I acquired a Swan 250 all-mode, 6 meter transceiver (paid for by cutting lawns) and built a 5 element Yagi from an *ARRL Handbook* design.[2] In 1974 I made the first USA to Canal Zone contact on 50 MHz with my Swan. But it would be

This Month

August 6-7	ARRL UHF Contest
August 12-13	Perseids meteor shower
August 12-19	South Africa VHF Conference
*August 13-14	Moderate EME conditions
August 20-21	ARRL 10 GHz and Up Contest

*Moon data from EA6VQ

[1]B. Smith, KØCER, "The World Above 50 MHz," *QST*, Jan 1970, pp 78-83.

[2]Available from your local ARRL dealer, or from the ARRL Bookstore, ARRL order no 0953. Telephone toll-free in the US 888-277-5289 or 860-594-0355, fax 860-594-0303; **www.arrl.org/shop**; **pubsales@arrl.org**.

Jon Jones, NØJK ♦ 9356 E Wilson Estates Ct, Wichita, KS 67206-4417 ♦ n0jk@arrl.net (316-425-5326)

nearly 20 years later in cycle 22 before I finally worked NI6E/KH6 for my first Hawaiian on 6. I sold my Swan for beer money when I went to college, right before solar cycle 21. Big mistake and another story...

Over the years there are other VHF/UHF contacts that stand out. Logging JY9NX from American Samoa on 50 MHz with 10 W long path over Brazil in April 2000; plucking Charlie, VR2XMT, from a huge JA pileup at HC8N, and running my own JA pileup in December 2001 from our home in Kansas with just a dipole via E_s-F2 link. Another memorable contact was working Doug, ZP6CW, in March 2005 with my attic dipole via an E_s-TEP (transequatorial propagation) link.

Going Up

I am active on the higher bands, too. On 1296 MHz I logged WA3TTS from our Wichita apartment with 8 W and a loop Yagi during the big Thanksgiving tropo opening of 1986 and CO2OJ on 2 meter tropo in 1998 with a 4 element Yagi. Running 144 MHz aurora CW contacts all the way to 2-land while portable in EM18 and seeing the aurora at the same time. Exchanging reports with PY5CC on 144.200 MHz via TEP from FG.

More recently, I heard VE4KQ's big signal on 2 meter tropo last August from Manitoba to the Flint Hills of Kansas. I enjoy working VHF and above now as much as when I made my first 6 meter E_s contact years ago with K8ZJR. The veterans on the VHF bands have their own memories and to the newcomers I hope I can share my enthusiasm with you. With the economic recession, local zoning and CC&R covenant restrictions, many amateur operators are unable to put up a "dream VHF/UHF station" with a tall tower and big Yagis. I hope to encourage those who have these challenges, as well as the fortunate who can push the envelope.

"How High Up Should My 6 Meter Antenna Be?"

This question arises frequently both from newcomers and experienced DXers on the band during summer E_s season. Some think that since sporadic E is "short skip," a low antenna should be the best choice. But it is forgotten that the E-layer at 110 km is much lower than the F2 layer, and the majority of E_s occurs close to 50 MHz MUF. Thus a low angle of radiation is usually better. I operated from several portable locations in the summer of 2010 — one a hilltop in the Flint Hills, another a bluff overlooking the Kaw (Kansas) river valley a few miles west of Lawrence, Kansas. Both locations are several hundred feet above the surrounding terrain with no trees or power lines and thus no electrical noise. Thus my portable Yagi on its 15 foot mast had a radiation pattern approaching "free space" with an effective low angle of radiation, no local clutter and no noise.

From the Flint Hills I heard/worked CN8, CT1, D4, EA6, EA8, PY, PZ and ZB. These areas were noted on several different days in June. The bluff location also played well, with HA, SM and S5 logged. But these contacts were made during unusual openings, how about a more rigorous "A-B" test?

On July 1, 2010 K5N was operating portable in grid DL79. From our home in Lawrence with surrounding trees, etc, I could copy them just above the noise with a 3 element Yagi on a 25 foot mast on 50 MHz. I called but received no reply. I went out to the portable bluff location and set up the 2 element Yagi. Now K5N was booming in, loud, solid copy and easily logged. Perhaps propagation? My wife listened on the home radio at the same time and said K5N was in the noise.

Bill, KØHA, has also studied the effect of antenna height on 6 meters. He says another "local" who uses similar antennas to his, but mounted 30-35 feet lower "only copies ½ to ¾ of the stations I am working in a pileup." He notes that "doubling the antenna height for low angle propagation may produce a gain of over 1 S-unit." He muses that a high dipole may outperform a larger but much lower array. I recall back in cycle 23 the OX beacon was strong many mornings; it was a dipole.

ON THE BANDS

6 meters. May was a big month for sporadic E (E_s) and a major E_s link to a TEP event on May 5. But let's start with May 3, where Julio, NP3CW, reported contacts with 9Y4D and YV4DYT around 2230Z. On May 5, "Cinco de Mayo," we saw E_s — TEP. There was multihop E_s to D4 in the early afternoon. D44TT worked as far west as N5DG TX and W5ZN AR. Later in the afternoon sporadic E allowed stations from the East Coast to the Gulf Coast west to Kansas and Missouri to link to TEP into deep South America. What a great and memorable "Cinco de Mayo" celebration. San, K5YY, in AR reported working 12 LUs and CX5CR from 2139-2158Z. He notes LU4FW (FF97) was his grid #800 on 6 meters. I logged LU4FW on 50.125 MHz from Lawrence, KS with an attic dipole at 2137Z. He was fairly loud at times. From my location I only heard the LUs, no stateside — later I noted E_s to TX and other areas. Many others worked the LUs. NØLL (EM09) heard LU9DEN at 2132Z. VP8NO (GD18) from the Falklands was on and worked by K3TKJ, N9HF and others. He was a "new one" for Al, K3TKJ, his DXCC #126 — congrats! Bill, KØHA, from Nebraska arrived home after the opening to eastern South America had ended. He heard the CE6B/b and OA4TT/b beacons. He observes that given OA4TT is right on the geomagnetic equator, it was probably not TEP to him. Was it direct F2 or multihop E_s? About a year ago in May OA4TT had a widespread opening to the central US via multihop E_s. The May 5 opening was the first time I and many others have worked CX and LU on 6 meters since 2004 and an all time first for many others. Single hop E_s was strong after the South Americans faded out. Mike, K7ULS, operated portable on Powder Mountain, UT and made 110 contacts in 63 grids with a vertical antenna. He was loud into EM28 around 2200Z. W6OAL in CO noted multiple E_s clouds in many locations across the US.

MICHAEL WHITE, K7ULS

Mike's, K7ULS, mobile set up on Powder Mountain, Utah on May 5, 2011. He was working a major 6 meter E_s opening. I logged him around 2215Z that day from my mobile in Lawrence, Kansas.

On May 10, 6 meter operators from Portugal, Germany, Spain and the Czech Republic reported working the following Brazilian stations between 1900-2030Z: PP5XX, PY1RO, PY2BW, PY2HN, PY2REK, PY2SP and PY2VA (courtesy *The Daily DX*). This may also have been an E_s link (from Europe) on to TEP. May 21 found CT1HZE to the states via multihop E_s; NWØW in EM47 worked him at 1329Z. May 22 was a big day to the Caribbean and northern South America. The band opened early in the morning and Caribbean stations were in until late afternoon. K6QXY worked NP4A at 1546Z. A "one man" DXpedition to St Barthelemy, FJ/OS1T, was active on 6 meters in the morning and gave many including N9HF and NWØW a rare new one. NWØW reports contacts with FJ/OS1T at 1216Z and rare PJ2LS Curaçao at 2115Z. From Lawrence, KS I logged Franz, FG5FR, on CW at 1927Z and a little later a loud KP4EIT on 50.125 SSB. Other DX active included P43A, 9Y4D, many KP4s, FM, HI and YV. On May 24 Tim, NWØW, reported working Europe, perhaps the first major US to deep Europe opening of the 2011 summer season. Tim logged 9A8A at 1455Z, S57A at 1502Z, HAØDU at 1523Z and OM4XA at 1528Z. GØJHC (heard but not completed, heavy fading) at 1601Z. These were remarkable contacts and all the way to Missouri.

The Memorial Holiday weekend was a disappointment to many, but on May 29 Ed, VP9GE, reported working FN25 and several 4s with a vertical antenna. Vic, WB4SLM, noted

CT1HZE in at a "579" and had "partials" with OH, ON, OX, PA and possibly GI4.

On May 31 the Caribbean was in most of the day, with intense strong E_s in the afternoon. From 2330-0100Z VP5/W5CW was very loud and running a big pileup on 50.130 MHz. Dave made many double hop contacts into the central and western US. He has done a great job handing out a new one. KG4EM, Guantanamo Bay, Cuba, made a rare appearance giving a number of the "deserving" a new country. During the peak of this opening 2 meter E_s appeared. On June 10, your conductor, NØJK, heard Philip, NØKE, in Colorado work Max, DK1MAX, at 1724Z! I didn't have any copy on Max here in KS. Also James, KS7S (DM41) spotted Jan, OY3JE, at 1735Z on 50.080 MHz. I consider his spots reliable.

2 Meter E_s

On May 31 ZF1EJ worked into North Carolina around 2350Z and C6ANX was worked by AC4TO and others around 2305Z. AC4TO noted extremely short E_s on 6 meters to EL95 at this time.

Tropospheric ducting. On May 1 Vic, WB4SLM, Macon, GA reported big signals out of FL. He "ran the bands" up to 2304 MHz with Charlie, KØVXM (EL98) and contacts on 432 MHz with K4LFK and N4QV in EL96. On May 9 tropospheric propagation into the Midwest was noted by Dan, K3ZXL (EL87) on the morning of May 9. He worked WØBLD (EM37), KØWYN (EM48) and closer in stations. K5SW (EM25) reported KØVXM (EL98) and N3LL (EL86) on 2 meters. NØIRS in Kansas City also worked N3LL (EL86). Tropo from FL to the Midwest is not common, compared to the path across the Gulf of Mexico between FL and TX. This opening was a surprise to some as it was not predicted on Hepburn's page (**www.dxinfocentre.com**).

On May 21 JD, NØIRS (EM29) noted good signals to TX with contacts to W3XO/5 (EM00) in south central TX on 2 meters. A nice duct developed the morning of May 30 between northern IN and MO; and KS, OK and TX. Gedas, W8BYA, was in the hot spot and picked up EM06 (KBØHH) as a new grid on 2 meters as well as K5SM (EM03) at 1400 km. NØIRS (EM29) spotted the WA1ZMS/b (FM07) on 144.284 MHz also about 1400 km at 1226Z. Your conductor had to work that morning...

EME. Lance, W7GJ, is planning an EME DXpedition to 5WØ in August. Information is at **www.bigskyspaces.com/w7gj**.

HERE AND THERE

Many have worked Tac, JA7QVI, via multihop E_s (or PSME) on 6 meters the last few summers. I worked Tac in June 2006 using a simple 2 element Yagi from Kansas. Unfortunately his home was destroyed by the tsunami following the earthquake in Japan this spring. His home was 1 mile from the shore. He lost his home, car and all Amateur Radio equipment. Tac e-mailed that his family is safe and he will be "back on the radio," perhaps in a year. He is looking forward to when that day comes. As am I.

How Would a Maunder Minimum Affect VHF Contesting?

This was inspired by Gary Sutcliffe's, W9XT, "Contest Tips, Tricks & Techniques" column in *NCJ*. Gary asked "What would you do if it turns out we are in another Maunder Minimum, with decades of very low sunspot numbers ahead?"[3]

A great question for HF contest operators and germane for the VHF crowd as well. While this is speculation, here are some of my predictions for VHF contesting in a Maunder Minimum.

F2 on 6 meters rarely appears in VHF contests except at solar maximum and even then is often more a novelty than a main propagation mode. It rarely accounts for many contacts.

Aurora would be definitely affected. It occurs more frequently during periods of high solar activity and the early down slope of a solar cycle. But even at a Maunder Minimum, aurora does not go away completely. The largest solar flare observed — the Carrington Flare — occurred in September 1859 during a very "below average" solar cycle. Auroras can also occur due to CMEs even during solar minimums.

E-skip, particularly in the June VHF QSO Party and July CQ VHF Contest, is the main propagation mode for 6 meter contesting. A Maunder Minimum would not affect E_s. Indeed, some experts believe E_s is better during years of low solar activity. To support this — 2006 and this year have had outstanding E_s on 6 and 2 meters. 4X, TZ and OD5 have been heard/worked in the Midwest USA and many stateside stations all the way to W1 have worked Japan on 6 meters this season.

EME (moonbounce) on 6 and 2 meters is better during periods of low solar activity. An active ionosphere plays havoc with 6 meter EME.

Tropospheric propagation is likely influenced by the solar cycle — though scientists may not know exactly how. A Maunder Minimum would affect tropo to some degree — perhaps by changes in ocean currents.

Meteor scatter would be unaffected by the solar cycle.

TEP in the tropics would continue despite the low solar flux. It is a robust mode.

So VHF contesting would continue through a Maunder Minimum relatively unscathed. E_s may actually be better than now. Tropo would be different, though it is uncertain if it would be better or worse. F2 would be a dim memory on 6 meters. Aurora would be very rare, but still might make an appearance. EME, TEP and meteor scatter would thrive.

[3]G. Sutcliffe, W9XT, "Contest Tips, Tricks & Techniques," *NCJ*, Sep 2009, pp 37-38. QST

Sean's Picks

Contest Manager Sean Kutzko, KX9X

All dates/times are in UTC.

- **State QSO Parties this month:** Hawaii, Kansas, Maryland-DC, Ohio
- **QRP Contests this month:** NAQCC Monthly CW Sprint (Aug 10), Flying Pigs' Run for the Bacon (Aug 22)
- **ARRL UHF Contest (August 6-7):** 222 MHz and up is the place to be for this 24 hour event. Grab your rig and take to the hills for some great UHF portable operating fun! Exchange is your grid square.
- **North American QSO Party, CW (August 6-7):** A simple and fun CW contest for all North American ops. With a 100 W power limit, tons of activity and an easy exchange (name and state or province), this is a great contest for both new and experienced ops that leaves you lots of time to enjoy other things on the weekend.
- **Worked All Europe, CW (August 13-14):** One of the finest events on the Contest Calendar. Europe's biggest on-air affair, WAE includes the exchange of QTC, or a list of other stations you've worked in the event. EU ops will be looking for your QTC, so please help them out!
- **CW Ops CW Open (August 20-21):** A brand new CW contest! Three operating periods of 4 hours per period, split over 20 hours. Exchange is a sequential serial number beginning with 001 and your name. This promises to be a lot of fun. See **www.cwops.org** for more info on this new event!
- **ARRL Rookie Roundup, RTTY (August 21):** Digital modes take center stage in the ARRL's contest for those licensed three years or less. Getting on RTTY is easier than ever; Rookies work everybody, Old-Timers work and mentor the Rookies. RYRYRY!

SPECIAL EVENTS

Contact these stations and help commemorate history. Many provide a special QSL card or certificate!

Jul 23-Jul 24, 1200Z-2100Z, W8P, Warren, OH. Warren Amateur Radio Association. Packard Auto Show Special Event. 14.325 7.235. Certificate. Jacqueline Clay, KD8DNE, PO Box 809, Warren, OH 44482.

Jul 27-Aug 8, 0200Z-0200Z,SJ22S, Rinkaby, Sweden. 22nd World Scout Jamboree. 80 40 20 15 10 6 m local VHF/EchoLink (434.750) SSB CW FM SSTV and PSK31. QSL. Jim Rooney, N4JJR, 10138 Granite Hill Dr, Parker, CO 80134. **www.worldscoutjamboree.se; www.qrz.com/db/sj22s**

Aug 2-Aug 3, 2100Z-0100Z, KD8KDP, Saginaw, MI. Saginaw County ARES. National Night Out. 14.260 7.260. Certificate. Dave Schneider, 7680 Krisdale Dr, Saginaw, MI 48609. **ares.saginawradio.com/scares_news.htm**

Aug 3-Aug 7, 1500Z-2300Z, W7JVO, Redmond, OR. High Desert Amateur Radio Group. Deschutes County Fair & Rodeo. 14.240 14.028 7.080 14.070 PSK. Certificate. HiDARG, PO Box 723, Bend, OR 97708. *SSB CW Digital.* **www.hidarg.org**

Aug 5-Aug 7, 2200Z-1800Z, W1AW/5, Taos, NM. 2011 ARRL Rocky Mountain Division Convention. 21.355 14.255 7.255 3.855. QSL. ARRL, W1AW/5, 225 Main St, Newington, CT 06111. *80 40 20 15 m SSB CW and digital depending on time of day and propagation. Frequencies ending in "5" for 5th district (NM).* **www.2011convention.org**

Aug 5-Aug 8, 1200Z-1200Z, W8B, Copper Harbor, MI. The Lone Wolfe Pack High Frequency Amateur Radio Society. Brockway Mountain Special Event. 50.125 29.600 18.140 14.320. QSL. John Ponchaud, 325 Carpenter Road, Crystal Falls, MI 49920. *Near Copper Harbor, Michigan, Grid Square EN67. Will be operating 160 meters through 440 MHz all modes.* **john-ab8ko@sbcglobal.net**

Aug 5-Aug 8, 1400Z-2300Z, KØH, Coralville, IA. Iowa City Amateur Radio Club. Hooverfest. 14.260 14.070 21.300 21.070. QSL. Iowa City Amateur Radio Club/KØH, PO Box 4, Iowa City, IA 52244. *Phone, PSK and some CW.* **www.icarc.org**

Aug 5-Aug 8, 1500Z-2200Z, K8BLP, Twinsburg, OH. Triangle Amateur Radio Club Inc. Twins Day Festival, The World's Largest Gathering of Identical Twins. 21.250 18.130 14.260 7.210. QSL. Richard, Box 30, East Liverpool, OH 43920. *Operators welcome.*

Aug 6, 1300Z-2200Z, W9B, Sheboygan, WI. Sheboygan County Amateur Radio Club. Brat Days 28.380 14.240 7.240. Certificate & QSL. John Draves, 1225 Carmen Ave, Sheboygan, WI 53081.

Aug 6, 1400Z-2200Z, WØR, Red Wing, MN. Hiawatha Valley Radio Club. River City Days. 147.300 14.300 21.300. Certificate. Bill Eichenlaub, 1966 Launa Ave, Red Wing, MN 55066.

Aug 6-Aug 7, 1400Z-0400Z, K1CG, Port Angeles, WA. Coast Guard CW Association. USCG 221st Birthday. 21.052 14.052 7.052 3.552. QSL. Fred Goodwin, 424 N Bagley Ck Rd, Port Angeles, WA 98362. *K1CG will be operated by several different stations across the country starting on the East Coast and moving west from 1400Z to 0400Z.*

Aug 6-Aug 7, 1600Z-2359Z daily, N6P, Point Reyes, CA. Valley of the Moon Amateur Radio Club. Point Reyes Lighthouse Activation. 14.270 7.270 PSK31 14.070 7.035. QSL. Ken McTaggart, N6KM, 402 4th St E, Sonoma, CA 95476. **vomarc.org**

Aug 7-Aug 15, 0000Z-0000Z, N6L, Mineral, CA. Area Amateurs. 95th Anniversary of Lassen Volcanic National Park. 14.244 10-40 m. QSL. K6LSN, 5921 Cedars Rd, Redding, CA 96001. **lassenbirthday.blogspot.com**

Aug 10-Aug 14, 1300Z-2100Z, W9S, Sycamore, IL. Kishwaukee Amateur Radio Club. 54th Annual Northern Illinois Steam Power Show & Threshing Bee. 14.268 7.268 7.042 3.988. Certificate. Bob Yurs, W9ICU, 1107 Commercial St, Sycamore, IL 60178. **www.kish-club.org**

Aug 11-Aug 14, 2000Z-2000Z, NU6DE, Los Gatos, CA. Pacific Area Naturists Amateur Radio Society. Naturist Society Western Gathering 2011. 28.465 21.365 14.265 7.265. Certificate & QSL. Jim Campbell, PO Box 232445, Encinitas, CA 92023. *Operation dependent on activities.* **www.inaro.com**

Aug 11-Aug 21, 1100Z-0300Z, WØISF, Des Moines, IA. Madison County DX Club. Iowa State Fair. 14.250 7.250 146.520. QSL. Mark Mease, 2989 Truro Rd, Truro, IA 50257. *Will operate at various times throughout the fair; 20 40 and whatever bands are open.* **mmease@netins.net**

Aug 12-Aug 14, 1400Z-0000Z, N7C, Window Rock, Navajo Nation, AZ. Navajo Amateur Radio Club. Navajo Code Talkers Day. 20 40 m 14.265 7.265. QSL. Herbert Goodluck, N7HG, PO Box 3611, Window Rock, AZ 86515. **www.qrz.com/db/n7c**

Aug 13-Aug 14, 0000Z-1700Z, N6T, Santa Rosa, CA. Sonoma County Radio Amateurs. Sonoma County Radio Amateurs Mini DX to CM79. 144.200 50.120 50.091 14.250. QSL. SCRA, PO Box 116, Santa Rosa, CA 95402. **www.sonomacountyradioamateurs.com**

Aug 15-Aug 17, 1700Z-1700Z, W2S, Fishkill, NY. WB2LQF. 42nd Anniversary of the 1969 Woodstock Festival. 14.034 7.034. Certificate. Stan Levandowski, 6 Chatham Ct, Fishkill, NY 12524. *Single-station, single-operator, QRP CW-only.* **wb2lqf@arrl.net**

Aug 19-Aug 22, 0000Z-2359Z, K6A, San Pedro, CA. US Coast Guard Auxiliary. International Lighthouse Weekend. 14.285 7.290 3.885 1.840. QSL. Jason Gant, W6AUX, PO Box 15937, Long Beach, CA 90815. **n6aux@uscgauxiliary.org**

Aug 19-Aug 28, 1500Z-2200Z, W9IMS, Indianapolis, IN. Indianapolis Motor Speedway Amateur Radio Club. Red Bull Indianapolis GP. 21.340 14.240 7.240 3.840. Certificate & QSL.* W9IMS, PO Box 30954, Indianapolis, IN 46230. *Must work all three races in one year for certificate.* **www.qrz.com/db/W9IMS**

Aug 20, 1400Z-2000Z, W4K, Hopkinsville, KY. Local Amateur Radio Operators. Anniversary of the "Kelly Little Green Men." 21.300 14.260 7.250 3.915. Certificate. Jerry Holt, 7585 Hopkinsville-Mt Zoar Rd, Hopkinsville, KY 42240. *Operating from the site that "Little Green Men" invaded the little community of Kelly, KY and terrified the local people on August 21, 1955.*

Aug 20, 1400Z-2100Z, W8LKY, Alliance, OH. Alliance Amateur Radio Club. Carnation Days. 21.250 14.045 7.240 7.045. Certificate. AARC-W8LKY, PO Box 3344, Alliance, OH 44601. **www.w8lky.org**

Aug 20, 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. **w0ky.kearney.net**

Aug 20, 1500Z-2100Z, KCØQNI, Oelwein, IA. Rural Iowa Amateur Radio Club. Oelwein Railroad Days, Celebration of Chicago Great Western Railroad. 7.285 7.240 3.980 147.345. QSL. Jerry Clark, 18 10th Ave NW, Oelwein, IA 50662. **www.ruraliowaares.com**

Aug 20-Aug 21, 0001Z-2359Z, AF6TS, Punta Gorda, CA. AF6TS. Lost Coast DXpedition to Punta Gorda Lighthouse for International Lighthouse Weekend. 21.200-21.450 14.150-14.350 7.125-7.300 3.600-4.000. QSL. Tyrel Carver, PO Box 8134, Eureka, CA 95502. **af6ts@arrl.net**

Aug 20-Aug 21, 1100Z-1800Z, W2GSB/LT, Ocean Beach, NY. The Great South Bay Amateur Radio Club. International Lighthouse Lightship Weekend Fire Island Lighthouse Station. 14.255 14.070 7.175 3.850. Certificate. W2GSB Lighthouse, PO Box 1356, West Babylon, NY 11704. *Guest operators welcome;* **info@gsbarc.org**, **www.gsbarc.org**

Aug 20-Aug 21, 1224Z-1224Z, W9AB, Notre Dame, IN. Michiana Amateur Radio Club. Michigan City Lighthouse (#US0079) — International Lighthouse Lightship Weekend. 14.225 14.060 7.225 7.040. QSL. W9AB, 3220 E Jefferson Blvd, South Bend, IN 46615. **community.michiana.org/marcsite**

Aug 20-Aug 21, 1402Z-1621Z, W8USA, Grand Rapids, MI. MARA 20th Anniversary. Michigan Amateur Radio Alliance. CW 14.180 7.075 3.550 SSB 14.230 7.230 3.845 145.230 94.8 PL. Certificate & QSL.* MARA, PO Box 670, Comstock Park, MI 49321. *Do not send envelope; we will supply.* **www.w8usa.org**

Aug 21-Aug 28, 1500Z-2359Z, W5C, Cedarville, AR. W5BUB. City of Cedarville Arkansas 13th Year of Incorporation. 14.240 7.240. QSL. Ewell D. "Bub" Pendergrass, 1106 Country Meadow Ln, Cedarville, AR 72932.

Aug 27, 1200Z-1800Z, W4OVH, Manassas, VA. Ole Virginia Hams. Second Battle of Manassas. 14.262 7.262 146.970. QSL. Ole Virginia Hams, PO Box 1255, Manassas, VA 20108. **www.w4ovh.net**

Aug 27, 1500Z-2300Z, W7SVD, Coronado National Memorial, AZ. Sierra Vista Contesting Group. Commemorating establishment of the National Park Service August 25, 1916. SSB 28.350 21.285 14.275 7.225 CW 21.050 14.050 7.050 PSK31 21.070 14.070 7.035 JT65 21.076 14.076 7.076. QSL. W7SVD, 1955 Santa Teresa Dr, Sierra Vista, AZ 85635. *W7SVD/P operating from Montezuma Pass high in the Huachuca Mountains of SE Arizona.* **W7SVD.net**

Aug 28, 1400Z-2100Z, KØASA, Hanover, KS. Crown Amateur Radio Association. Hollenberg Pony Express Station Festival. 18.085 14.245 14.045 7.045. Certificate & QSL. Crown Amateur Radio Association, 11551 W 176th Ter, Olathe, KS 66062. **www.arrlmidwest.org/ponyexpress.html**

*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.

Maty Weinberg, KB1EIB ♦ Special Events ♦ events@arrl.org

K2TQN

VINTAGE RADIO

Radio Amateur Days in Brooklyn

Lloyd Espenschied
New York City, July 9, 1943, Part 2

Brooklyn Children's Museum

There came into our lives about 1904 the Brooklyn Children's Museum, one of the greatest institutions ever devised for curious, eye-minded, constructive children. Austen Curtis became inspired there over the collecting of minerals and of butterflies. I had been attracted by nature displays and then by the little library which had books and magazines on how to make things, precursors of the amateur *Modern Electrics* and *Radio News*.

The museum became a center of attraction for a number of boys in the neighborhood, and under the kindly and wise supervision of its head, Miss [Anna B.] Gallup [Curator], and the encouragement of Miss Mary Day Lee who devoted all her time to natural science and physics, there was built by the boys the museum's amateur wireless station. I can still remember climbing around on the complicated roof of the old mansion house that it was, what had been the ancestral home of the historian, James Truslow Adams. Austen Curtis, and soon thereafter Frank Hart, had most to do with this station. I had my own station at home, that of my grandfather at 1369 Dean Street; Austen Curtis had his own in his home at Kingston Avenue; and around Pacific Street there was James Parker who had a little station, and up on St. Marks Avenue was Frank Hart with his buzzing outfit.

The Telegraph Wire

As if to bind together all the firmer our mutual interest, we boys strung a galvanized iron wire over the rooftops between our homes and used it both to telegraph over and as an extra antenna for receiving. This wire extended a mile and had on it about six stations, including at the southern end the Children's Museum. I remember getting from the city authorization for crossing the streets with this wire. The Borough President was Bird S. Coler, and I knew no better than to call upon him to get permission I understood to be required. The Borough President seemed surprised to see me. I was then about 16. I don't remember how I got in, unless it was that I knew his son. He asked me to sit down while he stepped out of the room. I well remember my surprise when upon his return he seemed uneasy and I discovered that I had occupied his chair; - was my face red! Truly "fools rush in where angels fear to tread!" It seemed the borough President did not know quite what was required, that he couldn't write out the permit on the spot as I had expected him to do. Little did I realize how taken aback he was, and yet how kindly. In the course of a week or two there came in the mail a formal looking paper, a permit of some kind which seemed to be the necessary authorization. I only wish I had preserved it because I cannot now imagine what it may have been, legally.

We went ahead and put up the wire.

GEORGE FLANAGAN, W2KRM

Brooklyn Children's Museum. New antenna on museum building composed of 5 wires, 1½ feet apart, 250 feet long and about 85 feet from the ground. Antenna designed and erected by Frank Hart and others during 1907-1908.

GEORGE FLANAGAN, W2KRM

Alma LeRay (rear) and Frank Hart, operate Children's Museum station "CM."

John Dilks, K2TQN ♦ 125 Wharf Rd, Egg Harbor Township, NJ 08234-8501 ♦ k2tqn@arrl.org

It was supported mainly on the chimney tops and along the eaves. The most ticklish part was the stringing of it across the two trolley lines, that of Kingston Avenue and that of Bergen Street. A string was thrown* over the trolley line, a stronger one pulled in place and then the wire attached and pulled across, taking care that it was prevented from sagging down on to the live trolley wire. We sat on chimney tops hoping we'd be sufficiently insulated in case the wire did go down! (* Upon reading this, Austen Curtis reminds me that the street crossings in some cases were accomplished by shooting from housetop to housetop a light string, by bow and arrow - doubtless his own resourcefulness.)

GEORGE FLANAGAN, W2KRM

James Parker (seated) and Alma LeRay operating station "CM." All wireless apparatus in the photo was installed by 16 year old Frank Hart during October and November 1907.

It was no stunt to gain entrance to apartment houses to string the wire over the roofs, for all one did was to ring the bell of, say the first-floor tenant and then proceed right up, with a coil of wire, posing as the electrician attending the wiring on the roof. In cases of the brownstone front private dwellings the gaining of admittance to the roof was more difficult; but there were a few friends and acquaintances about and once on top of one of them, one usually could go along for part of a block on adjoining roofs, treading lightly lest the folks be aroused. The telegraph line enabled us to learn Morse code in click form, in addition to the buzz characterizing wireless telegraphy.

Here, then, from the period of about 1905-08 was a little coterie of boy enthusiasts in the Bedford section of Brooklyn in the early amateur days of wireless, who had their own little wireless telegraph stations - it was before the days of radio telephony and broadcasting - with which to communicate with each other and sometimes bother the Brooklyn Navy Yard station; boys who tied themselves together with a telegraph line, and who had in the nearby Children's Museum a substantial cultural aid and abettor. Of course those in responsible charge at the Museum never did know the devices we resorted to, as "right-of-way men", to get the wire installed over the housetops of that residential neighborhood. Here are the names and locations of those who were on that line. Most of them had also an amateur wireless telegraph station at one time or another in this period of about 1905-1908. Beginning at the southern end:

Station	*Call Letters*
• Children's Museum, Brooklyn Ave. and Prospect Pl.	**CM**
• Frank Hart, apt. house south side St. Marks Pl. east of Kingston Ave.	**HA**
• Robert Stevenson, 1269 Bergen St., north side,middle of block bet. Brooklyn & Kingston Aves.	—
• Austen M. Curtis, 65 Kingston Ave. east side bet. Pacific and Atlantic Ave	**OS**
• Lloyd Espenschied, 1369 Dean St.	**XY**
• Mrs. Betty Van Reimer, Pacific St., north side, east of Brooklyn Ave.	**BV**
• James Parker, 1401 Pacific St., north side, bet. Brooklyn and New York Aves.	**JP**

K2TQN COLLECTION

The inventors of coaxial cable, Lloyd Espenschied (left) and Herman A. Affel, examine sections of coaxial cable.

Professional Stations

Station	*Call Letters*
• Brooklyn Navy Yard; Operators J.J. Fagan, George Davis, Arthur F. Wallace	**PT**
• Unitied Wireless Telegraph Company, 42 Broadway, NY; Operators Duffy, Thurston et al; Chief H.J. Hughes	**NY**
• Brighton Beach; Bob Marriott's baby, and a lusty one, could communicate nights with ships in the Caribbean and Gulf of Mexico	**DF**
• Galilee, NJ, with high spark tone.	**G**
• Atlantic City, Young's Pier; Bob Miller.	**AX**
• Sea Gate, Marconi station, low interrupter tone.	**SE**

At the William St., NY office of the Marconi Co. was Bradfield, General Mgr., Sammis, Chief Engr., and David Sarnoff, office boy! I would call on them on a Saturday and get permission to visit the repair shop on Front St. where the mechanic Brennen held forth. There about 1906 I met a young man who had the earmarks of a genius, and he proved to be one, H.J. Round! [Experimenting with the crystal detector Round applied a direct current to them and noticed that some actually emitted light. Round reported this in the February 1907 edition of *Electrical World*. This is the first known report of the effect of the light emitting diode, LED. Round would go on to hold 117 patents. — *Ed.*]

I look back on those days with surprise at our boyish enterprise and at what we "got away with." What started me off was the excitation I received in that old physics room of Boys High School - the school and curriculum of which I otherwise disliked. Now, just this morning, some 40 years later, am I reminded of these early days by another one of these boys - H. H. Young, who likewise had had his natural curiosity appealed to the same circumstances. During the intervening years he has likewise followed the field of electrical communications, unknown to me, but in the same Bell System, in the New York Telephone Company. Now along has come the war upheaval, thrown some of the Associated Company engineers into the Laboratories, and among them is Mr. Young, whereby our trails again cross and in this emporium of apparatus, the Bell Laboratories! Strange are moving spirits and vicissitudes of life, the intersection with one's surroundings and the interplay with one's fellow human beings.

Vintage Hamfests I'm attending: Berryville Hamfest, Berryville, Virginia, Sunday, August 7, **www.svarc.us/hamfest** and the Shelby Hamfest, Dallas, North Carolina, Saturday and Sunday September 3-4, **shelbyhamfest.com**.

WB8IMY

ECLECTIC TECHNOLOGY

PACTOR 4 Has Arrived

At the Ham Radio show in Friedrichshafen, Germany last month, SCS unveiled their model DR-7800 "P4Dragon" multimode controller, which includes the new PACTOR 4 protocol.

If you're scratching your head over the PACTOR moniker, bear with me while I make a slight digression. PACTOR is a digital communications protocol invented in Germany in the late 1980s by Ulrich Strate, DF4KV and Hans-Peter Helfert, DL6MAA. Together they founded SCS (Special Communications Systems GmbH) soon afterward. PACTOR was revolutionary because it combined the robust nature of AMTOR with the data handling ability and ASCII support of packet — hence the name. For improved performance on HF frequencies, PACTOR added Huffman data coding and "memory ARQ," which minimized the number of repeat transmissions required for error-free copy.

Amateurs embraced PACTOR in substantial numbers and it wasn't long before you heard its characteristic *chirp-chirp-chirp* melody on the HF bands. PACTOR soon became the backbone of the popular Winlink HF data network and, at the same time, PACTOR technology expanded into commercial and military markets. PACTOR — or PACTOR 1 as we call it today — evolved into PACTOR 2 and eventually PACTOR 3. All of these forms of PACTOR are legal for Amateur Radio use and all can still be heard on the air today.

You can purchase a PACTOR 1 multimode controller from several manufacturers. In addition to PACTOR 1, these units offer other modes such as RTTY, packet, CW and AMTOR. To enjoy the benefits of PACTOR 2 or 3, however, you must purchase the controller from SCS or one of their dealers.

So how is PACTOR 4 and the DR-7800 different? Functionally, when it is first released the controller will offer fewer modes than current SCS models — just packet and PACTOR. More will be coming in the future. The big difference is the speed. The PACTOR 4 protocol boasts a symbol rate of 1800 baud within a 2400 Hz bandwidth using 10 speed levels, DBPSK/DQPSK (non-coherent, spreading factor 16), BPSK-32QAM (coherent) and adaptive equalizing. All this translates into astonishing throughput that is potentially more than double that of PACTOR 3. Squeezing that kind of HF digital performance into a 2400 Hz bandwidth required years of painstaking work.

But is PACTOR 4 legal for amateur use on the HF bands? Unfortunately, the answer is no.

Below 28 MHz American amateurs are restricted to data modes with effective symbol rates of 300 baud or less. PACTOR 4 exceeds this limit substantially. On the other hand, since Military Auxiliary Radio System (MARS) HF operations take place outside the amateur bands, they aren't hobbled by that restriction. They've been using PACTOR with the Winlink network for a number of years, so the DR-7800 and PACTOR 4 could prove to be a powerful new tool for US amateurs who participate in MARS.

If anyone challenges you to name a communication advancement pioneered by amateurs, now you have something new to point to. PACTOR 4 may indeed be a commercial product, but it has a solid Amateur Radio pedigree.

SCS Mail

As long as we're discussing SCS devices, Walter, KB6BT, pointed me toward a neat bit of free software called *SCS Mail*. It is available on the SCS website at **www.scs-ptc.com/news/scsmail/scsmail-2013-small-and-helpful**.

This program allows you to build a simple mail system using either a PACTOR modem or the SCS tracker TNC (ver 1.1 only). The program has some limitations, but if a group of hams wanted to set up their own miniature on-air e-mail network, this may be worth a look.

The new SCS Model 7800 PRDragon PACTOR 4 controller.

DStarChatUSB

If you own an ICOM D-STAR transceiver, including the various D-STAR-capable handhelds, here is a free *Windows* application that makes use of the rig's low-speed data stream to easily swap text. It even includes a text-to-voice feature! Gene Swiech, WB9COY, developed *DStarChatUSB* for public service work, although it has other uses as well. In addition to the radio, all you need is a computer — desktop, laptop or even a netbook as long as it runs *Windows XP*, *Vista* or *7*. You connect your D-STAR radio to the computer via a serial-to-USB cable. You'll find *DStarChatUSB* at **www.wb9coy.com/DStarChatUSBSW.html**.

If you have a D-STAR radio, there is a new free text transfer application available: *DStarChatUSB*.

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

CONVENTION AND HAMFEST CALENDAR

Abbreviations
Spr = Sponsor
TI = Talk-in frequency
Adm = Admission

ALABAMA STATE CONVENTION

August 20-21, Huntsville

D F H Q S V

The Alabama State Convention, sponsored by the Huntsville Hamfest Assn, will be held at the Von Braun Center (South Hall), 700 Monroe St. Doors are open Saturday 9 AM-4:30 PM, Sunday 9 AM-3 PM. Features include all indoor, air-conditioned event with giant new dealer/manufacturer show; huge flea market (Dave Givens, K5RSI, 256-883-2760; **dagivens@yahoo.com**); exhibitors; vendors; wide selection of forums (Johnny Winter, KR4F, 256-534-6785; or Chuck Lewis, N4NM, 256-539-8950); special guest from ARRL HQ Bill Moore, NC1L, Awards Branch Manager; VE sessions (10 AM sharp, both days; $15 test fee); Hospitality Suites (Friday and Saturday eves at the Holiday Inn, located across the street from the VBC); DXCC card checking; convenient parking ($5); limited RV parking. Talk-in on 146.94, 147.3. Admission is $7 (under 13 free). Tables are $30 (8-ft table and 1 chair). Contact Charlie Emerson, N4OKL, 8003 Craigmont Rd, Huntsville, AL 35802; 256-882-9137; **n4okl@arrl.net**; **www.hamfest.org**.

Alaska (Fairbanks) — Aug 6 F H R S V

10 AM-5 PM. *Spr:* Arctic ARC. Bentley Mall, 32 College Rd. *TI:* 146.52. *Adm:* Free. Tables: $10 each. Sterling Muth, WL7TV, 912 N Stol Dr, North Pole, AK 99705; 907-488-5858; **sterlingmuth@hotmail.com**; **www.kl7kc.com/**.

Arkansas (Mena) — Sep 9-10 D F H T V

7 AM-5 PM (both days). *Spr:* Queen Wilhelmina Hamfest Assn. Queen Wilhelmina State Park, 3877 Hwy 88 W. *TI:* 146.79 (100 Hz). *Adm:* Free. Tables: Check web site for details. Michael Gathright, KC5ZJV, 464 Provo Rd, Lockesburg, AR 71846; 870-289-6335; **vegathright@gmail.com**; **menahamfest.org**.

California (Lincoln) — Sep 10 D R V

7 AM. *Sprs:* Western Placer ARC, Yuba Sutter ARC, River City AR Communications Society. McBean Park, Highway 193. *TI:* 147.36 (179.9 Hz). *Adm:* Free. Tables: $20. Jeremy Machado, KJ6CQT, Box 1444, Lincoln, CA 95648; 916-222-4379; **kj6cqt@gmail.com**; **www.wparc.org/**.

California (Santa Barbara) — Aug 14
D F H R T V

8:30 AM-3 PM. *Spr:* Santa Barbara ARC. Elks Lodge #613 Picnic Grounds, 150 N Kellogg Ave. Contests (ARDF), Santa Barbara Style BBQ. *TI:* 146.79, 223.92 (both 131.8 Hz). *Adm:* Free. Tables: Free. Al Soenke, WA6VNN, c/o SBARC, Box 3907, Santa Barbara, CA 93130; 805-455-7247; fax 805-967-3735; **wa6vnn@sbarc.org**; **www.sbarc.org**.

SOUTHWESTERN DIVISION CONVENTION

September 9-11, Torrance, California

D H Q R S V

The Southwestern Division Convention (HAMCON 2011 – "Communications Around the World"), sponsored by the Los Angeles Area Council of ARCs, will be held at the Marriott Torrance South Bay, 3635 Fashion Way. Doors are open Friday 5-8 PM, Saturday 8 AM-5 PM, Sunday 8 AM-noon. Features include "Meet & Greet" (Friday eve), vendors (61 booths showcasing the latest radios, accessories and gadgets for all your communications and AR needs), exhibitors, QSL card checking, forums, technical talks and great programs, great speakers with topics to interest all levels of communications enthusiasts, radio demos, W1AW/6 Special Event Station, T-hunting, VE sessions (Saturday, 8 AM, $15 test fee), Wouff Hong ceremony, breakfast (Sunday, 9 AM, $25), luncheon (Saturday, noon, $30), banquet (Saturday, 6 PM, $45), convention pins ($5, while supplies last), handicapped accessible. Talk-in on 145.525. Admission is $15 in advance, $20 at the door. Tables are $200. Contact Jim Pitman, WA6MZV, 2902 Onrado St, Torrance, CA 90503; 310-320-4707; **wa6mzv@att.net**; **www.hamconinc.org**.

Colorado (Golden) — Aug 21 D F H R S V

8:30 AM-1 PM. *Spr:* Denver Radio Club. Jefferson County Fairgrounds Exhibit Hall, 15200 W 6th Ave. *TI:* 145.49, 448.625 (100 Hz). *Adm:* $5. Tables: 8-ft advance $12, door $16. Bryan Steinberg, KBØA, 1011 S Foothill Dr, Lakewood, CO 80228; 303-987-9596; **drcfest@w0tx.org**; **www.w0tx.org**.

Florida (Fort Pierce) — Aug 20 F H Q R S V

Set up 6 AM; public 8 AM-2 PM. *Spr:* Fort Pierce ARC. Indian River State College, 3209 Virginia Ave. *TI:* 147.345 (107.2 Hz). *Adm:* $5. Tables: $15 (with electricity), $10 (without electricity); pre-registration $8 and $12. Joe Lenartiene, KD4BTD, c/o WQCS Radio, 3209 Virginia Ave, Ft Pierce, FL 34981; 772-462-7815; **kd4btdjoe@comcast.net**; or Pete Amar, KD4SPW, 772-465-5204; **kd4spw@aol.com**; **www.qsl.net/w4akh**.

Florida (Tampa) — Aug 20 F H Q R T V

8 AM-1 PM. *Spr:* Tampa ARC. Tampa ARC Clubhouse, 7801 N 22nd St. TARCFest XXVI. *TI:* 147.105 (146.2 Hz). *Adm:* $2. Tables: $3. William Bode, N4WEB, 14302 Capitol Dr, Tampa, FL 33613; 813-382-9262; **n4web@hamclub.org**; **www.hamclub.org**.

Hawaii (Honolulu) — Aug 6 D F H R V

8 AM-12:30 PM. *Spr:* Emergency ARC. Fleet Reserve Assn Branch 46, 891 Valkenburgh St. *TI:* 146.88. *Adm:* Donation at door. Tables: $5. Chris Colquhoun, NH7QH, Box 30315, Honolulu, HI 96820; 866-620-0127; **nh7qh@earchi.org**; **www.earchi.org**.

Illinois (Belvidere) — Sep 10-11
D F H Q R S T V

6 AM-4 PM (both days). *Spr:* Chicago FM Club. Boone County Fairgrounds, 8791 IL Rte 76. Radio Expo 2011, overnight camping. *TI:* 146.76 (107.2 Hz), 146.55. *Adm:* advance $8, door $10. Tables: $20. Donald Wondolkowski, W9DMW, 29W151 North Ave, W Chicago, IL 60185; 630-908-2082; **cfmc.radioexpo@yahoo.com**; **chicagofmclub.org**.

Illinois (Oakwood) — Aug 20 D F R T V

8 AM-1 PM. *Spr:* Vermilion County ARA. Vermilion County Fairgrounds, 11798 County Rd 1720 N. *TI:* 146.82 (88.5 Hz). *Adm:* $5. Tables: $5. Tuck Miller, NF9T, 807 Franklin St, Danville, IL 61832; 217-516-8367; **nf9t@arrl.org**; **www.vcara-hamfest.info**.

Illinois (Peotone) — Aug 7 D F H R T V

6 AM-3 PM. *Spr:* Hamfesters RC. Will County Fairgrounds, 701 S West St. 77th Annual Hamfest. *TI:* 146.52. *Adm:* advance $6 (with double stub), door $8 (with single stub). Tables: $15 (indoor reserved table). Kerry Nelson, AA9SB, 3404 Hazel Ln, Hazel Crest, IL 60429; 708-335-4574; **kw_nelson@earthlink.net**; **hamfesters.org**.

Coming ARRL Conventions

July 15-17
Montana State, Essex*

July 16-17
Arizona State, Williams*

July 23
W0DXCC, 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*
Rocky Mountain Division, Taos, NM*

August 12-14
Pacific Northwest DX, Everett, WA

August 20
West Virginia State, Weston

August 20-21
Alabama State, Huntsville

August 21
Kansas State, Salina

August 28
Western Pennsylvania Section, New Kensington

September 7-10
RV Radio Network Fall Rally, Gordon, WI

September 9-11
Southwestern Division, Torrance, CA
QCWA National, Warwick, RI

September 11
Great Lakes Division, Findlay, OH

September 16-17
W9DXCC, Elk Grove Village, IL

September 16-18
ARRL/TAPR Digital Communications, Baltimore, MD

September 17
Roanoke Division, Virginia Beach, VA

September 23-24
SEDCO W4DXCC, Pigeon Forge, TN

September 24
Washington State, Spokane Valley

September 25
EmComm East, Rochester, NY

October 8
Pacific Northwest VHF, Bend, OR

October 8-9
Florida State, Melbourne

October 9
Connecticut State, Wallingford

*See July *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

Indiana (Lafayette) — Aug 21 D F H R T V
8 AM-2 PM. *Spr:* Tippecanoe ARA. Tippecanoe Fairgrounds, Home Ec Bldg, 1401 Teal Rd. 41st Annual Hamfest. *TI:* 147.135 (88.5 Hz). *Adm:* advance $4, door $5. Tables: $5 each. John Parker, AB9LE, 30 Guinevere Ct, Lafayette, IN 47905; 765-446-7747; fax 509-694-0973; **ab9le@arrl.net**; **w9reg.org/hamfest/index.htm**.

Indiana (LaPorte) — Aug 20 D F R T
8 AM-3 PM. *Spr:* Porter County ARC. Allstate Radio Club Tower, Rte 35 and Schultz Rd. *TI:* 146.775 (131.8 Hz). *Adm:* $3. Tables: Included in admission fee. Matt Lasayko, KC9KUD, 6178 Lute Rd, Portage, IN 46368; 219-916-4907; **mlasayko@comcast.net**; **pcarc.net**.

Indiana (Osgood) — Aug 27 F H R
8 AM. *Spr:* Ripley County ARC. Ripley County Fairgrounds, 524 Beech St. 4th Annual Hamfest. *TI:* 441.775, 147.135 (146.2 Hz). *Adm:* $4. Tables: $3. Delbert Felix, WY9L, 114 Harlan St, Osgood, IN 47037; 812-756-2470; **wy9l.thebigdog@gmail.com**; **rcarc.ripleycounty.net**.

Indiana (Spencer) — Aug 27 D F H R S T V
7 AM to 2 PM. *Sprs:* Owen County ARA and Bloomington ARC. Owen County Fairgrounds Community Building, 100 S East St. *TI:* 146.985 (136.5 Hz). *Adm:* $5. Tables: First table free. Bob Poortinga, K9SQL, 5930 N Maple Grove Rd, Bloomington, IN 47404; 812-876-6174; fax 812-323-4060; **k9sql@arrl.net**; **www.owencountyara.org/**.

Iowa (Glenwood) — Aug 13 D F R
8 AM-1 PM. *Spr:* Heartland Hams ARC. Glenwood Wrestling Club, 501 Tyson. *TI:* 145.29. *Adm:* $3. Tables: $5. Donald Brown, ACØTS, 53243 260th St, Glenwood, IA 51534; 712-526-2080; **don_jean_2000@yahoo.com**; **heartlandhams.org**.

KANSAS STATE CONVENTION

August 21, Salina

D F H R S V

The Kansas State Convention, sponsored by the Central Kansas ARC, will be held at the Salina Bicentennial Center, 800 The Midway. Doors are open 8 AM-4 PM. Features include large indoor air-conditioned flea market; major vendors; forums; meetings; VE sessions (8:30-10 AM); DXCC, WAS, and VUCC card checking; special guest from ARRL HQ Chuck Skolaut, KØBOG, Field and Regulatory Correspondent; handicapped accessible; refreshments. Talk-in on 147.03, 443.9. Admission is $5. Tables are $15 (commercial or flea market; includes electricity if requested, and 1 admission ticket per table). Contact Ron Tremblay, WAØPSF, 112 N Douglas Dr, Salina, KS 67401; 785-827-8149; **rtremblay@cox.net**; **www.centralksarc.com**.

Kentucky (Lawrenceburg) — Aug 14
D F H R S T V
8 AM-3 PM. *Spr:* Bluegrass ARS. American Legion Post #34, 745 W Broadway. Special Event MARS Station, State Emergency Services Response Vehicle. *TI:* 145.39 (107.2 Hz), 146.67. *Adm:* advance $5, door $6. Tables: advance $15, door $25. Jeanie Dalton, KB8QLC, Box 24188, 342 Stoneybrook Dr, Lexington, KY 40517; 859-619-8164; **jeanie@insightbb.com**; **www.BluegrassARS.org**.

Kentucky (Shepherdsville) — Sep 10
D F H R S T V
6:30-11:30 AM. *Spr:* Greater Louisville Hamfest Assn. Paroquet Springs Conference Centre, 395 Paroquet Springs Dr. *TI:* 146.7 (79.7 Hz). *Adm:* advance $6, door $7. Tables: $10. Bob Myers, c/o Greater Louisville Hamfest Assn, Box 34444, Louisville, KY 40232-4444; 502-935-6710; **lsrh@louisvillehamfest.com**; **louisvillehamfest.com**.

Louisiana (Leesville) — Aug 13
D F H R S T V
7:30 AM-2 PM. *Spr:* West Central Louisiana ARC. Louisiana Forestry Festival Fairgrounds, Nolan Trace (Hwy 8W). 35th Annual Hamfest. *TI:* 145.31 (203.5 Hz), 146.52, 144.39. *Adm:* $5. Tables: $5. Josie Jacobs, W5JPJ, 12326 Lake Charles Hwy, Leesville, LA 71446; 337-329-0734; **w5jpj@cebridge.net**; **www.wclarc.com**.

Maine (Milo) — Aug 13 D H R T V
8 AM-noon. *Spr:* Piscataquis ARC. Penquis Valley High School, 37 W Main St. *TI:* 147.21 (71.9 Hz), 147.15 (103.5 Hz). *Adm:* $5. George Dean, WA1JMM, 39 Railroad Ave, Brownville, ME 04414; 207-441-6112; **wa1jmm@roadrunner.com**; **k1pq.org**.

Maryland (Westminster) — Aug 21 D F H R T
8 AM-1 PM. *Spr:* Carroll County ARC. Carroll County Agriculture Center, 706 Agriculture Center Dr. 12th Annual Tailgate Fest. *TI:* 145.41 (114.8 Hz). *Adm:* $5. Steve Beckman, N3SB, 2145 Bethel Rd, Finksburg, MD 21048; 410-876-1482; **n3sb@qis.net**; **qis.net/~k3pzn**.

Massachusetts (Adams) — Aug 28 D F R T V
Set up 7 AM; public 8 AM-2 PM. *Spr:* Northern Berkshire ARC. Adams Agricultural Fairgrounds, Rte 8. HF and Satellite demos. *TI:* 146.91 (162.2 Hz). *Adm:* $5. Tables: $10. Tim Ertl, KE3HT, 128 Hale St, Dalton, MA 01226; 413-822-7075; **hamfest@nobarc.org**; **www.nobarc.org/hamfest.htm**.

Massachusetts (Cambridge) — Aug 21. Nick Altenbernd, KA1MQX, 617-253-3776 (9 AM-5 PM); **w1gsl@mit.edu**; **www.swapfest.us**.

Michigan (Lapeer) — Aug 14 D F H R V
8 AM-noon. *Spr:* Lapeer County ARA. Lapeer County Center Building, 425 County Center Dr. *TI:* 146.62 (100 Hz). *Adm:* $5. Tables: $10. Bill Miller, KD8VP, 3605 Pratt Rd, Metamora, MI 48455; 810-797-5329; **kd8vp@arrl.net**; **w8lap.com**.

Michigan (Owosso) — Aug 27 D F R S V
8 AM-noon. *Spr:* Shiawassee ARA. Baker College Welcome Center, 1309 South M-52. Trunk sales in parking lot. *TI:* 147.02 (100 Hz). *Adm:* $2. Tables: $3 (inside), $2 (parking spot sales). Don Warner, WB8GUS, 10008 Lehring Rd, Byron, MI 48418; 810-599-0729; **wb8gus@arrl.net**; **www.w8qqq.org/**.

Michigan (Wyoming) — Sep 10 D F H R T V
8 AM-1 PM. *Spr:* Grand Rapids ARA. Home School Bldg, 5625 Burlingame Ave SW. *TI:* 147.26 (94.8 Hz), 146.52. *Adm:* advance $5, door $6. Tables: $8 (6-ft, inside). Rich Douglas, KC8NKA, Box 3282, Grand Rapids, MI 49501; 616-531-6218; **kc8nka@arrl.net**; **www.grahamfest.org**.

Minnesota (Rush City) — Sep 10 H R T
9 AM-noon. *Spr:* East Central Minnesota ARC. Rush City High School, 51001 Fairfield Ave. 19th Annual Rush City Radio Rendezvous, ARES information. *TI:* 145.33 (146.2 Hz). *Adm:* Free. Tables: Free. John O'Brien, KØDEH, Second and Field Ave, Rush City, MN 55069; 320-358-4676; **lj@ecenet.com**; **ecmarc.org**.

Minnesota (Worthington) — Sep 10
F H R S V
9 AM-4 PM. *Sprs:* Worthington ARC, Iowa Great Lakes ARC, Northwest Iowa ARC. Hickory Lodge, 2015 N Humiston Ave. Northern Plains Regional Radio Council Hamfest. *TI:* 146.67 (141.3 Hz). *Adm:* Free. Tables: $5 each. Rick Hansen, KDØBJY, 201 Hagge St, Worthington, MN 56187; 507-372-7113; **nprrc@yahoo.com**; **www.nprrc.org**.

Missouri (Joplin) — Aug 26-27
D F H Q R S V
Friday 4-9 PM; Saturday 8 AM-1 PM. *Spr:* Joplin ARC. Holiday Inn Convention Center, 3615 Hammons Blvd. 22nd Annual Hamfest. *TI:* 147.21. *Adm:* advance $6, door $8. Tables: $10. Jim Johannes, NØZSQ, c/o JARC, Box 2983, Joplin, MO 64803-2983; 417-437-9547; fax 417-347-9412; **jimjohannes@sbcglobal.net**; **www.joplin-arc.org**.

Missouri (O'Fallon) — Aug 14 D F R V
8 AM-1 PM. *Spr:* St Charles ARC. Elks Lodge, 1163 Tom Ginnever Ave. *TI:* 146.67. *Adm:* $3. Tables: $12. Patrick Stueck, KDØIGO, 1495 Brittany Cove, St Charles, MO 63304; 636-487-3933; **hamfest@wb0hsi.org**; **www.wb0hsi.org**.

New Jersey (Bergenfield) — Aug 13 D H R
8 AM-4 PM. *Spr:* Boy Scout Troop 139/Venturing Crew 7373. Conlon Hall, 19 N William St. *TI:* 146.955 (141.3 Hz), 146.52. *Adm:* $5 (includes pancake breakfast). Tables: $20 for 1, $35 for 2, $10 for each additional. Gordon Beattie, W2TTT, 29 N Washington Ave, Bergenfield, NJ 07621; 201-314-6964; fax 201-387-8896; **w2ttt@arrl.net**.

New Jersey (Haledon) — Aug 20 D F H R T
Set up 6 AM; public 8 AM. *Spr:* Ramapo Mountain ARC. Camp Veritans, 225 Pompton Rd. 35th Annual Ham Radio and Computer Flea Market. *TI:* 146.49, 446.175 (both 107.2 Hz). *Adm:* $5. Tables: $12 (inside); $10 tailgate space. Ronald Smith, N2MSV, c/o RMARC, Box 364, Oakland, NJ 07436; 201-891-4967; **n2msv@arrl.net**; **www.qsl.net/rmarc**.

New Jersey (Tinton Falls) — Sep 10
D F H R T V
Set up 7 AM; public 8 AM. *Spr:* Garden State ARA. Monmouth Adult Education Community (MAECOM), 100 Tornillo Way. *TI:* 448.125 (141.3 Hz), 147.045 (67 Hz). *Adm:* $5 per carload (free with coupon). Tables: $15 (first parking space); $10 each (second thru fifth space). Frank Wroblewski, W2XYZ, 450B Cheshire Ct, Lakewood, NJ 08701; 732-942-7705; **w2xyz@arrl.net**; **www.gardenstateara.org**.

New Jersey (Toms River) — Aug 14
D F H R T V
7 AM-noon. *Spr:* Jersey Shore ARS. Riverwood Park, Riverwood Rd. *TI:* 146.91 (127.3 Hz). *Adm:* $5. Tables: $15. Don McGlaughlin, K2HCW, Box 811, Ocean Gate, NJ 08740; 732-237-9448; **k2hcw@comcast.net**; **jsars.org**.

New York (Ballston Spa) — Sep 10
D F H R T V
Set up Friday 6-8:30 PM; public Saturday 7 AM-3 PM. *Spr:* Saratoga County RACES Assn. Saratoga County Fairgrounds, Prospect Ave. 26th Annual Hamfest, foxhunt. *TI:* 147.0 (91.5 Hz), 147.24. *Adm:* $5 (includes 1 8×8 tailgating spot). Tables: $5. Darlene Lake, N2XQG, 314 Loudon Rd #84, Saratoga Springs, NY 12866; 518-587-2385; **dar@saratogaspringsny.us**; **k2dll.net**.

New York (Howard) — Aug 13 D F H R T V
8 AM-noon. *Spr:* Keuka Lake ARA. Howard Community Building, 7481 Hopkins Rd. *TI:* 145.19. *Adm:* $5. Tables: Free. Roy Koehler, KB2WXV, 37 Carrington St, Avoca, NY 14809; 607-566-3688; **hamfest@xdrcertified.com**; **klara.us**.

New York (Medina) — Aug 13 D F H R V
8 AM. *Spr:* Orleans County ARC. Ridgeway Fire Hall, 11392 Ridge Rd (Rte 104). *TI:* 145.27. *Adm:* $5. Tables: $5. Terry Cook, KC2JKU, 14069 W County House Rd, Albion, NY 14411; 585-589-6362; **kc2jku@ocarc.us**; **www.ocarc.us**.

New York (Westmoreland) — Aug 13
D F H R S T
Set up 7 AM; public 8 AM-2 PM. *Spr:* Rome RC. Westmoreland Fire Station, 100 Station Rd. 58th Annual Hamfest. *TI:* 146.88 (151.4 Hz). *Adm:* $5. Tables: $5. James Gelose, AC2DB, 128 Seventh Ave, Frankfort, NY 13340; 315-717-6684; **ac2db@yahoo.com**; **www.romeradioclub.com**.

North Carolina (Dallas) — Sep 3-4
D F H Q R S V
Saturday 8 AM-5 PM, Sunday 8 AM-2 PM. *Spr:* Shelby ARC. Dallas (Biggerstaff) Park, 144 Leisure Ln. 55th Shelby Hamfest. *TI:* 146.88, 147.12. *Adm:* advance $6, door $8. Tables: $70. Ben Melvin, KM4C, 902 Henry St, Kings Mountain, NC 28086; 704-739-2583; **ben@kmse.com**; **shelbyhamfest.com**.

North Dakota (West Fargo) — Aug 20
F H Q R S V
8 AM-2 PM. *Spr:* Red River Radio Amateurs. Red River Valley Fairgrounds, 1805 W Main Ave. *TI:* 145.35, 146.76, 147.255, 444.875 (123 Hz). *Adm:* $7. Tables: $15. Tim Gooding, KDØYX, 421 12th Ave E, W Fargo, ND 58078; 701-282-6630; **kd0yx@cableone.net**; **www.rrra.org**.

Ohio (Cambridge) — Aug 28 D F H R T V
8 AM-1 PM. *Spr:* Cambridge ARA. Pritchard Laughlin Civic Center, 7033 Glenn Hwy. Hamfest and Computer Show, ARRL forum. *TI:* 146.85 (91.5 Hz). *Adm:* $5. Tables: $10. Lyn Alfman, N8IMW, 1975 N Moose Eye Rd, Norwich, OH 43767; 740-872-3888; **lynalfman@aol.com**; **www.w8vp.org**.

Ohio (Cortland) — Aug 21 D F H R T V
8 AM-2 PM. *Spr:* Warren ARA. Trumbull County Fairgrounds, 899 Everett Hull Rd. 55th Annual Hamfest. *TI:* 146.97. *Adm:* $6. Tables: $6. Jacqueline Clay, KD8DNE, Box 809, Warren, OH 44482; 440-636-2560; **kd8dne@yahoo.com**; **groups.yahoo.com/group/WARA_HAMFEST**.

Ohio (Friendship) — Aug 20 D F H R T
8 AM-1 PM. *Spr:* Portsmouth RC. Nile Twp Community Building, 12215 US Rte 52. Equipment Auction. *TI:* 145.39 (136.5 Hz). *Adm:* $5. Tables: Free as long as they last inside. Gary Stephenson, WW8O, 3763 Grace St, New Boston, OH 45662; 740-285-0944; **ww8o@arrl.net**.

Pennsylvania (Matamoras) — Aug 14
D F H R T
8 AM. *Spr:* Tri-State ARA. Matamoras Airport Park (South Pavillion), 9th St Extension. *TI:* 145.35 (100 Hz). *Adm:* $5. Tables: $15. Tom Olver, W2TAO, Box 711, Sparrowbush, NY 12780; 570-486-6773; **tristateara@gmail.com**; **www.k3tsa.com**.

WESTERN PENNSYLVANIA SECTION CONVENTION

August 28, New Kensington
D F H R S T

The Western Pennsylvania Section Convention, sponsored by the Skyview Radio Society, will be held at the Skyview Radio Society Clubhouse Grounds, 2335 Turkey Ridge Rd. Doors are open 8 AM-3 PM. Features include 50th Annual Swap 'n Shop; tailgating; VUCC/WAS card checking; breakfast and lunch served; "Skyview Jam" (musicians bring your instruments); bring your high performance or antique cars for the Skyview Car Show. Talk-in on 146.64 (131.8 Hz). Admission is $5. Tables are $5. Contact Rich Newbould, K3RWN, 3179 Churchview Ave, Pittsburgh, PA 15227; 412-951-8484; **k3rwn@arrl.net**; **www.skyviewradio.net**.

Pennsylvania (Sinking Spring) — Aug 13
D F H R T V
Set up 7 AM; public 8 AM-noon. *Spr:* Reading RC. Heritage Park, Clematis Ave. *TI:* 146.91 (131.8 Hz). *Adm:* $1 (nonham spouses and under 18 free). Tables: $2 per seller (tailgate or bring your own tables). Harry Hoffman, W3VBY, 104 Evans Ave, Sinking Spring, PA 19608; 610-678-8976; **harryhoffmanjr@juno.com**; **www.readingradioclub.org**.

Pennsylvania (Stroudsburg) — Sep 10
D F H R S T V
8 AM-2 PM. *Sprs:* Eastern Pennsylvania ARA and Pocono ARK. Stroudsburg Intermediate School, 1198 Chipperfield Dr. 11th Annual Pocono Area Hamfest. *TI:* 147.045 (131.8 Hz). *Adm:* $6. Tables: $10. Jerry Truax, N3SEI, Box 756, Bartonsville, PA 18321; 570-620-9080; fax 570-620-1089; **cameras@ptd.net**; **www.arvelo.net/N2MZZ/graphics/2011hamfestflyer2.wps.pdf**.

Pennsylvania (Uniontown) — Sep 3
D F H R T
8 AM-3 PM. *Spr:* Uniontown ARC. Uniontown ARC Clubhouse, 433 Old Pittsburgh Rd. 62nd Annual Gabfest, Homing Pigeons demonstrated (courtesy of John, N3DYZ). *TI:* 147.045 (131.8 Hz). *Adm:* Free. Tables: Free. John Wayt, WA3YT, 101-A De Lafayette St, Perryopolis, PA 15473; 724-736-0220; **wa3yt@arrl.net**; **www.w3pie.org**.

QCWA NATIONAL CONVENTION

September 9-11, Warwick, Rhode Island
H Q S

The QCWA National Convention, sponsored by the Quarter Century Wireless Assn, will be held at the Crowne Plaza at the Crossings, 801 Greenwich Ave. Doors are open Friday 8 AM-10 PM, Saturday 8 AM-5 PM, Sunday 8 AM-noon. This year's event is open to all hams (QCWA membership not required). Features include Meet and Greet (Friday 6-11 PM, $29.50); special guest speakers ARRL President Kay Craigie, N3KN and FCC's retired Special Counsel Riley Hollingsworth, K4ZDH; exciting variety of tours and activities; forums (QRP, Vintage Radio Museum, HandiHams, and more); Tangier Island 2011 IOTA DXpedition; QSL card checking; QCWA membership meeting; banquet dinner dance (Saturday, 6-11 PM, $47.50); farewell breakfast (Sunday, 8 AM, $24). Talk-in on 146.6. Admission is $35 (members), $7.50 (spouses), $20 (non-members), $5 (students). Contact Diane Swenson, 299 Wattaquadock Hill Rd, Bolton, MA 01740; 978-779-6468; **dmswenson52@comcast.net**; **qcwa.org**.

Texas (Gainesville) — Aug 27 D F H R T V
7 AM-1 PM. *Spr:* Cooke County ARC. Gainesville Civic Center, 311 S Weaver St. 19th Annual Hamfest. *TI:* 147.34, 442.775 (both 100 Hz). *Adm:* advance $6, door $8. Tables: $8. James K. Floyd, N5ZPU, 1704 E California St, Gainesville, TX 76240; 940-668-7511; **jfloyd54@swbell.net**; **www.gainesvillehamfest.org**.

Vermont (St Albans) — Aug 20 D F H R T V
9 AM-3 PM. *Spr:* St Albans ARC. VFW Post #758, 353 Lake St. *TI:* 145.23 (100 Hz). *Adm:* $5. Tables: $5. Arnold Benjamin, N1ARN, 1420 Rice Hill Rd, Franklin, VT 05457; 802-309-0666; **n1arn@yahoo.com**; **www.starc.org**.

PACIFIC NORTHWEST DX CONVENTION

August 12-14, Everett, Washington
D H Q R S

The Pacific Northwest DX Convention, sponsored by the Western Washington DX Club, will be held at the Everett Holiday Inn, 3105 Pine St. Doors are open Friday 3-7 PM, Saturday 7:30 AM-4 PM, Sunday 8 AM. Features include hospitality suites (Friday, 8 PM-midnight, Saturday 10 PM-2 AM); commercial exhibits; South Orkney Island DXpedition by N6MZ; Saba Island DXpedition by K4UEE; QRP contesting and DXing from the Pacific Northwest by K6UFO; ARRL forum; special guest Ward Silver, NØAX; DXCC card checking; Saturday dinner banquet (7 PM, $40; no-host cash bar 6-7 PM); Sunday brunch (8-11 AM, $25). Registration fee is $30. Contact Denny Bowman, W7SNH, 6916 160th St SW, Edmonds, WA 98026; 425-745-6149; **w7snh1@gmail.com**; **www.wwdxc.org/convention**.

Washington (Kent) — Aug 27 F H R T
9 AM-1 PM. *Spr:* Highline ARC. Gates and Controls, 6506 S 209th St, #102. *TI:* 146.66 (103.5 Hz). *Adm:* Free. Tables: $10 per space. Dennis Reanier, W7UBA, 204 S Normandy Rd, Burien, WA 98148; 206-241-6812; **w7uba@juno.com**; **www.highlinearc.org**.

Washington (Spanaway) — Aug 13 D F H R V
9 AM-1 PM. *Spr:* Radio Club of Tacoma. Bethel Junior High School, 22001 38th Ave E. *TI:* 147.28 (103.5 Hz), 147.5. *Adm:* $5. Tables: $20 (non-commercial), $30 (commercial), $5 per helper. Larry Watson, KD4VOM, 2708 295th St S, Roy, WA 98580; 253-843-2190; **royretreat@mailcan.com**; **w7dk.org**.

West Virginia (Huntington) — Aug 13
D F H Q R S V
8:30 AM-1 PM. *Spr:* Tri-State ARA. Veterans Memorial Field House, 2590 5th Ave. Hamfest and Computer Show. *TI:* 146.76 (131.8 Hz). *Adm:* $6. Tables: $10. Judy Taylor, WD8EOP, 3003 Wallace Cir, Huntington, WV 25705; 304-525-4237; **bdsjudy@wvdsl.net**; **www.qsl.net/tara**.

WEST VIRGINIA STATE CONVENTION

August 20, Weston
D F H Q R S T V

The West Virginia State Convention (53rd Annual Event), sponsored by the West Virginia State Amateur Radio Council, will be held at the WVU Convention Center – Jackson's Mill 4-H Conference Center, 160 WVU Jackson Mill. Doors are open 8 AM-10 PM. Features include flea market; vendors; auction; forums; talk-in station; special guest speaker from ARRL HQ Steve Ford, WB8IMY, *QST* Editor/ARRL Publications Manager; ARES, DXCC, MARS, QCWA, NTS Net Meetings; VE sessions; awards; lodging, camping and meals on site (reservations required; Ann Rinehart, KA8ZGY, 304-768-9534). Talk-in on 145.39, 147.88. Admission is $8. Contact Bob West, WA8YCD, 883 Goshen Rd, Morgantown, WV 26508; 304-291-0418 (home), 304-672-6381 (cell); **wa8ycd@hotmail.com**; **www.qsl.net/wvsarc**.

Wisconsin (Baraboo) — Aug 27 D F H R V
8 AM-1 PM. *Spr:* Yellow Thunder ARC. Elks Club Lodge, 623 Broadway St. 15th Annual Circus City Swapfest. *TI:* 147.315 (123 Hz). *Adm:* $5. Tables: $10. Thomas Harrison, N9PQJ, E7983 E Lake Virginia Rd, Reedsburg, WI 53959; 608-963-0762; **n9pqj@arrl.net**; **www.yellowthunder.org**.

RV RADIO NETWORK FALL RALLY

September 7-10, Gordon, Wisconsin
F H R S V

The RV Radio Network Fall Rally, sponsored by the RV Radio Network, will be held at the Happy Ours RV Park, 14627 S East Mail Rd. Features include flea market, Amateur Radio demonstration, Special Event Station (Saturday, 10 AM-2 PM), VE sessions (Saturday), lots of fun and events are being planned. Talk-in on 145.49 (110.9 Hz). Rally fee is $30 per person (includes pancake breakfast, biscuit and gravy breakfast; one supper and one catered meal). Camping rate is $20 per night (reserve, 715-376-2302). Contact Marshall Kiel, KF9SU, 7843 Dixie Rd, Tomah, WI 54660; 608-374-5435; **kf9su@arrl.net**; or Pat Ryan, N9JIX, 218-590-4665; **www.rvradionetwork.com**.

75, 50 AND 25 YEARS AGO

August 1936

■The cover photo shows part of the U.H.F. circuit for 56 Mc. that is described in this issue.

■The opening sentence of the editorial says, "The deep interest this journal and its staff for many years have displayed in the ultra-high frequencies has been born of the conviction that these waves are destined to play a most important part in the radio of the future."

■In "Licking the Crystal-Control Problem on the Ultra-High Frequencies," Charles Moody, W6HJN, and Frank Kirby, W6WI, describe medium- and high-power rigs for 56 Mc.

■Ed Sanders, W1EDY, adds his comments, with "56-Mc. Crystal Control with Resonant-Line Coupling."

■By Goodman, W1JPE, chimes in with "100-Watt 56-Mc. Crystal-Control Output with only Four Stages."

■F. T. Griffin tells us how to build "A General Purpose V.T. Voltmeter with Ray-Tube Indicator."

■Vern Chambers, W1JEQ, describes "An Inexpensive Four-Band Transmitter" for 160 through 20 meters."

■J. D. Blitch, W4IS, tells us how to use the autotransformer as "An Improved Method of Voltage Control."

■"Handling Ham Messages" announces changes in the standard A.R.R.L. message format and the way to count message-handling credits.

August 1961

■The cover photo shows W1HDQ's Nuvistor preamps for 50 and 144 Mc, described in this issue.

■The editorial sends kudos to the predecessor agency of the FCC's Field Engineering & Monitoring Bureau, which is celebrating its 50th anniversary.

■George Badger, W6RXW, keeps us up to date on one new frontier, with "An Introduction to the Klystron."

■"The Grounded-Grid Amplifier," by Bill Orr, W6SAI; Ray Rinaudo, W6KEV, and Bob Sutherland, W6UOV, discusses the effects of circuit design of grounded-grid amplifiers on linearity and stability.

■Carl Buhrer, K2OHF, presents "An S.S.B. Product-Detector Adapter" for older receivers.

■Lew McCoy, W1ICP, modifies his earlier HF transmitter by adding a plate tank for 50 Mc. to get on "Six Meters with the TV/Surplus 150-Watt Amplifier."

■"A Multi-output Variable-Voltage Power Supply," by Howard Cohen, K2ITO, provides voltages (both positive and negative) for your experimental electronics work.

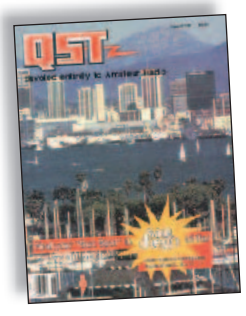
■In Part II of "A Two-Band Station for the V.H.F. Beginner," Ed Tilton, W1HDQ, describes the transmitters for 50 and 144 Mc.

■Ed also describes his "Nuvistor Preamplifiers for 50 and 144 Mc.", which give us a simple way of improving our V.H.F. reception.

■Gary Elliott, KM6CB, reports on the recent "DXpedition to Kure Island," about 65 miles west of Midway Island.

■The Collins ad on page 2 introduces the Collins 75S-3.

August 1986



■The cover photo shows San Diego, and invites members to attend the 1986 National Convention in that choice "sun spot."

■The editorial discusses "What has the League Done for YOU lately," citing a recent example of a ham who had received considerable help from the League in resolving RFI complaints and antenna zoning restrictions…but who thought the League "…hadn't done a thing for me."

■Dennis Bodson, W4PWF, presents Part 1 of "Electromagnetic Pulse and the Radio Amateur."

■John Uhl, KV5E, reports on "How to Construct a Wire Log-Periodic Dipole Array for 80 or 40 Meters."

■Paul Follini, VE1CZX, reports on using normal wall-toggle switches as "Inexpensive RF Switches for the Ham Shack." Yes, they work!

■Peter Meyer, NØAFW, tells us about "An Alternative Method of Mounting Large-Size Antennas."

■Doug DeMaw, W1FB, presents "The QRP Transmatch — A Novel Approach."

■In "Robbing the Cradle: Aggressive Recruitment of Young Hams," David Koch, W8LNJ, tells of his approach, as a teacher, to getting youngsters into ham radio.

■Gene Williamson, K7DBV, gives us "The K7DBV Guide to Easy CW QSOs."

Al Brogdon, W1AB ♦ Contributing Editor

Field Organization Reports

MAY 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**.

435 W5KAV
373 W4CAC
361 KØIBS
355 W9WXN
340 K8RDN
332 KD8EBY
330 KA2ZNZ
328 WB8RCR
310 KT2D
260 WA3EZN
255 WB9JSR
253 KD8KWG
250 NX8A
249 NC4VA
248 KB2ETO
235 K9LGU
233 WD8USA
232 WB9YBI
224 W2MTA
220 KB2RTZ KB5SDU
214 KØLQB
205 N1IQI
200 W5DY
195 K6HTN KB2KOJ
190 K7OAH
188 WB9FHP
186 K2HAT
181 KC5MMH
176 WA2BSS
173 KA8ZGY
171 K2ABX
170 KE5HYW
163 KC8YVF
165 KK3F
164 W3CB
162 W9WLW
161 W8EAB
160 W7ARC AG9G KT5SR N8IO KGØGG
159 N2DRB
155 N9VC WD9FLJ N5NVP
150 WA9LFO WK4P WE2G
145 W2KFV KF5CRX
144 KC5ZGG
140 W4DNA KE5YTA KF5IOU KB3LNM
137 KK7DEB
135 KD1LE W3YVQ
134 W2LIE
132 KJ6HWL
130 KØVTT K4IWW KB2BAA WØLAW KW1U K6JT WM2C K4BG
129 KC2SYM
125 NN7H NX9K K7EAJ W7ELI
123 KC2PSN
120 KA4FZI WA5LOU W1GMF K2DYB WB8HHZ W8UL N2JBA K4GK WB8WKQ
119 W5XX W8QZ
118 N9DVL
114 KK5NU KF7GC
110 W7QM KE4CB W2EAG N1LKJ K1YCQ WI2G KC5OZT KA3OCS N7CM N7YSS K7BDU W7FQQ KI4AAN N9MN
109 WS6P
107 W2DWR
105 K2TV N8CJS W8DJG WA4UJC
103 N2VC
102 WØSJS
100 W6WW K4SCL N5OUJ WB6UZX W4TTO W8CPG K5MC N2WKT WD8Q WG8Z WB8SIQ
N3SW W3TWV AA3SB WB4FDT K4BEH W4WNE WX4CB NR2F KA1G K4JGA NU8K KT4YA WØCLS NØMEA WAØVKC K8VFZ
99 W5GKH
98 N7IE NA7G
97 K1EIC K2GW KC2UVQ
96 W4OTN
95 KA4IZN KB8RCR KD8LZB
94 KB3LFG
90 AE5VY K4JUU KI4YV W9MBT WA2CUW AA2SV WA2NDA KK1X N3KB KA5AZK N9VT N8DD K3IN N3ZOC WB4BIK N5EEO N4ELI KJ4HGH W8IM K1JPG KZ8Q KD8CYK KØBXF
88 KJ7NO K2BRG
87 AD4BL
86 KB9KEG W7JSW
85 KØMEL KK7TN WB6OTS K1REV
84 N2DW
83 AL7N KC2YDT KC5ZZ
82 KD8AAD
81 WDØGUF
80 K7MQF KA3NZR KB8HJJ WD8DIP KA8IAF KB7RVF K8KV NIØI KCØZDA N8ASU KD8WNE
78 NA9L
77 KC2EMW W1PLK
76 KC2UMX
75 AC6C KE5ABO
74 WB4GHU
73 K2KYQ
72 N2VQA
71 WD8DHC KBØDTI
70 W2OSR N8SY KDØAYN KØDEU KØDLK NØDUW NØDUX NUØF WØFUI KBØJKO N3NTV KØPTK KØOR KØRXC NØUKO KD7ZUP

The following stations qualified for PSHR in previous months, but were not properly recognized in this column: (Apr) WB6UZX 110.

Section Traffic Manager Reports

The following Section Traffic Managers reported: AK, AZ, CO, CT, EB, EMA, ENY, EPA, GA, IA, IL, IN, KS, LAX, ME, MI, MN, MS, NC, NFL, NLI, NNY, NTX, OH, OK, OR, ORG, SFL, SJV, SNJ, STX, TN, UT, 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, MN, MO, MT, NLI, NM, OH, OK, SFL, SV, 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 1850, WB5NKD 1732, WB9FHP 1140, W8UL 1094, KK3F 964, W6WW 927, KW1U 827, W1GMF 767, WB9JSR 669, WB5NKC 631, N1LKJ 626, WB9WKQ 604, KZ8Q 599, NX9K 573, K6JT 569, WD8Q 543, N8IXF 511, W7QM 500.

Stations earning BPL by Originations plus Deliveries: NM1K 100; (Apr) KJ4HGH 110.

SILENT KEYS

It is with deep regret that we record the passing of these amateurs:

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N1BAZ **Reddish**, William M., Sherman, TX
N1CT **Nintzel**, Kevin J., Seymour, CT
K1HAH **Callaghan**, John P., Plainville, CT
W1KKK **Rapelye**, Arthur G., Beverly Hills, FL
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W1NXF **Spinney**, Robert G., Green Harbor, MA
♦WA1UHH **Werns**, George C., Wallingford, CT
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♦W1ZM **Scarano**, Gerard J., New Port Richey, FL
N2ARE **Gardner**, Joseph D., Liverpool, NY
W2BGL **Wilsey**, Henry R., Needham, MA
N2DLQ **Mischlich**, William A. Sr, Robbinsville, NJ
WA2EWE **McLaughlin**, James A. Jr, Santa Rosa, CA
WB2J **Werner**, Bruce W. Sr, Hasbrouck Heights, NJ
♦W2KIT **Fein**, Marvin J., Newport Beach, CA
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W2TQF **Cantine**, Thomas, Fulton, NY
♦ex-W2JDK **Herrmann**, Paul J., Lockport, NY
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W3CL **Lagoda**, Carl P., Washington, DC
W3CP **Headrick**, James M., Stanfield, OR
W3CQH **Gorden**, Howard S., Frederick, MD
WA3DLU **De Huarte**, John F., Berlin, MD
K3GJO **Shuster**, Leonard Jr, Dallastown, PA
K3GR **Reissig**, George W., Sarver, PA
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W3QU **Nocar**, Albert F. Jr, Laurel, DE
♦AF3RM **Olson**, Kenneth A., Lawrence, KS
K3SDL **Colbert**, R. John., Dallas, TX
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♦ 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

Silent Keys Administrator ♦ sk@arrl.org

Strays

AMERICAN LEGION ARC

◊The nation's largest wartime veterans organization has formed a national club for its members who hold Amateur Radio licenses. Membership is free for Legion family members. The American Legion Amateur Radio Club's flagship station, K9TAL (The American Legion) is located at the organization's national headquarters in Indianapolis, Indiana.

"The American Legion has always enjoyed an affiliation with amateur radio going back to the civil defense days when hams were key communicators in local units," said Jimmie L. Foster, national commander of The American Legion. "Today 'hams' are providing communications when traditional methods are knocked out."

Through the years, countless members of the US military were trained as technicians or engineers and later obtained Amateur Radio licenses to continue to use their abilities at home as both recreation and a public service commitment.

The objectives of the new club are to conduct special commemorative event operations on Veterans Day and Memorial Day and to conduct regular nets on veterans' news, the promotion of Amateur Radio, and disaster preparedness and response among the Legion's 14,000 nationwide posts.

Because the club has just recently been authorized by the organization's National Executive Committee, Foster invites licensed Legion family hams to join now but to be patient; it will take time to solicit equipment donations and get a national club station assembled and on the air. Licensed Legionnaires, Auxiliary members and Sons of The American Legion can join by sending their full name, call sign, address and Legion/Auxiliary/SAL membership number to **k9tal@legion.org**.

Updates on club activities will be posted at **www.legion.org**; eventually, a dedicated web page will be available. — *Joe March, KJ9M, Director of Public Relations, The American Legion National HQ*

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This set of interfaces allows remote control of your Amateur Radio Station via Internet in a user-friendly and cost effective way!

RemoteRig gives you control of the radio coupled with crystal clear TX & RX audio and sending CW with your own Paddle!

New! Now Stereo Version for Dual Receiver radios.

Works with all Computer-controllable radios from:
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Just simply insert your control box in place of your front panel interconnect cable, place the body of the radio on the remote end and you are on the air as if you are there!

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Now includes 12v power supply, $12.95 value!

Available exclusively from all HRO Locations!

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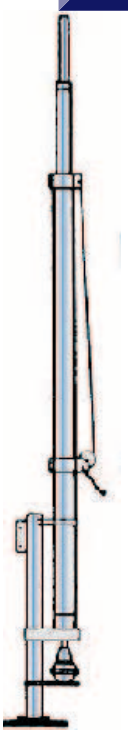
US TOWER



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MA-40

40' Tubular Tower

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MA-550

55' Tubular Tower

Handles 10 sq.ft. at 50mph
Pleases neighbors with tubular streamlined look

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DXE-MBVE-5 DXE-MBVE-1

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From $194.95

Stainless steel tilt and mount, strongest Extren® base insulator—standard equipment

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- High strength Delrin Compression Insulator or Extren Channel—your choice for the same low price!
- NEW #5 patent pending SAF-T-TILT™ base allows easy, safe tilt action without unsafe removal of mounting hardware!
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DX Engineering Original Multi-Band Antennas

DXE-8040VA-1	THUNDERBOLT™ Design 80/40 Meter Dual Band, 55 ft.	$694.95
DXE-MBVA-1UP	THUNDERBOLT™ Design 160-10 Meter with UNUN, 43 ft.	$299.95
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DXE-MBVE-1-4UPR	Vertical/Radial Plate/UNUN Package, 43 ft.	$349.95
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DXE-4030VA-1	THUNDERBOLT™ 40/30 Meter Dual Band	$199.95

Monoband

DXE-7580VA-1	THUNDERBOLT™ Design 75/80 Meter, 55 ft.	$549.95
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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 High Performance Freestanding, Low Profile, 24 ft.	$179.95
DXE-40VE-1	Fast Taper, High Performance 40 Meter	$179.95
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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 DXE-213U Cable Assemblies with PL-259 Connectors

DXE-213DU003	3 ft.	$12.88
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DXE-213DU012	12 ft.	$20.88
DXE-213DU018	18 ft.	$24.88
DXE-213DU025	25 ft.	$29.88
DXE-213DU050	50 ft.	$52.88
DXE-213DU075	75 ft.	$71.88
DXE-213DU100	100 ft.	$91.88
DXE-213DU125	125 ft.	$112.88
DXE-213DU150	150 ft.	$133.88
DXE-213DU175	175 ft.	$182.88
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RG-8/U DXE-8U Cable Assemblies with PL-259 Connectors

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DXE-8UDU018	18 ft.	$31.88
DXE-8UDU025	25 ft.	$39.88
DXE-8UDU050	50 ft.	$61.88
DXE-8UDU075	75 ft.	$85.88
DXE-8UDU100	100 ft.	$108.88
DXE-8UDU125	125 ft.	$139.88
DXE-8UDU150	150 ft.	$159.88
DXE-8UDU175	175 ft.	$179.88
DXE-8UDU200	200 ft.	$199.88

RG-8X DXE-8X Cable Assemblies with PL-259 Connectors

DXE-8XDU1.5	1.5 ft.	$9.88
DXE-8XDU002	2 ft.	$10.88
DXE-8XDU003	3 ft.	$11.88
DXE-8XDU006	6 ft.	$13.88
DXE-8XDU012	12 ft.	$16.88
DXE-8XDU025	25 ft.	$23.88
DXE-8XDU050	50 ft.	$32.88
DXE-8XDU075	75 ft.	$40.88
DXE-8XDU100	100 ft.	$47.88
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DXE-400MAX Cable Assemblies with PL-259 Connectors

DXE-400MAXDU003	3 ft.	$13.88
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DXE-400MAXDU012	12 ft.	$24.88
DXE-400MAXDU018	18 ft.	$31.88
DXE-400MAXDU025	25 ft.	$39.88
DXE-400MAXDU050	50 ft.	$61.88
DXE-400MAXDU075	75 ft.	$85.88
DXE-400MAXDU100	100 ft.	$104.88
DXE-400MAXDU150	150 ft.	$159.88
DXE-400MAXDU175	175 ft.	$179.88
DXE-400MAXDU200	200 ft.	$199.88

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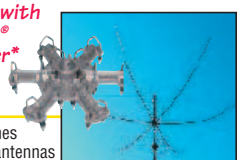
Complete 5-Band Kit with NEW Stainless/Teflon® Balanced RIGID Feeder*



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- 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
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$50.00 or more COAX ORDER!

DXE-213U

New!

- 96% Bare Copper Braid Shield
- 66% Velocity Factor
- Polyethylene Dielectric .285" O.D.
- .405" O.D. Non-Contaminating Black Vinyl Jacket
- Center Conductor 12.5 AWG
  7 Strands of 21 AWG Bare Copper

DXE-400MAX

New!

- Bonded Aluminum Tape plus Tinned Copper Braid Shield, 95% coverage
- 84% Velocity Factor
- Gas Injected Foam Polyethylene Dielectric,.285" O.D.
- .405" O.D. Black Low Density Polyethylene Jacket
- Center Conductor 10 AWG
  19/.0210" Strands Bare Copper

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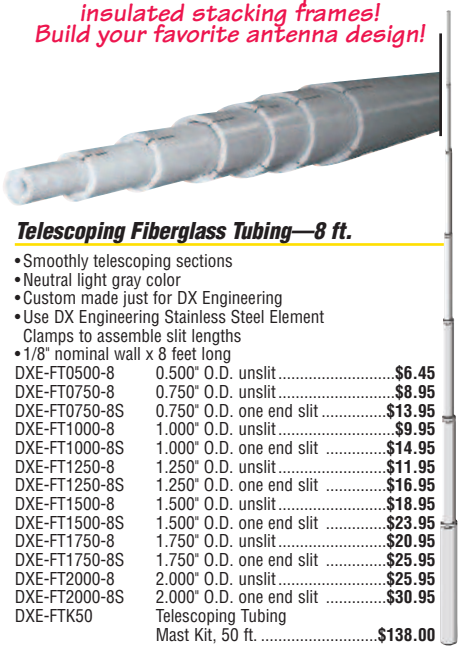
Great for wire antenna spreaders or insulated stacking frames! Build your favorite antenna design!



Telescoping Fiberglass Tubing—8 ft.

- Smoothly telescoping sections
- Neutral light gray color
- Custom made just for DX Engineering
- Use DX Engineering Stainless Steel Element Clamps to assemble slit lengths
- 1/8" nominal wall x 8 feet long

DXE-FT0500-8	0.500" O.D. unslit	$6.45
DXE-FT0750-8	0.750" O.D. unslit	$8.95
DXE-FT0750-8S	0.750" O.D. one end slit	$13.95
DXE-FT1000-8	1.000" O.D. unslit	$9.95
DXE-FT1000-8S	1.000" O.D. one end slit	$14.95
DXE-FT1250-8	1.250" O.D. unslit	$11.95
DXE-FT1250-8S	1.250" O.D. one end slit	$16.95
DXE-FT1500-8	1.500" O.D. unslit	$18.95
DXE-FT1500-8S	1.500" O.D. one end slit	$23.95
DXE-FT1750-8	1.750" O.D. unslit	$20.95
DXE-FT1750-8S	1.750" O.D. one end slit	$25.95
DXE-FT2000-8	2.000" O.D. unslit	$25.95
DXE-FT2000-8S	2.000" O.D. one end slit	$30.95
DXE-FTK50	Telescoping Tubing Mast Kit, 50 ft.	$138.00

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

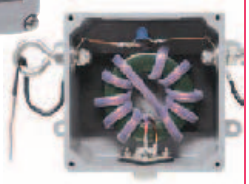
DXE-RFS-SYS-2P	Controller and Switch only	$389.95
DXE-RFS-SYS-3P	160/80/40m Electronics	$799.00

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.

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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
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- 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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- ***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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hy-gain® ROTATORS

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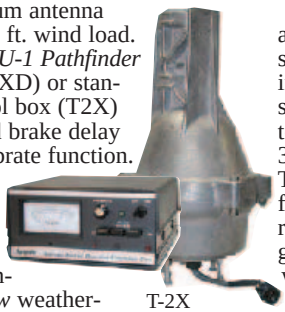
HAM-IV

HAM-IV $649.95

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

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

TAILTWISTER SERIES II



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

T-2X $799.95

T-2XD $1229.95 with DCU-1

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

CD-45II

CD-45II $449.95

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

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

HAM-V

HAM-V $1099.95 with DCU-1

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

AR-40

AR-40 $349.95

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

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

HDR-300A

HDR-300A $1499.95

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

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

ROTATOR OPTIONS

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

Digital Automatic Controller

DCU-1 $749.95

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

AR-35 Rotator/Controller

AR-35 $89.95

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

RBD-5 $29.95

NEW! Automatic Rotator Brake Delay

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

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IC-91A

IC-V80 2M FM Handheld

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- 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-91A 2M/440 FM Dual Band HT

- TX: 144-148, 420-450 MHz
- RX: 0.495-999 MHz (cell blkd) • Power: 5/0.5W
- Memories: 1304 • D-Star w/optional UT-121 board

IC-T70A

RX-7-05

IC-T70A 2M/440 FM Handheld

- TX: 144-148, 430-450 MHz • RX: 136-174, 400-479 MHz
- Power: 5/2.5/0.5W • Memories: 302
- Comes with NiMH Battery and Wall Charger

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

IC-208H 2M/440 FM Mobile

- TX: 144-148, 430-450 MHz • Memories: 512
- RX: 118-173, 230-549, 810-999 MHz (cell blk)
- Power: 55/15/5W (2M), 50/15/5W (440 MHz)

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-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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Canada	$49	$93	$132	Monthly *QST* via standard mail for Canadian members
Intl *QST*	$62	$118	$167	Monthly *QST* via air mail for international members
Intl CD	$39	$76	$111	Annual CD-ROM (*QST*, *NCJ* and *QEX*) for international members
Blind	$8	$16	$24	No *QST* delivery, all other member benefits apply
Family	$8	$16	$24	Reside at the same address as the primary member, no additional *QST*. Membership dates must correspond with primary member.

Membership includes $15 per year for subscription to *QST*. Memberships and *QST* cannot be separated. Dues subject to change without notice and are nonrefundable.

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Source Code: QST 7/2011

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

TH-D72A 2M/440 FM HT w/Built-in GPS

- TX: 144-148, 430-450 • 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 - stores up to 5,000 points of track data
- Echolink® ready • KISS mode protocol

TM-271A 2M FM Mobile

- TX: 144-148 MHz • RX: 136-174 MHz
- Power: 60/25W • Memories: 200

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 G6 & EchoLink® ready

AvMap G6 APRS GPS Navigator

- Intergrates best with the TM-D710A and TH-D72A but also works well with the TM-D700A and TH-D7A
- Bright non-glare 4.8 inch color touchscreen
- Preloaded NAVTEQ street maps of N. America
- Text to Speech instructions • Lane Assistant
- Full bi-directional RS-232 APRS communication

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
- The optional RC-D710 can replace the TM-V71A control panel to enable all the features of the TM-D710A.

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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Radios by KENWOOD

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-8DR Quad-band FM HT

• TX: 50-54, 144-148, 222-225, 430-450 MHz
• RX: 0.5-999 MHz (cell blocked) • Memories: 1200+
• Power: 5/2.5/1/0.05W (1.5W on 220 MHz)
• Optional GPS Unit FGPS-2 with either CT-136 adapter or MH-74A7A hand mic provides you with APRS® data

FT-7900R 2M/440 FM Mobile

• TX: 144-148, 430-450 MHz
• RX: 108-520, 700-999 MHz (cell blocked)
• Power: 50/20/10/5W (2M), 45/20/10/5W (440 MHz)
• Memories: 1055 • YSK-7800 included!

FT-8800R 2M/440 FM Mobile

• TX: 144-148, 430-450 MHz • RX: 108-520, 700-999 MHz (cell blkd) • Power: 50/20/10/5W (2M), 35/20/10/5W (440 MHz) • Memories: 1000
• Crossband repeat • YSK-8900 included!

FT-8900R Quad-Band FM Mobile

• Same as FT-8800R but TX: 28-29.7, 50-54, 144-148, 430-450 MHz and RX: 28-29.7, 50-54, 108-180, 320-480, 700-985 MHz (cell blkd) • Power: 50/20/10/5W (10/6/2M), 35/20/10/5W (440 MHz) • YSK-8900 included!

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

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

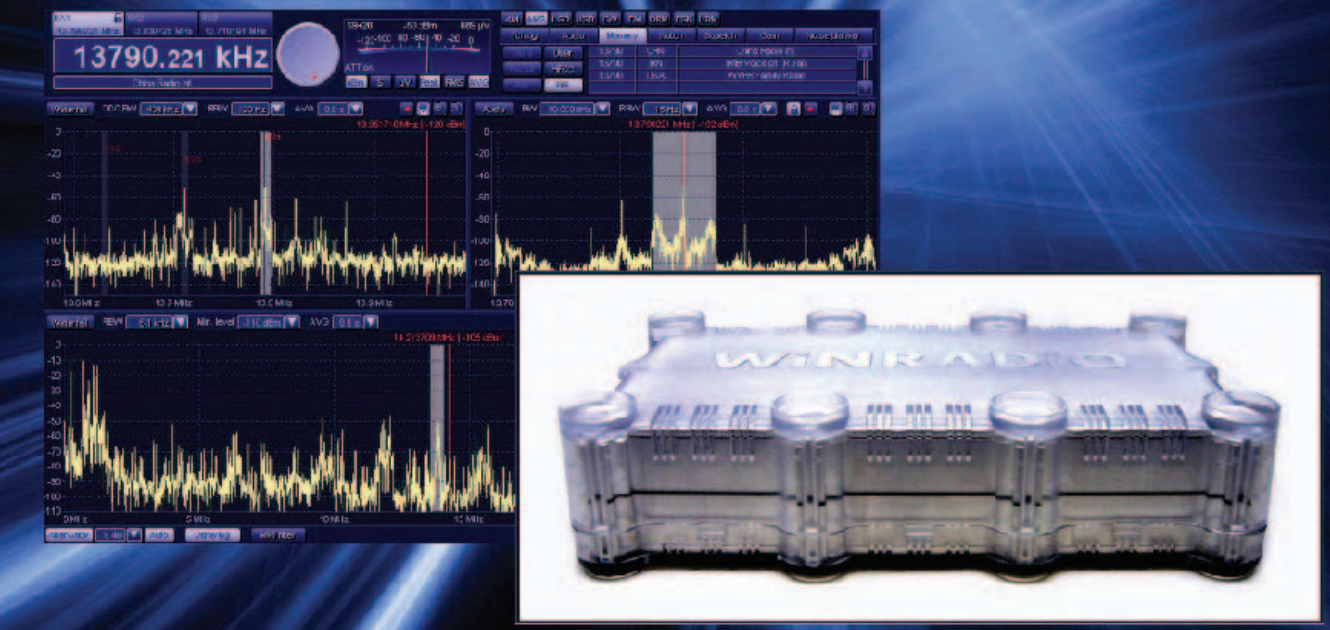
FTDX-5000 Basic Model & ±0.5ppm TCXO
FTDX-5000D With Station Monitor & ±0.5ppm TCXO
FTDX-5000MP With Station Monitor, ±0.05ppm OCXO & 300 Hz Roofing Filter

It's a Winner!

"In performance terms the Excalibur sets new standards in several areas. It is the most sensitive SDR we have yet measured."

"Conclusion: All in all, Excalibur is already the best SDR we have used - and knowing WiNRADiO we imagine that future software releases will only serve to make it even better."

Overall rating: 5 stars
WRTH category award winner: Best SDR 2011



And many other independent reviewers agree:

"The Excalibur receiver is a top rate performer supported by excellent software and the spectrum displays are a superb bonus. The 16-bit analogue to digital converter results in unsurpassed strong signal performance and once again my league table of close-in dynamic range receiver performance has a new No. 1." --- *Peter Hart, RadCom*

"In my professional lifetime in communications electronics, I've never seen anything with such shortwave receiving and processing power at such a low price. In the time it took me to write this review, I have changed from a digital skeptic to a true believer. This is one amazing radio!" --- *Bob Grove, Monitoring Times*

Shouldn't you have a look, too?
www.winradio.com

MFJ-259B *World's* most popular Antenna Analyzer is super easy-to-use!

MFJ-259B
$289.95

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

CoaxCalculator™

Lets you calculate coax line length in feet given electrical degrees and vice versa for any frequency and any velocity factor -- *an MFJ-269 exclusive!*

Use any Characteristic Impedance

You can measure SWR and 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

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300 Industrial Pk Rd, Starkville, MS 39759 **PH:** (662) 323-5869
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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 *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

MFJ-928 $199.95

High-speed, wide matching range and compactness at low cost! Leave in-line and forget it -- your antenna is *always* automatically tuned! 2-position antenna switch.

200 Watt *MightyMite*™

Matches IC-706, FT-857D, TS-50S

MFJ-925 $179.95

***No** extra space needed!* Just set your IC-706/7000, FT-857D, TS-50S on top of this matching low-profile automatic tuner -- it's all you need for a completely automated station using *any* antenna! Just tune and talk!

G5RV Antenna

MFJ-1778 $44.95

Covers all bands, 160-10 Meters with antenna tuner. 102 ft. long. Can use as inverted vee or sloper. Use on 160 Meters as Marconi.1500 Watts. Super-strong fiberglass center/feedpoint insulators. *Glazed ceramic* end insulators. All hand-soldered connections. Add coax, some rope and you're *on the air!*

MFJ-1778M, $39.95. G5RV Junior. Half-size, 52 ft. 40-10M with tuner, 1500 Watts.

200W...Weather-sealed

for Remote/Outdoor/Marine

MFJ-926B $399.95

***Fully** weather-sealed for remote Outdoor/Marine use*! Tough, durable, built-to-last the elements for years.

200 Watt...Remote

Coax/Wire Ant, No pwr cable needed

MFJ-927 $259.95

Weather protected fully automatic *remote* auto tuner for wire ***and*** *coax* antennas -- an MFJ exclusive. Powers through coax -- No separate power cable needed.

Free MFJ Catalog

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MFJ 160-6 Meter Antenna

Self-supporting 43 foot vertical -- no guy wires required . . . 1500 Watts . . . exceptional performance . . . low-profile . . . includes base mount and legal limit balun . . . assembles in an hour . . .

MFJ-2990
$359.95

New!

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

Exceptional Performance

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

With an automatic antenna tuner there's no fuss -- just talk!

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

An optimized balun design allows *direct coax feed* with negligible coax loss (typically less than ½ dB 60-6 Meters and less than 1 dB 160-80 M with good quality, low-loss coax).

Fully self-supporting, Extremely low wind loading, Very low visibility . . .

With just 2 square feet wind load, the fully self-supporting MFJ-2990 -- *no guy wires needed* -- has the lowest wind-loading and lowest visibility of any vertical antenna! The key is a six foot section of tapering diameter *stainless steel* whip that flexes in strong wind instead of stressing the bottom sections. Its 2-inch O.D. and .120 inch thick walled tubing bottom section makes it incredibly strong -- it'll stay up!

Weighs just 20 pounds -- you can easily put it up by yourself because its corrosion resistant *6063 aircraft aluminum* tubing and stainless steel construction make it light *and* super-strong.

Assembles in an hour

You can easily assemble it in an hour! Ground mounting lets you completely hide its antenna base in shrubbery. Includes ATB-65 high-strength antenna mount. Requires ground system -- at least one radial. More extensive ground system will give much better performance.

Great for Stealth Operation in antenna restricted areas

This very low-profile antenna is perfect for stealth operation in antenna restricted areas. Hide it behind trees, fences, buildings, bushes. Use it as a flagpole. Telescope it down during the day. Put it up at night and take it down in the morning before the neighbors even notice!

Quick and easy installation makes it great for DXpeditions, field day and other portable and temporary operations.

MFJ *Automatic* Tuners

MFJ-998
$699.95

For legal limit 1500 Watt SSB/CW amplifiers. Auto-ranging LCD and Cross-Needle SWR/Wattmeter, antenna switch, amp bypass, matches 12-1600 Ohms, 1.8-30 MHz.

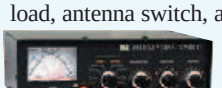
MFJ-993B
$259.95

Dual power range -- 300 Watt range matches 6-1600 Ohms. 150 Watt/6-3200 Ohms. Auto-ranging LCD and Cross-Needle SWR/Wattmeter, antenna switch, 1.8-30 MHz.

MFJ *Manual* Tuners

MFJ-989D
$389.95

1500 Watts SSB/CW, 1.8-30 MHz. Active peak-reading Cross-Needle SWR/Wattmeter, balun, dummy load, antenna switch, aircore roller inductor.



MFJ-949E
$179.95

World's most popular tuner! 300 Watts, 1.8-30 MHz. Peak/Average Cross-Needle SWR/Wattmeter, 8 pos. antenna switch, dummy load, 1kV capacitors.

Window Feedthru

MFJ-4602
$69.95

Bring 3 coaxes, balanced line, random wire, ground thru window. Connectors mounted on *stainless steel* panel. ¾" thick *pressure-treated* weather-proof wood.

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TIMEWAVE TECHNOLOGY INC.

Available at:
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- HRO
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New! - PK-232SC with Sound Card, Rig Control, USB - All built-in!

PK-232SC Multimode Data Controller*

Sound Card, Rig Control, USB, Pactor, RTTY, CW Packet & more!

100,000 sold - All-time top selling data controller!

- Single USB connection to computer
- USB Sound Card built-in
- 3-Way Rig Control built-in - logic level, RS-232 & USB!
- Computer isolated from radio

As Always- Upgrade any PK-232 ever made to the PK-232SC!

Customize your PK-232 with our complete line of upgrades and accessories.

The incredible PK-232SC again expands it role in your radio station. Now it connects to your computer with a single USB cable - no audio cables, no RS-232 cables! It has a built-in USB sound card with isolated audio I/O to your radio to prevent ground loops. The new logic level and RS-232 rig control is optically isolated for your Icom CI-V, Yaesu CAT, Kenwood and other radios. You never have enough downstream USB ports so we even added a pair for that new radio with USB rig control and other accessories.

Signal Processing, Antenna Analysis, Data & Remote Control

TZ-900 Antenna Analyzer

Once you use the TZ-900 - you'll never want to use any other!

Sweep and analyze antennas in seconds. Zoom, Compare & Store Data. Sunlight-visible color graphics, handheld, rechargable batteries, no computer required.

DSP-599zx Audio Signal Processor*

Noise Reduction, precision highpass, lowpass, bandpass & notch filtering for audio, CW & data.

ANC-4 Antenna Noise Canceller

Kill Noise before it reaches your receiver! Great for supressing power line noise, plasma TV noise & many other local electrical noises.

DSP-232+ Multimode Data Controller*

Sound card interface, USB, Pactor, 1200/9600 Packet

PK-96/100 TNC - 1200/9600 Packet*

Available with USB or RS-232

HamLink™ Wireless and USB Remote Control & Audio

HamLinkUSB™ Rig Control Plus

Logic Level plus PTT

PK-232 RS-232-to-USB Adapter*

Use the PK-232 with new computers!

HamLinkBT-BTH+™ Bluetooth® Adaptor

Use a standard cellphone Bluetooth® headset to keep your hands free for driving and operating.
Includes USB rig control for your station.
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MFJ All-Band G5RV Antennas

Operate all bands through 10 Meters, even 160 Meters, with a single wire antenna!

MFJ-1778
$44.95

***The** famous G5RV antenna is the most popular ham radio antenna in the world!* You hear strong signals from G5RVs day and night, 24/7.

And it's no wonder . . . it's an efficient, *all band* antenna that's only 102 feet long -- shorter than an 80 Meter dipole. Has 32.5 foot ladder line matching section ending in SO-239 connector for your coax feedline.

Use as Inverted Vee or Sloper, and it's even more compact and needs just one support.

With an antenna tuner, you can operate all bands 80 Meters through 10 Meters and even 160 Meters with an antenna tuner and a ground.

MFJ's fully assembled G5RV handles 1500 Watts. *Hang and Play™* -- add coax, some rope to hang and you're on the air!

MFJ-1778M, $39.95. *Half-size*, 52 foot *G5RV JUNIOR* covers 40-10 Meters with tuner. Handles full 1500 Watts.

MFJ All Band Doublet

MFJ-1777
$59.95

MFJ-1777 is a 102 foot *all band* doublet antenna that covers 160 through 6 Meters with a balanced line tuner. Super strong custom fiberglass center insulator provides stress relief for ladder line (100 ft. included). Authentic *glazed ceramic* end insulators. Handles full 1500 Watts.

MFJ ***Dual Band*** 80/40 ***or*** 40/20M Dipoles

MFJ-17758
$89.95
80/40 Meters

MFJ-17758 is a short 85 foot long *dual band* 80/40 Meter dipole antenna. It's *full-size* on 40 Meters and has ultra-efficient end-loading on 80 Meters. Handles full 1500 Watts. Super-strong injection-molded center insulator with built-in SO-239 connector and hang hole. Solderless, crimped construction. 7-strand, #14 gauge hard copper wire. Connect your coax feedline directly, no tuner needed.

MFJ-17754, $59.95. Short coax fed 42 foot long *dual band* 40/20 Meter dipole antenna. *Full-size* on 20 Meters, ultra-efficient end-loading on 40 Meters. Same construction as MFJ-17758.

MFJ ***Single Band*** Dipole Antennas

Ultra high quality center fed dipoles will give you trouble-free operation for years. Custom injection-molded UV-resistant center insulator has built-in coax connector and hanging hole. Heavy duty 7-strand, 14-gauge hard copper antenna wire. Extremely strong solderless crimped construction. Authentic *glazed ceramic* end insulators. Use as horizontal or sloping dipole or inverted vee. Handles full 1500 Watts. Simply cut to length for your favorite frequency with cutting chart provided.

MFJ-1779A
$69.95
160M, 265 ft.

MFJ-1779B
$49.95
80-40M, 135 ft.

MFJ-1779C
$29.95
20-6M, 35 ft.

True 1:1 Current *Balun & Center Insulator*

MFJ-918
$24.95

True *1:1 Current Balun/ Center Insulator* forces equal antenna currents in dipoles for superior performance. Reduces coax feedline radiation and field pattern distortion -- your signal goes where *you* want it. Reduces TVI, RFI and RF hot spots in your shack. *Don't build a dipole without one!* 50 hi-permeability ferrite beads on high quality RG-303 *Teflon*(R) coax and *Teflon*(R) 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 *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. 7Wx5½Hx5D 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. 7¼Wx4½Hx4½D 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. 6½Wx2⅝Hx6D inches.

MFJ-826B
$179.95

www.mfjenterprises.com . . . World's largest selection of HF/VHF/UHF SWR Wattmeters!

MFJ-822
$59.95

Lighted 3" Cross-Needle Meter, SWR/Watts, 1.8-200 MHz, Fwd/Ref pwr, 30/300W. Compact.

MFJ-862
$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

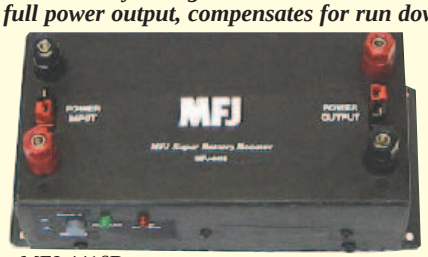
Lighted 3" VHF SWR Wattmeter, 2M/C/N Meter, SWR/Watts, 1.8-30 MHz, 300/3000W Fwd, 60/600W Ref. True Peak.

MFJ-812B
$39.95

Lighted 3" 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. 7¾Wx4Hx2⅛D inches.

100 Watts SSB from cigarette lighter socket!

MFJ-4403
$119.95

4-Farad capacitors supply 25 Amps needed for 100 Watts SSB peaks and replenished by 10 Amps average from cigarette lighter socket. Protects against reverse/over voltage, voltage transients, short circuits. Provides super noise/ripple filtering.

MFJ AC Line RFI Filter

Eliminate obnoxious power line and computer hash and noise by 6 S-units!

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 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.

MFJ-655B
$219.95

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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

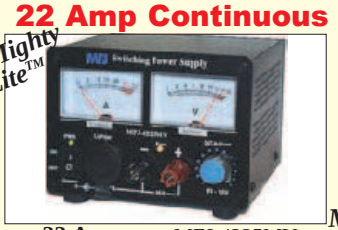
Ham Radio's smallest and lightest 22 Amp continuous power supply is also its best selling!

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

MightyLite™

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**

MFJ-1118, $84.95. Power two HF and/or VHF rigs and six accessories from your main 12 VDC supply. *Built-in 0-25 VDC voltmeter*. Two pairs 35 amp 5-way binding posts, fused and RF bypassed for transceivers. Six pairs RF bypassed binding posts provide 15 Amps for accessories. Master fuse, ON/OFF switch,"ON" LED. 12½x2¾x2½ in.

MFJ-1116 **$59.95**

MFJ-1116, $59.95. 8 pairs binding posts, 15A total.Voltmeter, on/off switch.

MFJ-1112 **$44.95**

MFJ-1112, $44.95. 6 pairs binding posts, 15 Amps total.

MFJ-1117 **$64.95**

MFJ-1117, $64.95. Powers *four* transceivers simultaneously (two at 35 Amps each and two at 35 Amps combined). 8x2x3 inches.

All PowerPoles™

MFJ-1128 **$104.95**

MFJ-1128, $104.95. 3 high-current outlets for transceivers. 9 *switched* outlets for accessories. Mix & match included fuses as needed (one-40A, one-25A, four-10A, four-5A, three-1A fuses installed). 0-25 VDC *Voltmeter*. *Extra* contacts, fuses. 12Wx1¼Hx2¾D".

MFJ-1126 **$84.95**

MFJ-1126, $84.95. 8 outlets, each fused, 40 Amps total. Factory installed fuses: two 1A, three 5A, two 10A, one 25A, one 40A. *0-25 VDC Voltmeter*. Includes *extra PowerPoles*®, *extra* fuses -- *no extra cost*. 9Wx1¼Hx2¾ inches.

MFJ-1129 **$114.95**

PowerPoles™ *AND 5-Way Binding Posts*

MFJ-1129, $114.95. 10 outlets each fused, 40 Amp total. 3 high-current outlets for rigs -- 2 *PowerPoles*® and one 5-way binding post. 7 *switched* outlets for accessories (20A max) -- 5 *PowerPoles*® and 2 binding posts. Fuses include (1- 40A, 2-25A, 3-10A, 3-5A, 2-1A installed). *0-25 VDC Voltmeter*. Includes extra *PowerPoles*® and fuses, 12½Wx1¼Hx2¾D inches.

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MFJ-1124, $64.95. 6 outlets each fused, 40 Amps total. 4 *PowerPoles*®, 2 high-current binding posts, Installed fuses: 1-40A, 2-25A, 2-10A, 1-5A, 1-1A. Includes extra *PowerPoles*® & fuses -- *no extra cost.*

15 Amp Continuous

15 Amps continuous, 17 Amps max at 13.8 VDC. Over-voltage, over-current protection. 5-way binding posts. Load fault indicator and automatic shutdown. 90-130 VAC input. 1½ lbs. Tiny 3¾Wx2¼Hx3¾D inches fits easily in an overnight bag.

MFJ-4115 **$59.95**

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Linear with 19.2 lb.Transformer

This heavy-duty linearly regulated MFJ-4035MV has *abolutely no RF Hash*. It delivers 30 Amps continuous, 35 Amps maximum from its massive 19.2 lb. transformer. Front panel adjustable 1-14 VDC output with convenient detent at 13.8 VDC. Volt/Amp Meters. 1% load regulation, 30 mV ripple. Over-voltage/current/temperature protection, 5-way binding posts, 2 pairs of quick-connects and a covered cigarette lighter socket for mobile accessories. Front panel replaceable fuse. 110 VAC input. 9½Wx6Hx9¾D in.

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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.

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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.

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LP-30, $89.95 Eliminates TVI by attenuating harmonics at the source. Plugs between transmitter and antenna or tuner. Handles 1.5 kW.

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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

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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*.

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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.

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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.

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Huntsville Hamfest and ARRL Alabama Section Convention

August 20-21, 2011

South Hall, Von Braun Center, Huntsville, Alabama

Program Highlights

- **Huntsville Hamfest:** Featuring huge new equipment dealer show, many major manufacturers, giant flea market. Huge forum slate including ARRL, public service, DX, technical and contesting topics.
- **DX Card Checking:** Representatives will be available to field check your DX cards for DXCC credit. Visit the NADXC booth for information.
- **Hospitality Suites:** Huntsville Hamfest will host Hospitality Rooms at the Holiday Inn across the street from the VBC on Friday and Saturday nights.
- **2011 YHOTY (Young Ham of the Year):** An award intended to recognize a young ham who has demonstrated his or her dedication to Amateur Radio through his or her activities.
- **Talk-in station:** Our always welcoming and always helpful talk-in crew (they haven't lost a visitor yet) will be operating as K4BFT on the 146.94 repeater for complete talk-in information. Back-up frequency is 147.30. No PL required during the hamfest weekend.
- **HAYLARC YL Breakfast:** The Huntsville Area Young Ladies Amateur Radio Club (HAYLARC) invites all YLs attending the Huntsville Hamfest to join them for a Dutch breakfast Sunday, 7:00 AM at Shoney's.

- **DX Banquet** – Saturday evening sponsored by the North Alabama DX Club, featuring Wes Lamboley, W3WL, speaking on the VP8ORK South Orkney DXpedition. The DX Banquet is held at the Holiday Inn across from the Von Braun Center.
- **License Exams:** Exams will begin at 10:00 sharp Saturday and Sunday in the curtained area outside the South Hall. Bring your original license, copy of same, any CSCE's you want to present, some means of personal identification and the $15 test fee.the Holiday Inn across the street from the Von Braun Center.

Hotels

Holiday Inn Downtown
Huntsville Hamfest Official Hotel
Right across the street from the hamfest site, is the Holiday Inn, Huntsville Downtown. Call them at (256) 533-1400 (Huntsville) or 1-877-320-8455 (Corporate). Mention the Group/Convention code "**SHA**" to get the special Hamfest rate of $82. **www.holidayinn.com/hunsvilleal**

Embassy Suites, Huntsville, AL
You may also want to consider reservations at the Embassy Suites adjacent to the Von Braun Center. Call (256) 539-7373 (Huntsville) or 1-800-362-2779 (Corporate) and mention the Group/Convention code "**HFT**" for the special Hamfest rate of $109 (single or double).
www.embassysuiteshuntsville.com

Nearby Points of Interest

- ✓ U.S. Space & Rocket Center and U.S. Space Camp
- ✓ Bridge Street Centre – Upscale Shopping Mall
- ✓ Huntsville Botanical Garden
- ✓ Huntsville Museum of Art
- ✓ Cathedral Caverns State Park
- ✓ Historic Huntsville Depot Museum and Alabama's Constitution Village

Parking: The parking garage across the street from the VBC will be open with a parking fee of $5. The South Hall where the Hamfest is located has a 500 space ground level garage with a parking fee of $5. Elevators carry you up to the hamfest.

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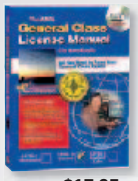

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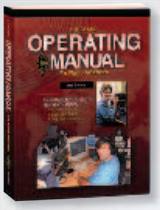

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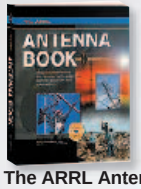

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Continued on page 130

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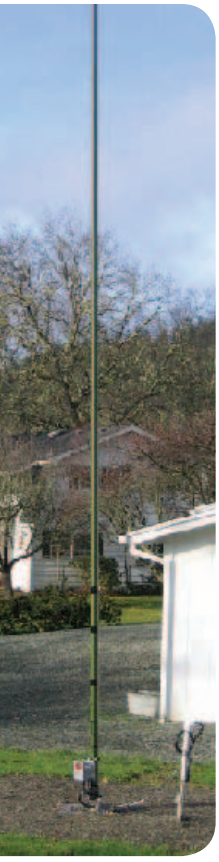

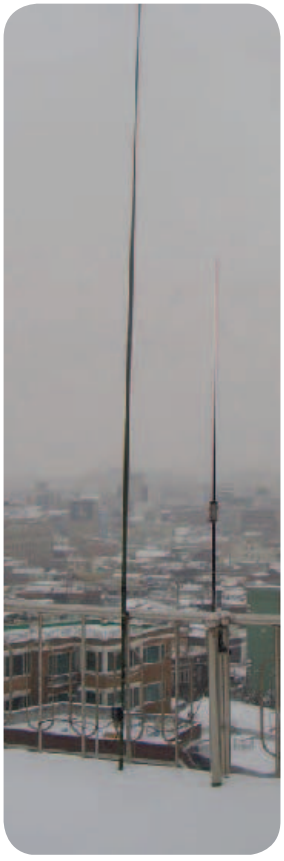

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Meters!

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FT Meter signal strength, discriminator reading on receive, and power output, SWR, modulation, ALC action and supply voltage on transmit, all selectable from the radio's menu.
Still Only $49

FTL Meter For Yaesu FT-857(D) and FT-897(D). Signal strength, discriminator reading on receive, and power output, SWR, modulation, ALC action and supply voltage on transmit, all selectable from the radio's menu.
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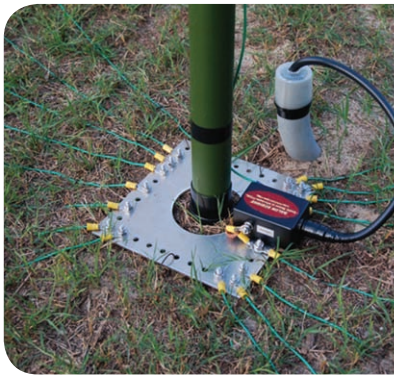

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ARRL Publications—continued from page 128

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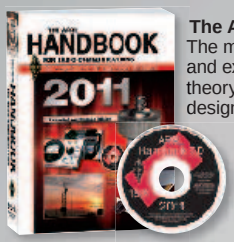

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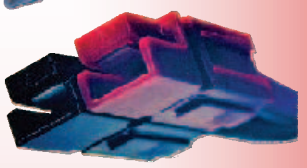

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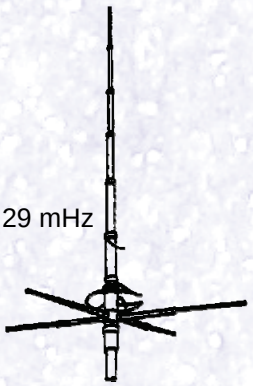

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Mast size: $1^1/_4 - 1^1/_2$ inches
Radials: Not required

QST QuickStats

sta·tis·tics (st-tstks) n.
1. (used with a sing. verb) The mathematics of the collection, organization, and interpretation of numerical data, especially the analysis of population characteristics by inference from sampling.
2. (used with a pl. verb) Numerical data.

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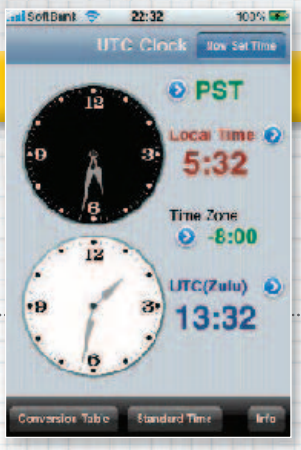
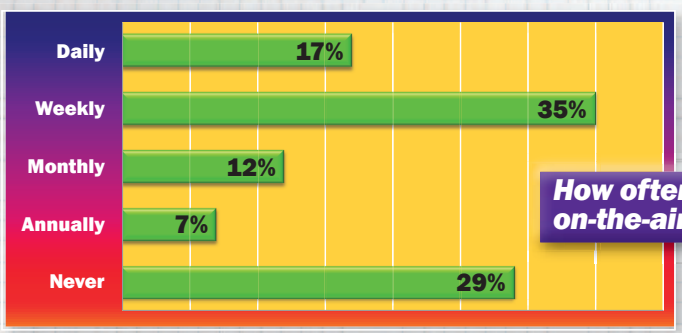
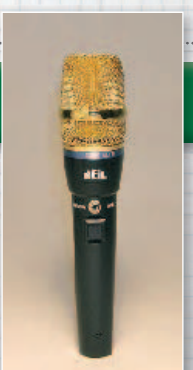


Yes – **75%**
No – **20%**
I don't have a station at home – **5%**

How often do you check into an on-the-air net?



How many different microphones do you own (including headsets)?



1 – **7%**
2 to 5 – **57%**
6 to 10 – **24%**
More than 10 – **9%**
None – **3%**

Do you plan to participate in the IARU HF World Championships contest July 9 - 10?

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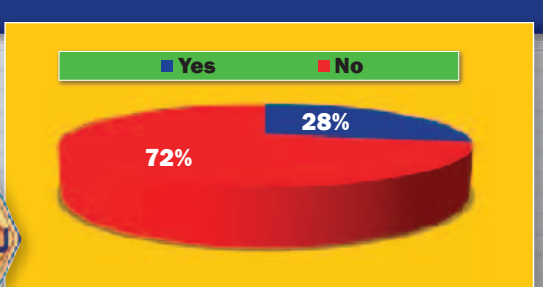

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DAC Dynamic Range, S/N: 115dB

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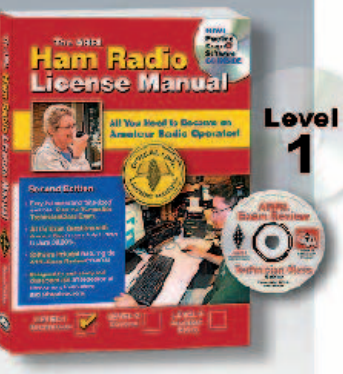

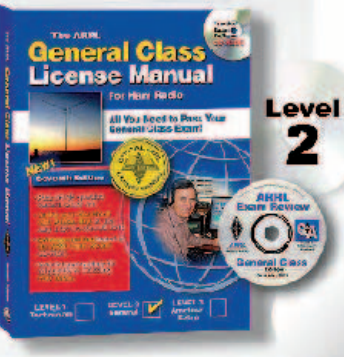

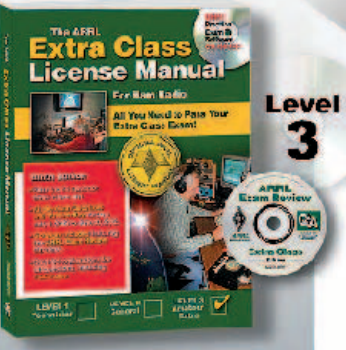

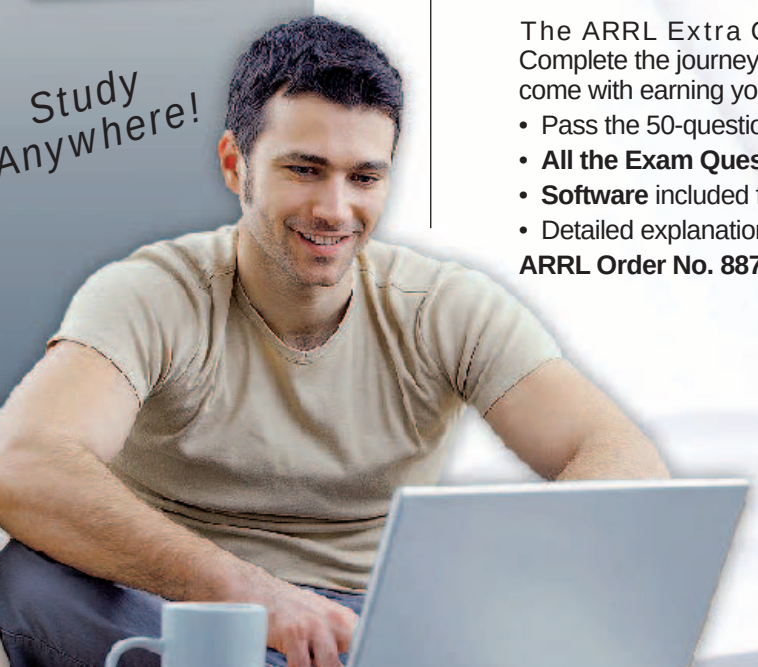

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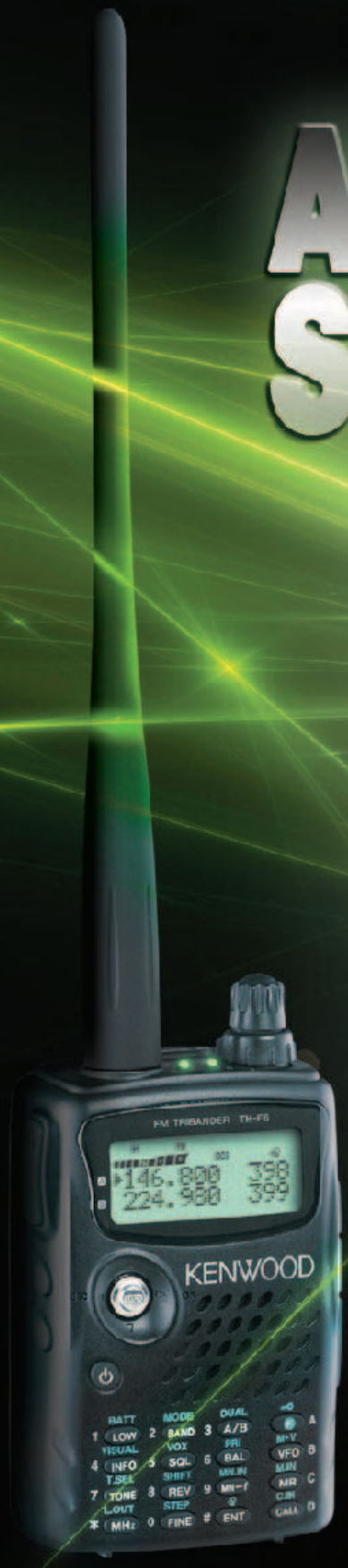
[1]Note that certain frequencies are unavailable. [2]5W output



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September 2011	Friday, July 15, 2011	Monday, July 18, 2011
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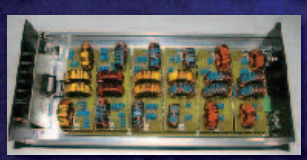

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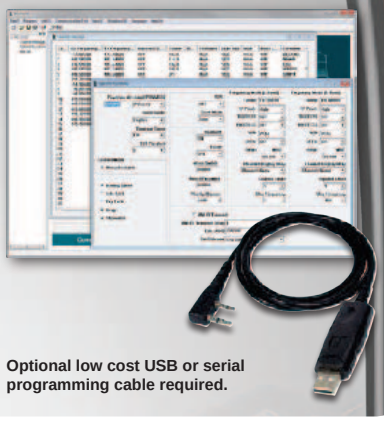

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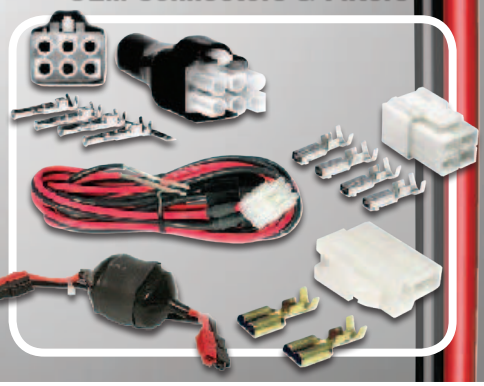

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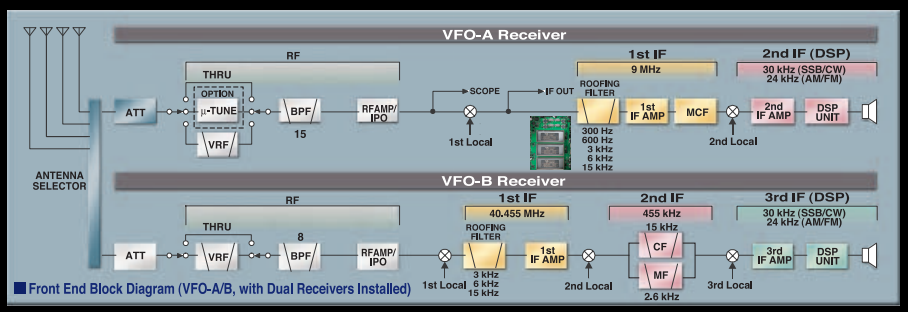
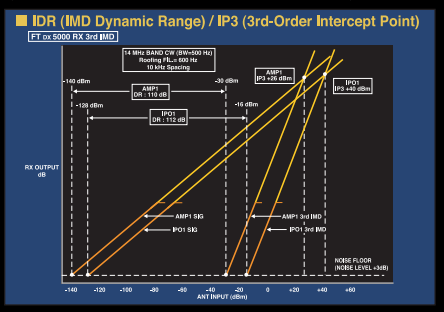


Front End Block Diagram (VFO-A/B, with Dual Receivers Installed)



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