SPECIAL DXING ISSUE

QST

DEVOTED ENTIRELY TO AMATEUR RADIO

October 2011 WWW.ARRL.ORG

QST reviews:

Inside:

The CE9 2011 DXpedition
Activates Rare Antarctic Islands

Page 64

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Official Journal of ARRL The national association for AMATEUR RADIO®

OCTOBER 2011 QST Vol 95 No 10

The radio YAESU ...

The Dawn of a New Era
Dynamic Range 112 dB/IP3 +40 dBm

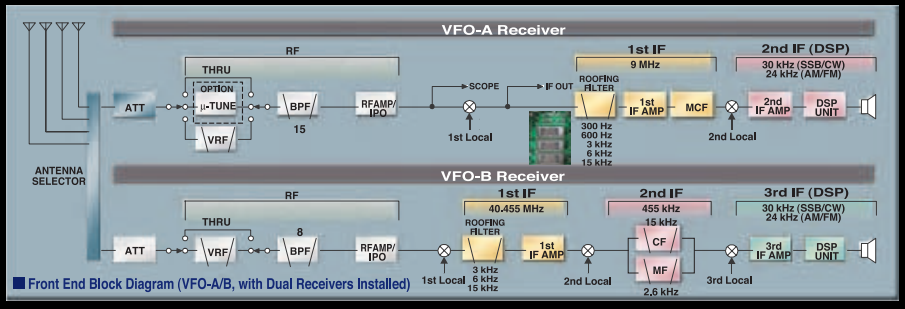
The New Premium HF/50 MHz Transceiver
FT DX 5000 Series

Two Totally Independent Receivers - The VFO-A/Main Receiver utilizes Super Sharp Roofing filters to give you the highest performance and best flexibility

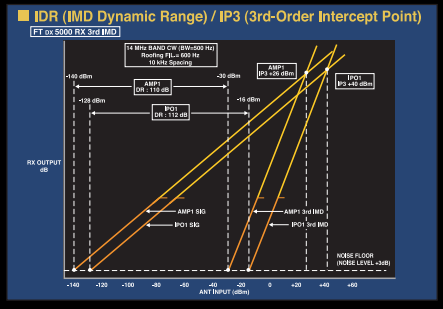
The tight shape factor 6 pole crystal filters and D Quad Double Balanced Mixer design afford incredible improvement in 3rd – Order dynamic range and IP3 performance

Superb 3rd-Order Dynamic Range and 3rd-Order Intercept Point (IP3)

You will be pleased with the astounding 112 dB dynamic range and superb IP3 + 40 dBm at 10 kHz separation (CW/500 Hz BW). Experience the unmatched close-in dynamic range of 105 dB, IP3 +36 dBm at 2 kHz separation (CW/500 Hz BW)! (VFO-A/Main Receiver, 14 MHz, IPO-1)



Front End Block Diagram (VFO-A/B, with Dual Receivers Installed)



HF/50 MHz 200 W Transceiver NEW
FT DX 5000MP

Station Monitor SM-5000 included
± 0.05ppm OCXO included
300 Hz Roofing Filter included

HF/50 MHz 200 W Transceiver NEW
FT DX 5000D

Station Monitor SM-5000 included
± 0.5ppm TCXO included
300 Hz Roofing Filter optional

HF/50 MHz 200 W Transceiver NEW
FT DX 5000

Station Monitor SM-5000 optional
± 0.5ppm TCXO included
300 Hz Roofing Filter optional

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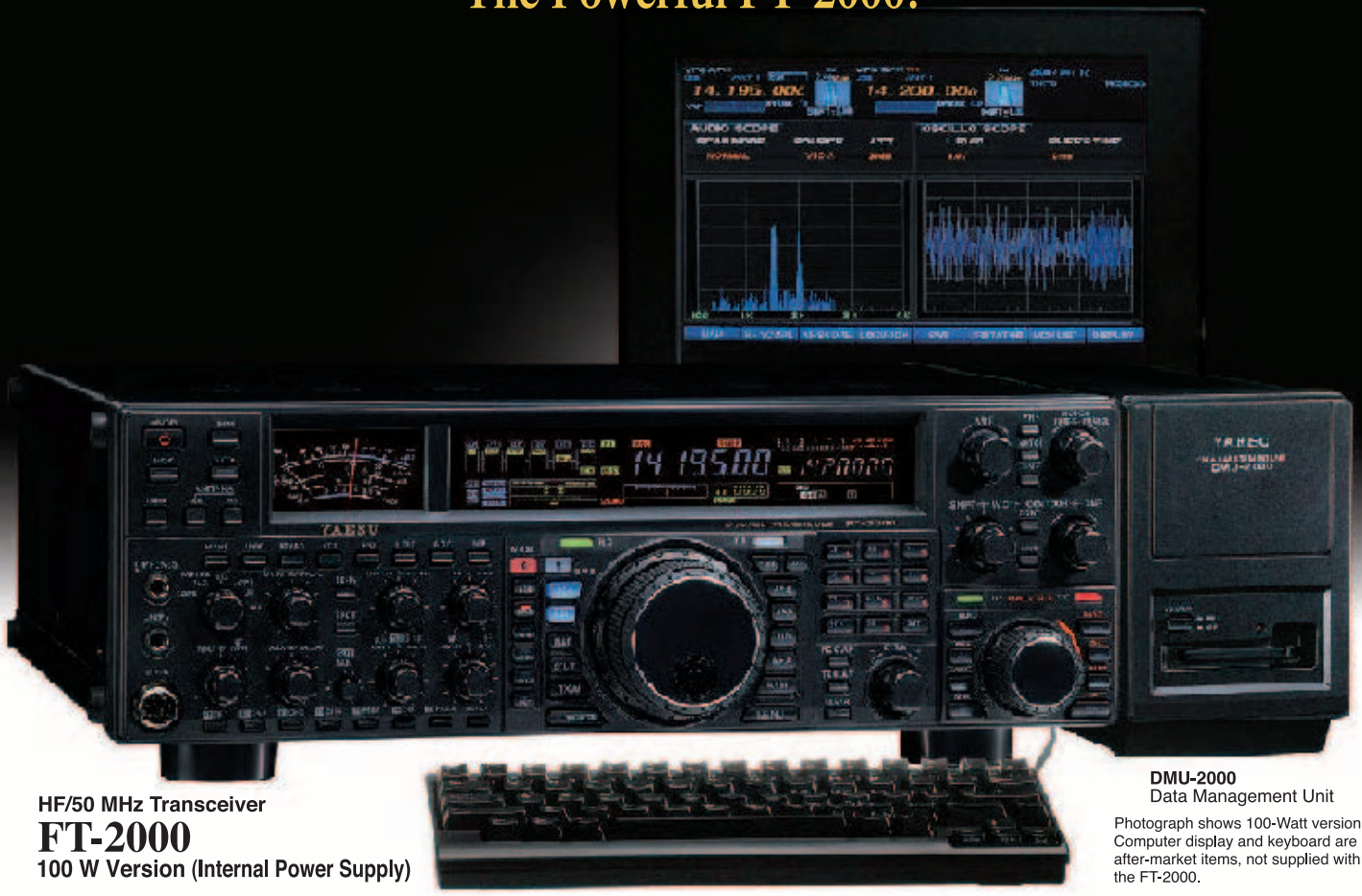
Loaded with Leading-edge Performance Capabilities. . .
The First Triumph in the 2nd Generation of the FT DX 9000 Lineage:
The Powerful FT-2000!



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

DMU-2000
Data Management Unit

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

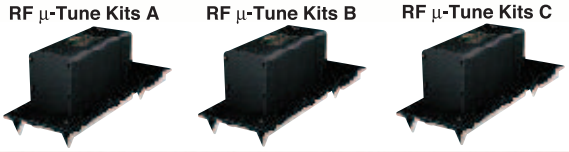
HF/50 MHz Transceiver
FT-2000D
200 W Version
(External Power Supply)

Options

SP-2000
External Speaker
with Audio filters

RF μ-Tune Kits

160m Band 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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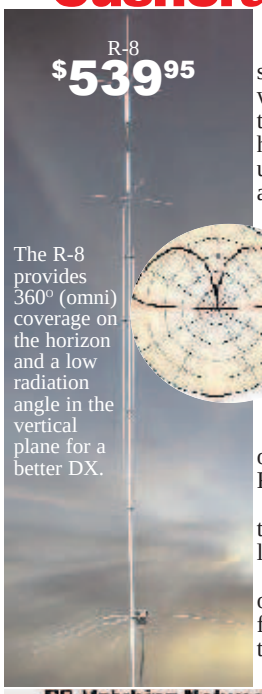
Cushcraft R8 *8-Band Vertical*



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

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

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

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

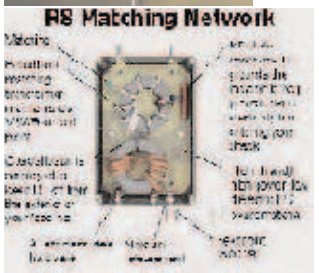
Rugged Construction: Thick fiberglass insulators, all-stainless hardware, and 6063 aircraft-aluminum tubing that is double or triple walled at key stress points handle anything Mother Nature can dish out.

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

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

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

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



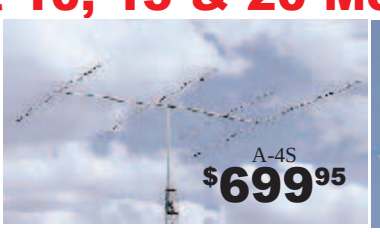
MA-5B *5-Band* Beam

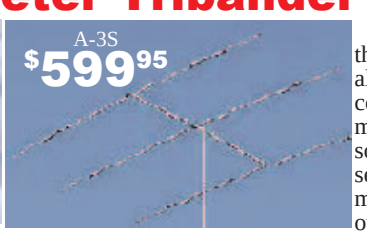
Small Footprint -- Big Signal

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

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

Cushcraft 10, 15 & 20 Meter Tribander Beams





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

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

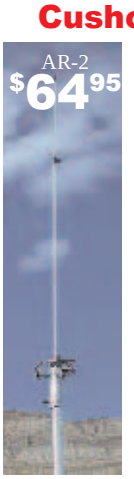
The 3-element A3S/A3WS and 4-element A4S are world-famous for powerhouse gain and super performance. **A-3WS, $499.95,** 12/17 M. **30/40 Meter** *add-on kits* available.

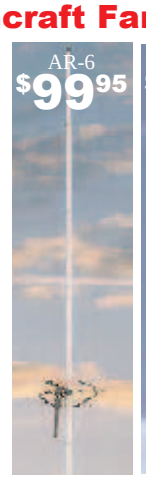
Cushcraft Dual Band Yagis

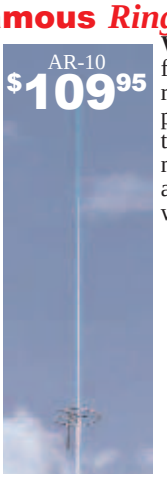
One Yagi for Dual-Band FM Radios

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

Cushcraft Famous *Ringo* Compact FM Verticals







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

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Life is a JOURNEY, Enjoy the ride!

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

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

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

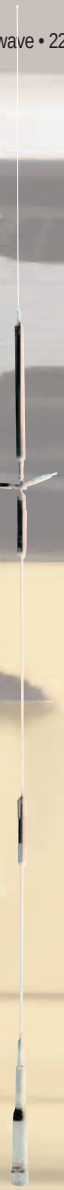
Maldol MH-610 TRI-BAND 2M/220/70CM HT ANTENNA • Wavelength: 2M 1/4 wave • 220MHz 1/2 wave • 70cm 5/8 wave • Length: 14" • Conn: Male SMA

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

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

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

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



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

UHV-6 in fold-over position.

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

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

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

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

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

For Small Antennas & Limited Space

MODEL / ANT CONN / COAX CONN

Maldol EM-5M SO-239 / PL-259

Footprint: 1.1"x .75"

Max Antenna: 40"

For Medium Size Antennas

MODEL / ANT CONN / COAX CONN

COMET CP-5M SO-239 / PL-259

COMET CP-5NMO NMO / PL-259

Footprint: 3.4" x 1.25"

Max Antenna: 60"

For Tall or Multi-band HF Antennas

MODEL / ANT CONN / COAX CONN

COMET HD-5M SO-239 / PL-259

COMET HD- 5 3/8-24 3/8-24 / PL-259

Footprint: 3.75" x 1.1 "

Max antenna: 80"

COMET and Maldol Mobile

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

October 2011 ■ Volume 95 Number 10

Technical

News and Features

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Radiosport

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Our Cover
Romanticized by explorers and authors, Cape Horn and the Drake Passage are the stuff of legend — and a perfect spot for a DXpedition! Cezar Trifu, VE3LYC, and Johan Willemsen, PA3EXX, headed down to South America's southernmost point to activate two rare islands, Herschel and Gonzalo. *Main photo:* A panoramic view of the CE9 camp on Gonzalo Island. *Top inset photo:* The camp on Herschel Island. *Bottom photo:* Johan in the operating tent. Turn to page 64 to read the article. Photos by Cezar Trifu, VE3LYC.

Departments

October 2011 ■ Volume 95 Number 10

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

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

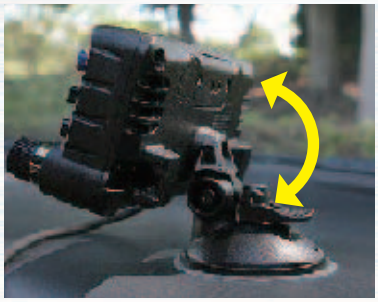
FTM-350AR NEW

220 MHz 1 W (USA version only)

New Features of The FTM-350AR

1. New Vacuum Cup-Mounting Bracket with Angle Adjustment

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



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- **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.**
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- **Re-allocated often used keys to more convenient positions for easier operation**
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*SmartBeaconing™ from HamHUD Nichetronix

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A TECHNOLOGY BREAKTHROUGH

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

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

Actual Size

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

Actual Size

VX-8DR NEW

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

Optional GPS and antenna unit for GPS/APRS® operation

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

Bluetooth®

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

VX-8GR NEW

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

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

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

- SmartBeaconing™ Function
- Memories to list 50 stations
- Memories to store 30 APRS® messages
- DIGI-PATH routing indication function
- 8 DIGI-PATH routing settings
- GPS Compass Display - "Heading Up" or "North Up"
- APRS® Symbol Icon pre-set function
- Clearly displayed APRS® Beacon Messages
- Selective Message Received indicated by Flashing LED

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- Battery Powered
- Covering the HF, VHF, and UHF Bands
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Advocacy
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Technology
Membership

Power

"In our special emergency communications and public service issue last month, on this page we said what has been said often before: to communicate, all a skilled radio amateur needs is a radio, a battery and a piece of wire."

With those simple tools and the knowledge and experience gained from using them, radio amateurs can communicate with one another with no infrastructure whatsoever. By harnessing the natural phenomenon of ionospheric radio propagation we can span vast distances. We understand that this property of the ionosphere is both priceless and irreplaceable, which is why we are zealous in combating pollution of the radio spectrum — so often the topic discussed on this page.

Yes, we can communicate — but for how long? Batteries do not last forever. Without a way to recharge or replace them, our equipment soon becomes useless.

IARU Region 1 Emergency Communications Coordinator Greg Mossup, GØDUB highlighted the issue in a tabletop exercise at the 2011 Global Amateur Radio Emergency Communications (GAREC) Conference held in August in South Africa. His scenario assumed a major disruption of the electric power grid, with normal power distribution not being restored for days or weeks afterwards. Such scenarios are not merely hypothetical; in recent memory and in various parts of the world they have resulted from a number of causes ranging from cataclysmic natural disasters to human error. Time and again, those who thought "it can't happen here" have been proved wrong.

Brief power outages are disruptive enough. Loss of power for a few hours gives us a taste of what life was like in the 19th century, except that we're not as well prepared as our ancestors whose lives were not illuminated by the inventions of Edison and Tesla. We take for granted conveniences that they never could have experienced and are frustrated when we lose them.

If called upon to do so, most of us could get on the air for a few hours without commercial power. To do that a car battery is all we need. When a major disaster occurs, normal communications are likely to be severely disrupted or overloaded. In such an event, during the first few hours Amateur Radio's capabilities can save lives.

But that's the exception. While you may think it blasphemous to say so, in most cases our communities will not need us to provide communications just because the power goes out. While we may be able to provide a useful supplement here and there and should always be prepared to do so, not every emergency is a communications emergency. Unless badly damaged, public safety communications facilities will continue to operate. Unless there is unusual damage to the wired telephone system (you have at least one telephone in the house that isn't cordless, don't you?) it will probably be available for the duration of a typical blackout. Cell sites generally have backup power; they may be overloaded and it may be difficult to make a phone call, but text messages are likely to get through.

But what if the blackout continues for days or weeks? It can happen. It has happened. Inconvenience can rapidly escalate to something much more serious. If you have a generator, eventually it will need to be refueled — but if the gas pumps aren't working in your area then you're out of luck. The same goes for that car battery we spoke of earlier; if your car's out of gas you can't keep it charged. We may find ourselves incapable of communicating at the same time our served agencies lose the communications systems we're supposed to back up.

Greg Mossup's tabletop exercise scenario underscored the fact that without a source of electrical power, a radio is of no use. We must be prepared not only to operate our radios but also to keep the juice flowing to them. A battery with enough capacity to provide communications for a public service event or other brief operation will not be enough to sustain us through a lengthy power outage. If there is any chance of a sustained outage we should conserve the energy we have, disciplining ourselves to use only what we absolutely need. This applies not only to our radio equipment but also to peripherals such as computers. Even a light bulb can consume energy that we may later wish we'd saved.

Speaking of wishes, if you've been thinking of solar power but haven't gotten around to it there may come a time when you wish you had. As Jim Talens, N3JT, noted in his May *QST* article, solar power is not yet an economic way to reduce your utility bill. On the other hand, when the utility isn't delivering electricity to you the value of a watthour suddenly becomes a lot more than you'd normally be willing to pay.

Whether by using renewable energy sources or by careful preparation, the longer we are able to power our radios after a disruption the more likely it is that we will be able to serve our communities. That's a small price to pay for the access we enjoy to a priceless asset: the radio spectrum.

David Sumner, K1ZZ
ARRL Chief Executive Officer

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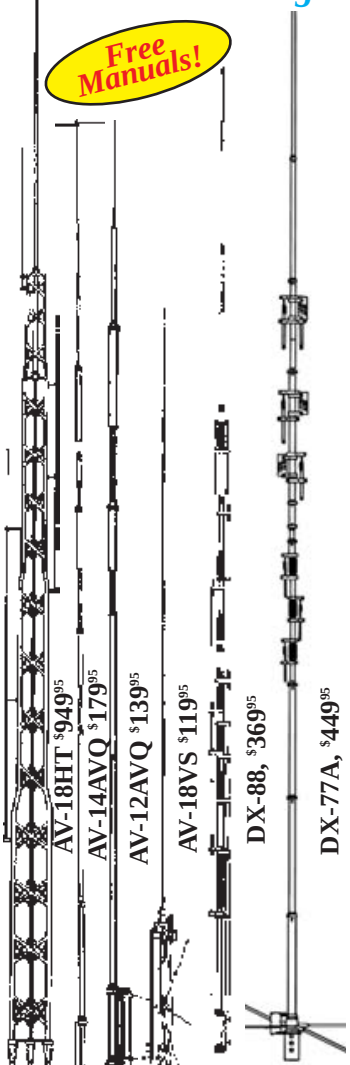

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Standing 53 feet tall, the famous *Hy-Gain HyTower* is the world's best performing vertical! The AV-18HT features automatic band selection achieved through a unique stub-decoupling system which effectively isolates various sections of the antenna so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

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

AV-12AVQ, $139.95. (10, 15, 20 Meters). 13 ft., 9 lbs. **AV-12AVQ** also uses Thunderbird beam design air dielectric traps for extremely Hy-Q performance. This is the way to go for inexpensive tri-band performance in limited space. Roof mount with AV-14RMQ kit, $89.95.

AV-18VS, $119.95 (10,12,15,17,20,30,40,80 Meters). 18 ft., 4 lbs. **High** quality construction and low cost make the AV-18VS an exceptional value. Easily tuned to any band by adjusting feed point at the base loading coil. Roof mount with Hy-Gain AV-14RMQ kit, $89.95.

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

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

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

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

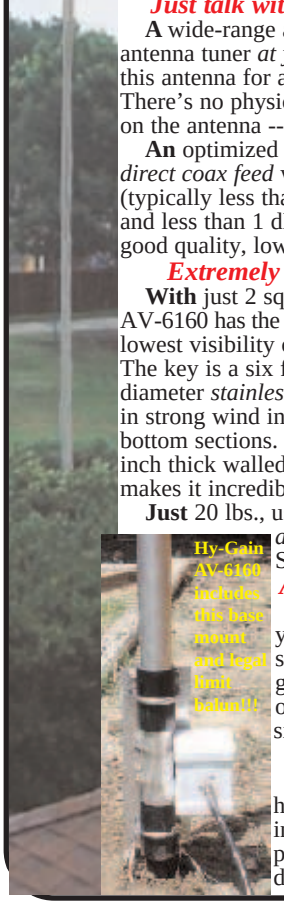
Model #	Price	Bands	Max Power	Height	Weight	Wind Surv.	Rec. Mast
AV-18HT	$949.95	10,15,20,40,80	1500 W PEP	53 feet	114 pounds	75 MPH	------
AV-14AVQ	**$179.95**	**10,15,20,40**	**1500 W PEP**	**18 feet**	**9 pounds**	**80 MPH**	**1.5-1.625"**
AV-12AVQ	$139.95	10,15,20 M	1500 W PEP	13 feet	9 pounds	80 MPH	1.5-1.625"
AV-18VS	**$119.95**	**10 - 80 M**	**1500 W PEP**	**18 feet**	**4 pounds**	**80 MPH**	**1.5-1.625"**
DX-88	$369.95	10 - 40 M	1500 W PEP	25 feet	18 pounds	75 mph no guy	1.5-1.625"
DX-77A	**$449.95**	**10 - 80 M**	**1500 W PEP**	**29 feet**	**25 pounds**	**60 mph no guy**	**1.5-1.625"**

Hy-Gain 160-6 Meters Self-Supporting Vertical

Full 1500 Watts, 43 feet, includes base mount

New! AV-6160 **$399.95** UPS SHIPPABLE

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



Exceptional Performance

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

Just talk with automatic tuner!

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

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

Assembles in an hour

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

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Dual bander

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This Just In

Joel P. Kleinman, N1BKE
jkleinman@arrl.org

In Brief

- ARISSat-1 was deployed August 3 from the International Space Station. See "Happenings," this issue, for more information.
- This past summer, the ARRL offered five sessions of the Teachers Institute on Wireless Technology. A total of 55 educators took part.
- The combined list of Logs Received for the 2011 ARRL Field Day has been posted to the ARRL website.
- After a hiatus of almost 20 years, venerable kit manufacturer Heathkit is again offering kits, although the company will be offering only "around the house" items for now.
- ARRL Official Observers have helped resolve interference caused by coastal HF radar (CODAR). The interference affected the 60 and 12 meter amateur bands.
- Members of the ARRL Second Century Campaign Committee held their first formal meeting in Newington in August. David W. Brandenburg, K5RQ, is the chairman.
- Effective September 9, the FCC raised the cost of an Amateur Radio vanity call sign 90 cents to $14.20 for the 10 year term.
- Representatives of 12 of the nation's 14 Volunteer Examiner Coordinators (VECs) met July 29 in Gettysburg, Pennsylvania for the 26th Annual National Conference of Volunteer Examiner Coordinators (NCVEC).
- The ARRL has launched three forums — Contesting, Awards and Technology — on its website (**www.arrl.org/forums**).
- The winner of the *QST* Cover Plaque Award for July is Jerry Clement, VE6AB, for his article "Gain Twist 75 Meter Mobile Monobander." The winner of the August Cover Plaque Award is Doug Hall, K4DSP, for his article "The FSKit — A Simple Sound Card Interface for Generating Radioteletype Frequency Shift Keying."

STEVE BRANDT, N7VS

In Portland, Oregon in June, Willamette Valley DX Club Japan Earthquake Relief Committee members Frank Gruber, KB7NJV, and Caroline Brandt, AD7UP, watch as WVDX Club President Jim Cassidy, KI7Y, presents a donation for Japan earthquake and tsunami relief to Mercy Corps Community Fundraising Associate Carlene Deits.

Glacier-Waterton Hamfest "Friendliest Ever"

"Vintage Radio" columnist John Dilks, K2TQN, made his way to Big Sky Country in July to take in his first Glacier-Waterton International Peace Park Hamfest near Glacier National Park, Montana. "Emphasis here," he reports, "is on fellowship. Many attending proudly say they have attended for the last 20 to 30 years. The hamfest has run 72 years.

"Family activities: breakfast-lunch-dinner, singing around the campfire(s), swapping tall tales. For the hams, there were seminars and forums, selling and buying, an auction, and checking out the latest mobile antennas and gear. There seems to be an unofficial contest among a few to see who can make the tallest antenna attached to their mobile or camper. A special event station was set up.

"It was the friendliest hamfest I ever attended. We stayed in a (very) rustic motel about a half mile away. Upon leaving, one of the hams offered his cabin (free) for us to use next year."

Photos by John Dilks, K2TQN

A well-attended seminar inside a tent.

K2TQN: **There were two rows of campers, plus a row of 50 more behind me along the woods and a few more in the woods behind the campers. Including family members (kids) I'd estimate that over 1000 attended. They came from Canada and mostly the western US.**

Media Hits

Allen Pitts, W1AGP
Media & Public Relations Manager

■ Space and ham radio have gone together since 1957. The space programs have been very good to hams and in July it seemed that every space-related publication had something about our new ARISSat-1 satellite. While the dithering about the actual launch date and confusion on just what to call it (Kedr?) stole many of the PR opportunities outside of the ham radio community, EETimes, NASA.gov, Space.com, United Press International (UPI) and even the International Business Times reported on it. This modern ham technology brings up an important media point for all hams.

■ Our Public Information Officers (PIOs) have known for a long time that there is a battle of media perception about Amateur Radio. On the one hand we have articles such as "*Meet the Makers: Henry Ford Hosts Weekend of Innovation, Technology*" in *Patch.com* noting Bill Boyke conducting ham radio demonstrations. Another is "*Kopernik's Summer Pegasus program teaches kids science*" in the *Press & Sun-Bulletin* (NY) where they made contact with orbiting satellites using the observatory's Amateur Radio station. Another major media hit showing our technologies was on WIS-TV (Columbia, SC) in the story "Ham radio operators don't need phone signals to communicate." "When cell phones don't work and land lines are knocked out, what do you do?" Unfortunately, the antithesis of this also is in the media — often brought about by hams themselves! In June the *Alexandria Times* had us using "centuries-old technology." In July an ABC-TV 33/40 (AL) headlines hospital hams (HCARC) were using "19th century technology" in disaster responses. While the rest of their story was good, all amateurs need to work to stop these misrepresentations and historical blunders. As the *Hi-Desert Star* (CA) reported in "Have no fear, the hams are here!" "Amateur radio operators are *not* a relic of a simpler time, but heroes on the frontline when disaster strikes."

■ Another battle is that Amateur Radio is somehow dying out. The impression given by the *Christian Science Monitor*'s headline "*Ham radio hangs on*" was far removed from the tone and facts in the actual article about the Tuscaloosa Amateur Radio Club.

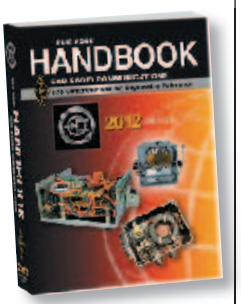
■ Good news came from several directions in July. PBS Newshour's science section had a nice segment about Field Day on July 1 called "Hamming Up the Airwaves." The *Delta County Independent* (CO) had a complimentary article about the Mesa, Montrose and Delta County Skywarn units achieving first place in all three categories during Skywarn Recognition Day. WGMD Radio celebrated Bill Colley receiving a 2010 Bill Leonard Award for audio work and *Radio World* wrote **"**Another (Slightly Different) Radio Show" about how ham radio has been "responsible for promoting friendships on a global basis and that it provides one of the best opportunities for doing so."

But the most intriguing headline of all, and one that gives PIOs a new idea and theme to play with, came from a *Philadelphia Inquirer* headline, "Amateur radio operators enjoy *nondependence day.*" You'll see that idea again!

■ Did you know that ARRL has its very own YouTube Channel? Go to **www.youtube.com/ARRLHQ**.

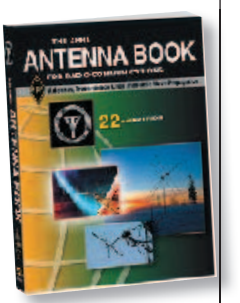
Inside HQ

2012 ARRL Handbook and the 22nd Edition of *The ARRL Antenna Book*



This month we debut both the new *2012 ARRL Handbook for Radio Communications* and the new 22nd edition of *The ARRL Antenna Book*. Two heavy hitters! We put a lot of thought and effort into ensuring the technical accuracy, usability and relevance of these publications. While our primary publication audience is our members, these publications represent Amateur Radio's best thinking about radio and communications to a worldwide community of engineers, regulators, government agencies, and communications and electronics professionals. Along with the content on theory, they also include many practical projects that active amateurs can construct and use.

So what's new? A major change in this year's *Handbook* is the new Test Equipment and Measurements chapter by Alan Bloom, N1AL. This chapter includes many new projects including a Logic Probe, an RF Current Meter and a Two-Tone Audio Oscillator designed by the ARRL Lab. Jim Tonne, W4ENE, has updated the *ELSIE* filter design software and has provided a new manual for his *MeterBasic* software. There is also a comprehensive treatment of Noise from material provided by Paul Wade, W1GHZ, and Joe Taylor, K1JT.



The Antenna Book has been reorganized to present material in a logical progression from fundamentals to practical applications. To this end, nearly every chapter has been revised. Content that was previously spread across several chapters is now more logically grouped. For example, the new chapter, HF Antenna System Design, has aggregated information from several chapters to help the reader take an overall approach to antenna system design. Roy Lewellan, W7EL, has updated his *EZNEC* antenna modeling program, and the software is included with the book.

In addition, *The Antenna Book* includes many new hands-on antenna projects including Cheap Yagis by Kent Brittain, WA5VJB; a 40 Meter Moxon by Dave Leeson, W6NL, and a TV to Ham Log-Periodic Conversion by John Stanley, K4ERO. Every project includes the complete construction details.

Along with content updates, based on reader feedback, we have improved *The Antenna Book*'s ease of use. The indexes have been redone. There are now separate Author and Project Indexes, and a detailed Master Table of Contents and a Table of Contents for each chapter.

QR Codes

This month we debut QR codes here in *QST*. These are a type of bar code that is readable by smartphones and other devices that bring the user to a specific web address. Our first QR Code, on page 54, connects to a video of ARRL Lab Engineer Bob Allison, WB1GCM, discussing this month's Product Review items. If you don't have a QR Reader, you can download a free reader app to your smartphone. We hope you enjoy this new *QST* feature.

73,

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

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- **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.

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  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**
  Every purchase supports ARRL programs and services.
- **MetLife® Auto, Home, Renters, Boaters, Fire Insurance and Banking Products**
  ARRL members may qualify for up to a 10% discount on home or auto insurance.

* 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.

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Logbook of the World – **www.arrl.org/lotw**

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ARRL Field Organization – **www.arrl.org/field-organization**

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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**
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Three electro-luminescent subdisplays indicate sub frequency, graphical wave and menu functions. Additional features: Parametric Microphone Equalizer; Dual Receive In Band Function Contest-ready Antenna Selection; Manual and Automatic Digital Notch; High Speed Automatic Antenna Tuner; DSP Noise Reduction.

FT-2000 and FT-2000D

This rugged DX hunter has power and performance to spare. The FT-2000 provides a full 100 Watts RF output on 160 through 6 meters with an internal power supply, but the FT-2000D version doubles down with 200 Watts and an external supply. The impressive feature list for both versions includes dual receive capability for effortless split frequency operation; a receiver front-end VRF (Variable RF Tuning) preselector; 1st IF roofing filters (3/6/15 kHz) for superb dynamic range; variable IF bandwidth and IF Shift; receiver DSP with Auto-Notch, Manual Notch, Digital Noise Reduction; and a continuously-variable passband contour control.

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FT-450D

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THE ARRL LOGBOOK OF THE WORLD

DXCC Entity List

All entities on the current list are eligible for field checking.

Note: * Indicates current list of entities for which QSLs may be forwarded by the ARRL membership Outgoing QSL Service.
# Indicates entities with which US Amateurs may legally handle third-party message traffic.

Prefix	Entity
	Spratly Is.
1A [1]	Sov.Mil. Order of Malta
3A*	Monaco
3B6, 7	Agalega & St. Brandon Is.
3B8	Mauritius
3B9	Rodriguez I.
3C	Equatorial Guinea
3C0	Annobon I.
3D2*	Fiji
3D2	Conway Reef
3D2*	Rotuma I.
3DA#	Swaziland
3V*	Tunisia
3W,XV	Viet Nam
3X	Guinea
3Y*	Bouvet
3Y*	Peter 1 I.
4J, 4K	Azerbaijan
4L*	Georgia
4O[47]*	Montenegro
4S*	Sri Lanka
4U_ITU#	ITU HQ
4U_UN*	United Nations HQ
4W[44]	Timor - Leste
4X, 4Z	Israel
5A	Libya
5B, C4, P3*	Cyprus
5H-5I*	Tanzania
5N*	Nigeria
5R	Madagascar
5T[2]	Mauritania
5U[3]	Niger
5V	Togo
5W*	Samoa
5X*	Uganda
5Y-5Z*	Kenya
6V-6W[4]*	Senegal
6Y#*	Jamaica
7O[5]	Yemen
7P	Lesotho
7Q	Malawi
7T-7Y*	Algeria
8P*	Barbados
8Q*	Maldives
8R#*	Guyana
9A[6]*	Croatia
9G[7]#	Ghana
9H*	Malta
9I-9J*	Zambia
9K*	Kuwait
9L#	Sierra Leone
9M2, 4[8]*	West Malaysia
9M6, 8[8]*	East Malaysia
9N	Nepal
9Q-9T*	Dem. Rep. of Congo
9U[9]	Burundi
9V[10]*	Singapore
9X[9]	Rwanda
9Y-9Z#	Trinidad & Tobago
A2*	Botswana
A3	Tonga
A4*	Oman
A5	Bhutan
A6	United Arab Emirates
A7*	Qatar
A9*	Bahrain
AP*	Pakistan
B*	China
BS7[11]	Scarborough Reef
BU-BX*	Taiwan
BV9P[12]	Pratas I.
C2	Nauru
C3*	Andorra
C5#	The Gambia
C6	Bahamas
C8-9*	Mozambique
CA-CE#*	Chile
CE0#*	Easter I.
CE0#*	Juan Fernandez Is.
CE0#*	San Felix & San Ambrosio
CE9/KC4^*	Antarctica
CM, CO#*	Cuba
CN	Morocco
CP#*	Bolivia
CT*	Portugal
CT3*	Madeira Is.
CU*	Azores
CV-CX#*	Uruguay
CY0*	Sable I.
CY9*	St. Paul I.
D2-3	Angola
D4	Cape Verde
D6*#[13]	Comoros
DA-DR[14]*	Fed. Rep. of Germany
DU-DZ,4D-4I#*	Philippines
E3[15]	Eritrea
E4[43]	Palestine
E5	N. Cook Is.
E5	S. Cook Is.
E7[29]#*	Bosnia-Herzegovina
EA-EH*	Spain
EA6-EH6*	Balearic Is.
EA8-EH8*	Canary Is.
EA9-EH9*	Ceuta & Melilla
EI-EJ*	Ireland
EK*	Armenia
EL#*	Liberia
EP-EQ*	Iran
ER*	Moldova
ES*	Estonia
ET*	Ethiopia
EU-EW*	Belarus
EX*	Kyrgyzstan
EY*	Tajikistan
EZ*	Turkmenistan
F*	France
FG, TO*	Guadeloupe
FH, TO[13]*	Mayotte
FJ, TO[49]*	Saint Barthelemy
FK, TX*	New Caledonia
FK, TX[45]	Chesterfield Is.
FM, TO*	Martinique
FO, TX[16]*	Austral I.
FO, TX*	Clipperton I.
FO, TX*	French Polynesia
FO, TX[16]*	Marquesas Is.
FP*	St. Pierre & Miquelon
FR, TO*	Reunion I.
FS, TO*	Saint Martin
FT/G, TO[17]*	Glorioso Is.
FT/J,E, TO[17]*	Juan de Nova, Europa
FT/T, TO*	Tromelin I.
FT/W*	Crozet I.
FT/X*	Kerguelen Is.
FT/Z*	Amsterdam & St. Paul Is.
FW*	Wallis & Futuna Is.
FY*	French Guiana
G, GX, M*	England
GD, GT*	Isle of Man
GI, GN*	Northern Ireland
GJ, GH*	Jersey
GM, GS*	Scotland
GU, GP*	Guernsey
GW, GC*	Wales
H4*	Solomon Is.
H40[18]*	Temotu Province
HA, HG*	Hungary
HB*	Switzerland
HB0	Liechtenstein
HC-HD#*	Ecuador
HC8-HD8#*	Galapagos Is.
HH#	Haiti
HI#*	Dominican Republic
HJ-HK, 5J-5K#*	Colombia
HK0#*	Malpelo I.
HK0#*	San Andres & Providencia
HL, 6K-6N*	Republic of Korea
HO-HP#*	Panama
HQ-HR#*	Honduras
HS, E2*	Thailand
HV	Vatican
HZ*	Saudi Arabia
I*	Italy
IS0, IM0*	Sardinia
J2*	Djibouti
J3#*	Grenada
J5	Guinea-Bissau
J6#*	St. Lucia
J7#*	Dominica
J8#	St. Vincent
JA-JS, 7J-7N*	Japan
JD1[19]*	Minami Torishima
JD1[20]*	Ogasawara
JT-JV*	Mongolia
JW*	Svalbard
JX*	Jan Mayen
JY#*	Jordan
A, K,N,W	United States of America
KG4#	Guantanamo Bay
KH0#	Mariana Is.
KH1#	Baker & Howland Is.
KH2#*	Guam
KH3#*	Johnston I.
KH4#	Midway I.
KH5#	Palmyra & Jarvis Is.
KH5K#	Kingman Reef
KH6,7#*	Hawaii
KH7K#	Kure I.
KH8#*	American Samoa
KH8[48]#*	Swains I.
KH9#	Wake I.
KL,AL,NL, WL#*	Alaska
KP1#	Navassa I.
KP2#*	Virgin Is.
KP3,4#*	Puerto Rico
KP5[22]#	Desecheo I.
LA-LN*	Norway
LO-LW#*	Argentina
LX*	Luxembourg
LY*	Lithuania
LZ*	Bulgaria
OA-OC#*	Peru
OD*	Lebanon
OE#*	Austria
OF-OI*	Finland
OH0*	Aland Is.
OJ0*	Market Reef
OK-OL[23]*	Czech Republic
OM[23]*	Slovak Republic
ON-OT*	Belgium
OU-OW, OZ*	Denmark
OX*	Greenland
OY*	Faroe Is.
P2[24]	Papua New Guinea
P4[25]*	Aruba
P5[26]	DPR of Korea
PA-PI*	Netherlands
PJ2[50]	Curacao
PJ4[51]	Bonaire
PJ5,6[52]	Saba & St. Eustatius
PJ7[53]	St Maarten
PP-PY, ZV-ZZ#*	Brazil
PP0-PY0F#*	Fernando de Noronha
PP0-PY0S#*	St. Peter & St. Paul Rocks
PP0-PY0T#*	Trindade & Martim Vaz Is.
PZ	Suriname
R1/F*	Franz Josef Land
R1/M*	Malyj Vysotskij I.
S0[1, 27]	Western Sahara
S2*	Bangladesh
S5[6]*	Slovenia
S7	Seychelles
S9	Sao Tome & Principe
SA-SM, 7S-8S*	Sweden
SN-SR*	Poland
ST	Sudan
ST0[1]	South Sudan
SU	Egypt
SV-SZ, J4*	Greece
SV/A*	Mount Athos
SV5, J45*	Dodecanese
SV9, J49*	Crete
T2[28]	Tuvalu
T30	W. Kiribati (Gilbert Is.)
T31	C. Kiribati (British Phoenix Is)
T32	E. Kiribati (Line Is.)
T33	Banaba I. (Ocean I.)
T5, 6O	Somalia
T7*	San Marino
T8[21]	Palau
TA-TC*	Turkey
TF*	Iceland
TG, TD#*	Guatemala
TI, TE#*	Costa Rica
TI9#*	Cocos I.
TJ	Cameroon
TK*	Corsica
TL[30]	Central Africa
TN[31]	Congo (Republic of the)
TR[32]*	Gabon
TT[33]	Chad
TU[34]	Cote d'Ivoire
TY[35]	Benin
TZ[36]*	Mali
UA-UI1,3,4,6	European Russia
RA-RZ*	
UA2, RA2*	Kaliningrad
UA-UI8,9,0	Asiatic Russia
RA-RZ*	
UJ-UM	Uzbekistan
UN-UQ*	Kazakhstan
UR-UZ,	Ukraine
EM-EO*	
V2#*	Antigua & Barbuda
V3#	Belize
V4[37]#	St. Kitts & Nevis
V5*	Namibia
V6[38]	Micronesia
V7#*	Marshall Is.
V8*	Brunei Darussalam
VA-VG,	Canada
VO,VY#*	
VK, AX#*	Australia
VK0#*	Heard I.
VK0#*	Macquarie I.
VK9C#*	Cocos (Keeling) Is.
VK9L#*	Lord Howe I.
VK9M#*	Mellish Reef
VK9N*	Norfolk I.
VK9W#*	Willis I.
VK9X#*	Christmas I.
VP2E[37]	Anguilla
VP2M[37]	Montserrat
VP2V[37]*	British Virgin Is.
VP5*	Turks & Caicos Is.
VP6#*	Pitcairn I.
VP6[46]*	Ducie I.
VP8*	Falkland Is.
VP8, LU*	South Georgia I.
VP8, LU*	South Orkney Is.
VP8, LU*	South Sandwich Is.
VP8, LU, CE9, HF0, 4K1*	South Shetland Is.
VP9*	Bermuda
VQ9*	Chagos Is.
VR*	Hong Kong
VU*	India
VU4*	Andaman & Nicobar Is.
VU7*	Lakshadweep Is.
XA-XI#*	Mexico
XA4-XI4#*	Revillagigedo
XT[39]*	Burkina Faso
XU	Cambodia
XW	Laos
XX9*	Macao
XY-XZ	Myanmar
YA, T6	Afghanistan
YB-YH[40]*	Indonesia
YI*	Iraq
YJ*	Vanuatu
YK*	Syria
YL*	Latvia
YN,H6-7,HT#*	Nicaragua
YO-YR*	Romania
YS, HU#*	El Salvador
YT-YU*	Serbia
YV-YY, 4M#*	Venezuela
YV0#*	Aves I.
Z2	Zimbabwe
Z3[41]*	Macedonia
ZA	Albania
ZB2*	Gibraltar
ZC4[42]*	UK Sov. Base Areas on Cyprus
ZD7*	St. Helena
ZD8*	Ascension I.
ZD9	Tristan da Cunha & Gough I.
ZF*	Cayman Is.
ZK2*	Niue
ZK3*	Tokelau Is.
ZL-ZM*	New Zealand
ZL7*	Chatham Is.
ZL8*	Kermadec Is.
ZL9*	Auckland & Campbell Is.
ZP#*	Paraguay
ZR-ZU#*	South Africa
ZS8*	Prince Edward & Marion Is.

DXCC Entity List NOTES:

1 Unofficial prefix.
2 (5T) Only contacts made June 20, 1960, and after, count for this entity.
3 (5U) Only contacts made August 3, 1960, and after, count for this entity.
4 (6W) Only contact made June 20, 1960, and after, count for this entity.
5 (70) Only contacts made May 22, 1990, and after, count for this entity.
6 (9A,S5) Only contacts made June 26, 1991, and after, count for this entity.7 (9G) Only contacts made March 5, 1957, and after, count for this entity.
8 (9M2,4,6,8) Only contacts made September 16, 1963, and after,count for this entity.
9 (9U, 9X) Only contacts made July 1, 1962, and after, count for this entity.
10(9V) Contacts made from September 16, 1963 to August 8, 1965, count for West Malaysia.
11(BS7) Only contacts made January 1, 1995, and after, count for this entity.
12(BV9P) Only contact made January 1, 1994, and after, count for this entity.
13(D6,FH) Only contacts made July 6, 1975, and after, count for this entity.
14(DA-DR) Only contacts made with DA-DL stations September 17, 1973, and after, and contacts made Y2-Y9 stations October 3, 1990 and after, count for this entity.
15(E3) Only contacts made November 14, 1962, and before, or May 24, 1991, and after, count for this entity.
16(FO) Only contacts made after 23:59 UTC, March 31, 1998 count for this entity.
17(FR) Only contacts made June 25, 1960, and after, count for this entity.
18(H40) Only contacts made after 23:59 UTC, March 31, 1998 count for this entity.
19(JD) Formerly Marcus Island.
20(JD) Formerly Bonin and Volcano Islands
21(T8) Valid prefix January 1, 1994, or after (KC6 prior to this date).
22(KP5) Only contacts made March 1, 1979, and after, count for this entity.
23(OK-OL, OM) Only contacts made January 1, 1993, and after, count for this entity.
24(P2) Only contacts made September 16, 1975, and after count for this entity.
25(P4) Only contacts made January 1, 1986, and after, count for this entity.
26(P5) Only contacts made May 14, 1995, and after, count for this entity.
27(S0) Contacts with Rio de Oro (Spanish Sahara), EA9, also count for this entity.
28(T2) Only contacts made January 1, 1976, and after, count for this entity.
29(E7) New prefix for Bosnia - Herzegovina effective November 17, 2007. Contacts are valid for this entity effective October 15, 1991.
30(TL) Only contacts made August 13, 1960, and after, count for this entity.
31(TN) Only contacts made August 15, 1960, and after, count for this entity.
32(TR) Only contacts made August 17, 1960, and after, count for this entity.
33(TT) Only contacts made August 11, 1960, and after, count for this entity.
34(TU) Only contacts made August 7, 1960, and after, count for this entity.
35(TY) Only contacts made August 1, 1960, and after, count for this entity.
36(TZ) Only contacts made June 20, 1960, and after, count for this entity.
37(V4,VP2) For DXCC credit for contacts made May 31, 1958, and before, see page 97, June 1958 QST.
38(V6) Includes Yap Islands January 1, 1981, and after.
39(XT) Only contacts made August 16, 1960, and after, count for this entity.
40(YB) Only contacts made May 1, 1963, and after, count for this entity.
41(Z3) Only contacts made September 8, 1991, and after, count for this entity.
42(ZC4) Only contacts made August 16, 1960, and after, count for this entity.
43(E4) Only contacts made February 1, 1999, and after, count for this entity.
44(4W) Only contacts made March 1, 2000, and after, count for this entity.
45(FK/C) Only contacts made March 23, 2000, and after, count for this entity.
46(VP6) Only contacts made November 16, 2001, and after, count for this entity.
47(4O) Only contacts made June 28, 2006, and after, count for this entity.
48(KH8) Only contacts made July 22, 2006, and after, count for this entity.
49(FJ) Only contacts made December 14, 2007, and after, count for this entity.
50(PJ2) Only contacts made starting 0400 UTC October 10, 2010, or after, count for this entity.
51(PJ4) Only contacts made starting 0400 UTC October 10, 2010, or after, count for this entity.
52(PJ5, 6) Only contacts made starting 0400 UTC October 10, 2010, or after, count for this entity.
53 (PJ7) Only contacts made starting 0400 UTC October 10, 2010, or after, count for this entity.

Also 3Y, BJ1, AT0, DP0, FT8Y, LU, OR4, VK0, R1AW, VP8, ZL5, ZS1, ZX0, etc. QSL via country under whose auspices the particular station is operating. The availability of a third-party traffic agreement and a QSL Bureau applies to the country under whose auspices the particular station is operating.

Zone Notes can be found with Prefix Cross References.

DXCC Entity List provided by:

ARRL The national association for AMATEUR RADIO®

DXCC Deleted Entity List

Prefix	Entity
2	Blenheim Reef
3	Geyser Reef
4	Abu Ail Is.
1M[1,5]	Minerva Reef
4W[6]	Yemen Arab Rep.
7J[17]	Okino Tori-shima
8Z4[8]	Saudi Arabia/Iraq Neut. Zone
8Z5, 9K3[9]	Kuwait/Saudi Arabia Neut. Zone
9S4[10]	Saar
9U5[11]	Ruanda-Urundi
AC3[1, 12]	Sikkim
AC4[1, 13]	Tibet
C9[14]	Manchuria
CN2[15]	Tangier
CR8[16]	Damao, Diu
CR8[16]	Goa
CR8, CR10[17]	Portuguese Timor
DA-DM[18]	Germany
DM, Y2-9[19]	German Dem. Rep.
EA9[20]	Ifni
FF[21]	French West Africa
FH, FB8[22]	Comoros
FI8[23]	French Indo-China
FN8[24]	French India
FQ8[25]	Fr. Equatorial Africa
HK0[26]	Bajo Nuevo
HK0,KP3,[26]	Serrana Bank & Roncador Cay
KS4	Serranilla Bk.
I1[27]	Trieste
I5[28]	Italian Somaliland
JZ0[29]	Netherlands N. Guinea
KR6,8,JR6, KA6[30]	Okinawa (Ryukyu Is.)
KS4[31]	Swan Is.
KZ5[32]	Canal Zone
OK-OM[33]	Czechoslovakia
P2,VK9[34]	Papua Territory
P2,VK9[34]	Terr. New Guinea
PJ[35]	Bonaire, Curacao
PJ[35]	St. Maarten, Saba, St. Eustatius
PK1-3[36]	Java
PK4[36]	Sumatra
PK5[36]	Netherlands Borneo
PK6[36]	Celebe & Molucca Is.
ST0[37]	Southern Sudan
UN1[38]	Karelo-Finnish Rep.
VO[39]	Newfoundland, Labrador
VQ1,5H1[40]	Zanzibar
VQ6[41]	British Somaliland
VQ9[42]	Aldabra
VQ9[42]	Desroches
VQ9[42]	Farquhar
VS2, 9M2[43]	Malaya
VS4[43]	Sarawak
VS9A,P,S[44]	People's Dem. Rep. of Yemen
VS9H[45]	Kuria Muria I.
VS9K[46]	Kamaran Is.
ZC5[43]	British North Borneo
ZC6, 4X1[47]	Palestine
ZD4[48]	Gold Coast, Togoland
ZS9[50]	Walvis Bay
ZS0, 1[49]	Penguin Is.

DXCC Deleted Entity List NOTES:

1 Unofficial prefix.
2 (Blenheim Reef) Only contacts made from May 4, 1967, to June 30, 1975, count for this entity. Contacts made July 1, 1975, and after, count as Chagos (VQ9).
3 (Geysey Reef) Only contacts made from May 4, 1967, to February 28, 1978, count for this entity.
4 (Abu Ail Is.) Only contacts made March 30, 1991, and before, count for this entity.
5 (1M) Only contacts made from July 15, 1972, and before, count for this entity. Contacts made July 16, 1972, and after, count as Tonga (A3).
6 (4W) Only contacts made before May 21, 1990, and before, count for this entity.
7 (7J1) Only contacts made May 30, 1976, to November 30, 1980, count for this entity. Contacts made December 1, 1980, and after, count as Ogasawara (JD1).
8 (8Z4) Only contacts made December 25, 1981, and before, count for this entity.
9 (8Z5,9K3) Only contacts made December 14, 1969, and before, count for this entity.
10 (9S4) Only contacts made March 31, 1957, and before, count for this entity.
11 (9U5) Only contacts made from July 1, 1960, to June 30, 1962, count for this entity. Contact made July 1, 1962, and after, count as Burundi (9U) or Rwanda (9X).
12 (AC3) Only contacts made April 30, 1975, and before, count for this entity. Contacts made May 1, 1975, and after, count as India (VU).
13 (AC4) Only contacts made May 30, 1974, and before, count for this entity. Contacts made May 31, 1974, and after, count as China (BY).
14 (C9) Only contacts made September 15, 1963, and before, count for this entity. Contacts made September 16, 1963, and after, count as China (BY).
15 (CN2) Only contacts made June 30, 1960, and before, count for this entity. Contacts made July 1, 1960, and after, count as Morocco (CN).
16 (CR8) Only contacts made December 31, 1961, and before, count for this entity.
17 (CR8,CR10) Only contacts made September 14, 1976, and before, count for this entity.
18 (DA-DM) Only contacts made September 16, 1973, and before, count for this entity. Contacts made September 17, 1973, and after, count as either FRG (DADL) or GDR (Y2-Y9).
19 (DM,Y2-9) Only contacts made from September 17, 1973, to October 2, 1990 count for this entity. On October 3, 1990, the GDR became part of the FRG.
20 (EA9) Only contacts made May 13, 1969, and before, count for this entity.
21 (FF) Only contacts made August 6, 1960, and before, count for this entity.
22 (FH, FB8) Only contacts made July 5, 1975, and before, count for this entity. Contacts made July 6, 1975, and after, count as Comoros (D6) or Mayotte (FH).
23 (FI8) Only contacts made December 20, 1950, and before, count for this entity.
24 (FN8) Only contacts made October 31, 1954, and before, count for this entity.
25 (FQ8) Only contacts made August 16, 1960, and before will count for this entity.
26 (HK,KP3,KS4) Only contacts made September 16, 1981, and before, count for this entity. Contacts made September 17, 1981, and after, count as San Andres (HK).
27 (I1) Only contacts made March 31, 1957, and before, count for this entity.
28 (I5) Only contacts made June 30, 1960, and before, count for this entity.
29 (JZ) Only contacts made April 30, 1963, and before, count for this entity.
30 (KR6,8,JR6,KA6) Only contacts made May 14, 1972, and before, count for this entity. Contacts made May 15, 1972, and after, count as Japan (JA).
31 (KS4) Only contacts made August 31, 1972, and before, count for this entity Contacts made September 1, 1972, and after, count as Honduras (HR).
32 (KZ5) Only contacts made September 30, 1979, and before, count for this entity.
33 (OK-OM) Only contacts made December 31, 1992, and before, count for this entity.
34 (P2,VK9) Only contacts made September 15, 1975, and before, count for this entity. Contacts made September 16, 1975, and after, count as Papua New Guinea (P2).
35 (PJ) Only contacts made October 9, 2010, and before, count for this entity.
36 (PK1-6) Only contacts made April 30, 1963, and before, count for this entity. Contact made May 1, 1963, and after, count as Indonesia.
37 (ST0) Only contacts made between May 7, 1972 and December 31, 1994, count for this entity.
38 (UN1) Only contacts made June 30, 1960, and before, count for this entity. Contacts made July 1, 1960, and after count as European RSFSR (UA).
39 (VO) Only contacts made March 31, 1949, and before, count for this entity. Contacts made April 1, 1949, and after, count as Canada (VE).
40 (VQ1,5H1) Only contacts made May 31, 1974, and before, count for this entity. Contacts made June 1, 1974, and after, count as Tanzania (5H).
41 (VQ6) Only contacts made June 30, 1960, and before, count for this entity.
42 (VQ9) Only contacts made June 28, 1976, and before, count for this entity. Contacts made June 29, 1976, and after, count as Seychelles (S7).
43 (VS2-VS4,ZC5,9M2) Only contacts made September 15, 1963, and before, count for this entity. Contacts made September 16, 1963, and after, count as West Malaysia (9M2) or East Malaysia (9M6,8).
44 (VS9A,P,S) Only contacts made before May 22, 1990, and before, count for this entity.
45 (VS9H) Only contacts made November 29, 1967, and before, count for this entity.
46 (VS9K) Only contacts made on March 10, 1982, and before, count for this entity.
47 (ZC6,4X1) Only contacts made June 30, 1968, and before, count for this entity. Contacts made July 1, 1968, and after, count as Israel (4X).
48 (ZD4) Only contacts made March 5, 1957, and before, count for this entity.
49 (ZS0, 1) Only contacts made February 29, 1904, and before, count for this entity.
50 (ZS9) Only contacts made from September 1, 1977 to February 28, 1994, count for this entity.

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

Ameritron *1200 Watts* Solid State Amplifier

1200 Watts PEP SSB/CW Output, 1.5-30 MHz. No Tune, Instant-On, Instant Bandswitching, Super Reliable, Whisper Quiet, Remote Controllable, QSK, Fully Protected, Fully Metered ...

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

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

Put out-of-the-way and Remote Control

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

Features Galore!

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

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

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

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

Super-clean modular construction makes service quick and easy.

Fully Protected!

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

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

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

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

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

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

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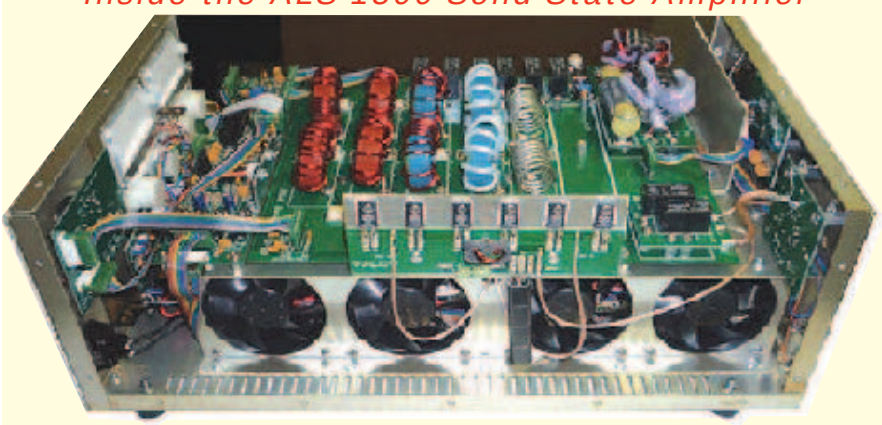
Here's what they say . . .

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

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

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

Inside the ALS-1300 Solid State Amplifier



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An Unexpected Caribbean DXpedition

John T. Luebbers, K1AYZ

The cruise ship Carnival *Freedom* provided an unexpected opportunity for me to be on the busy end of a DX pileup while cruising the Caribbean. My wife Deborah, KB1FEF; myself, K1AYZ, and our friend Carl, K8BBT, and his wife Jayne booked a cruise on the Carnival *Freedom* for 2 weeks in 2010.

As we boarded the *Freedom* I noticed another gentleman wearing his call letter hat and we stopped for a moment to say hello, then continued on to find our rooms. That evening after a dinner in the posh dining room we met Paul, N1ZYB, and Linda, N1ZYC, who told us they were part of a group of about 25 hams who were cruising together and had stations set up on the Lido deck. They invited us to stop by the next day to check out their operation.

The next morning Carl and I went to the Lido deck and much to our surprise and delight here were two HF stations set up at opposite corners of the deck. Each station consisted of an ICOM IC-7000 transceiver feeding a Tarheel screwdriver antenna mounted on the deck above the operating position.

This group was called Ham Radio Cruise 2010. It had been organized by Vernon Fix, W4THN, from Virginia Beach, Virginia and was the third such floating DXpedition he had put together. They had several seminars scheduled during the cruise on subjects such as County Hunting and Fox Hunting.

Vernon arranged for an International Amateur Radio Permit (IARP) through the ARRL to allow the operation of a ham radio station on board this Panamanian registered ship. Stations were using the prefix HPØ and then their calls followed by maritime mobile.

The ship's engineering department mounted the Tarheel screwdriver antenna on Deck 10 above the Lido deck.

Carl and I were invited to join in and we had fun operating maritime mobile somewhere off the Dominican Republic. I made two contacts on 20 meters, and Carl met a fellow member of the Royal Naval Amateur Radio Society (**www.rnars.org.uk**), Terry Passey, K4TRP, whom he had talked to on their net but had never eyeballed.

Results

The primary modes used were SSB and CW with some PSK31 and AMTOR. The bands used were mainly 20, 17 and 15 meters. Pete, K9OWQ, who was in charge of compiling all the logs, tells me there were a total of 450 contacts made during the cruise. We had a great time traveling with this group of hams who made the cruise seem like one big seagoing hamfest.

Photos by John T. Luebbers, K1AYZ

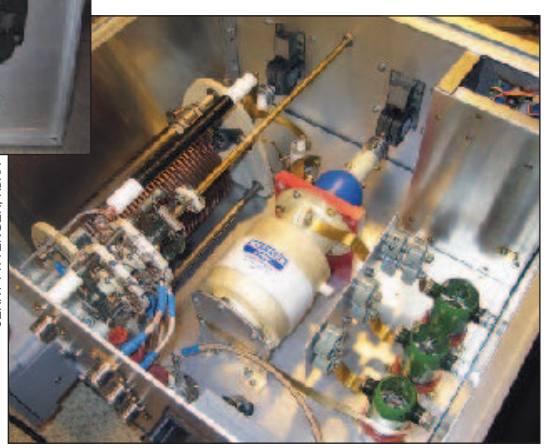
Rick Bailor, W7BBQ (now W7UN) (left) is working the SSB DX while Carl DePoy, K8BBT, logs.

"What'd we do wrong?" Sonny Hood, K4WYS; Charles Chapman, W1WTG; Paul Towne, N1ZYB, and Vernon Fix, W4THN, do some troubleshooting.

Tuner Research Yields Sturdy Shack Accessory

After reading *The ARRL Guide to Antenna Tuners* (and corresponding with its author, Joel Hallas, W1ZR, in addition to scouring the Internet), Jerry Pittenger, K8RA, of Powell, Ohio designed and built this L-network tuner.

The homebrew antenna tuner that was inspired by *The ARRL Guide to Antenna Tuners*.



JERRY PITTENGER, K8RA

He describes it this way: "The tuner uses a 500 pF/10 kV vacuum variable and a 31 µH roller inductor. The only problem I had was some SWR on 15/17/10 meters going straight through the tuner. A low capacitance 6 kV disk cap across the input connector and the output connector took the SWR down to near perfect 1.0. Another thing I did was to put in a TUNE switch that switches a vacuum relay to select a second RF input. Putting my MFJ-259B SWR analyzer on that second input allows me to adjust the tuner without putting out a signal that causes interference. It works great." — *Jerry Pittenger, K8RA*

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CORRESPONDENCE

RETHINKING EMCOMM

♦ I read with interest, and mostly with agreement, David Sumner's, K1ZZ, comments ["It Seems to Us: Our Future in Emergency Communications," Sep 2011, page 9]. Having spent the past eight of my 48 years in public safety as director of a 9-1-1 Dispatch Center and county-wide communications system, I too agree that Representative Peter King's (R-NY-3) proposal is misguided. The focus on national interoperability is misplaced. What is needed, and what billions in Public Safety Interoperable Communications (PSIC) grants should be focused on is regional interoperability. And, in my opinion, 700 MHz is not the answer on any sort of widespread basis. Its diminished coverage and extreme costs in areas with other than flat terrain are prohibitive.

As a result of the national focus on "Next Gen 911," dispatch centers will in the not-too-distant future be capable of receiving multi-media messages, including photos and videos. Continuance of the PSIC grant program will eventually result in most public safety communications systems being target-hardened, redundant and reliable under almost all imaginable circumstances and thus, with less need for Amateur Radio assistance.

Where amateurs will always be able to contribute in a meaningful way following emergencies/disasters is by providing communications support for NGOs, such as the American Red Cross and Salvation Army, as well as non-public safety government entities, such as schools and hospitals. While the days of Amateur Radio assistance to law enforcement and fire agencies may be drawing to a close, the opportunity to refocus our efforts in support of those who truly need us is there.

JERRY BOYD, N7WR, ARRL Life Member
Director, Baker County Oregon 9-1-1 Communications
Baker City, Oregon

AN OUNCE OF PREVENTION

♦ Paul Havlik, WD9IOK ["Correspondence: FCC Solves Interference Mystery," Sep 2011, page 24] wrote about an interference problem that could, if not solved, have created a very serious fire. Older structures, especially residences, have a fairly high frequency of fire conditions, due to the lack of knowledge for a deficiency in electrical service and because of load center arcing, the problem discovered by Havlik. So, in this case, a concerned ham probably saved his neighbor from a house fire. Most people do not regularly inspect their control panel and maintain their electrical panels, incorrectly assuming that electrical equipment does not fail. Speaking from 40 years of experience as a fire protection consultant, it is not a bad idea to have these serviced by qualified individuals on a regular basis.

JOHN MARTHENS, NU6A,
ARRL Life Member
Normand Park, Washington

MARS TODAY

♦ The "Hamspeak" glossary box ["Optimizing Amateur Radio Resources for Major Disasters," Sep 2011, pages 30-34] describes the Military Auxiliary Radio System (MARS) as "Organizations providing non-operational communications support, such as health and welfare traffic, to each of the US military services."

While the mention of MARS is appreciated, the description is outdated and incomplete. MARS provides contingency radio communications support not only to the military, but to US government operations — including civil agencies at all levels — in support of the Pentagon's homeland defense mission. The expanded MARS mission outlined in Department of Defense Instruction (DoDI) 4650.02 defines "contingency radio communications support" as "The provision of radio-based transfer or exchange of information to assist with DoD or civilian authorities' operations during, or responses to, any major disruption of DoD or other communications networks, such as those associated with official national security or emergency preparedness events or activities."

In addition, the MARS communications station at the Pentagon provides contingency communications to the Joint Staff and the National Military Command Center (NMCC). MARS operators also support a wide range of other government activities, from domestic emergency response programs run by FEMA and the Department of Homeland Security, to active support of the National Guard.

In working with Amateur Radio organizations, volunteer MARS operators assisted the US military in support of medical and humanitarian relief efforts after last year's devastating earthquake in Haiti, facilitating life-saving communications links between doctors in Port au Prince and the hospital ship USNS *Comfort* off the Haitian coast.

Long gone are the days when health and welfare traffic comprised the main communications support MARS provided. Though MARS still provides this service, the focus today is on emergency preparedness and disaster response. Times have changed and MARS has changed with them.

DAVID J. TRACHTENBERG, N4WWL
National Planning Coordinator, Northeast Area and Region 3 Public Information Officer, and Virginia State MARS Director for Air Force MARS
Burke, Virginia

PASS THE TORCH

♦ The "sink or swim" attitude of some ham communities discourages new hams from continuing their education and or continuing with Amateur Radio. It is sad this is the state of affairs in my community. Older Amateur Radio operators need to step up and offer assistance to new radio operators, rather than throwing a book at them, saying "Study this!"

Newer hams, such as myself, would appreciate those more experienced amateurs demonstrating how things work, or even just inviting us to the next club meeting. I understand that there are many modes of operation and that some hams prefer one mode over another — that's fine, just show us the modes and how they work, let us know how to use them. Help us in continuing to spread the word about Amateur Radio and its use in our community.

GENE TUCKER, KF5EAF
El Paso, Texas

A FOX BY THE TAIL

♦ I found the article by Stu Turner, WØSTU ["GeoFox Radiosport Rally," Aug 2011, pages 58-60] to be a delightful escape into earlier years. With his article and photos, Stu captured the real fun of being both a kid and a ham in the late 1950s. I think that the real miracle might have been finding that many kids who would give up video games and texting long enough to participate. Good going, Stu!

MIKE KITSKO, K6VGQ
Grove, Oklahoma

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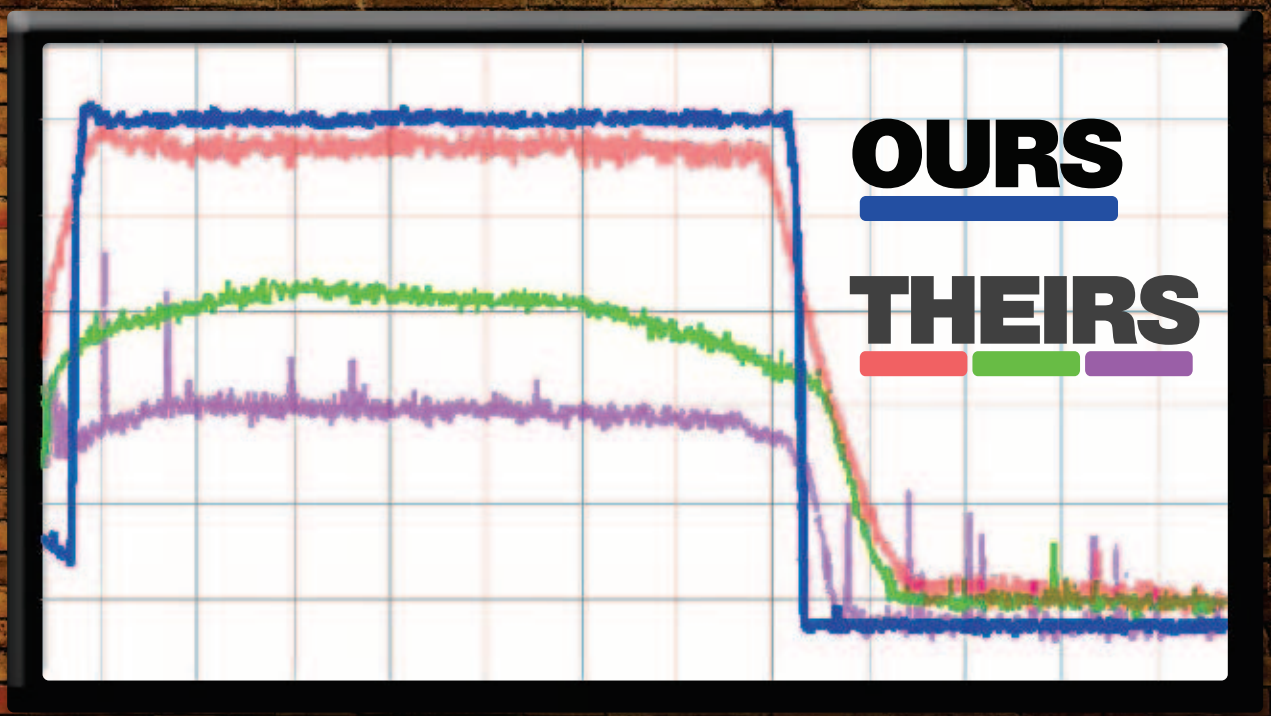
brick wall /brĭk - wôl/ ▪ *noun*

anything or anyone that is impenetrable, unrelenting, or unyielding



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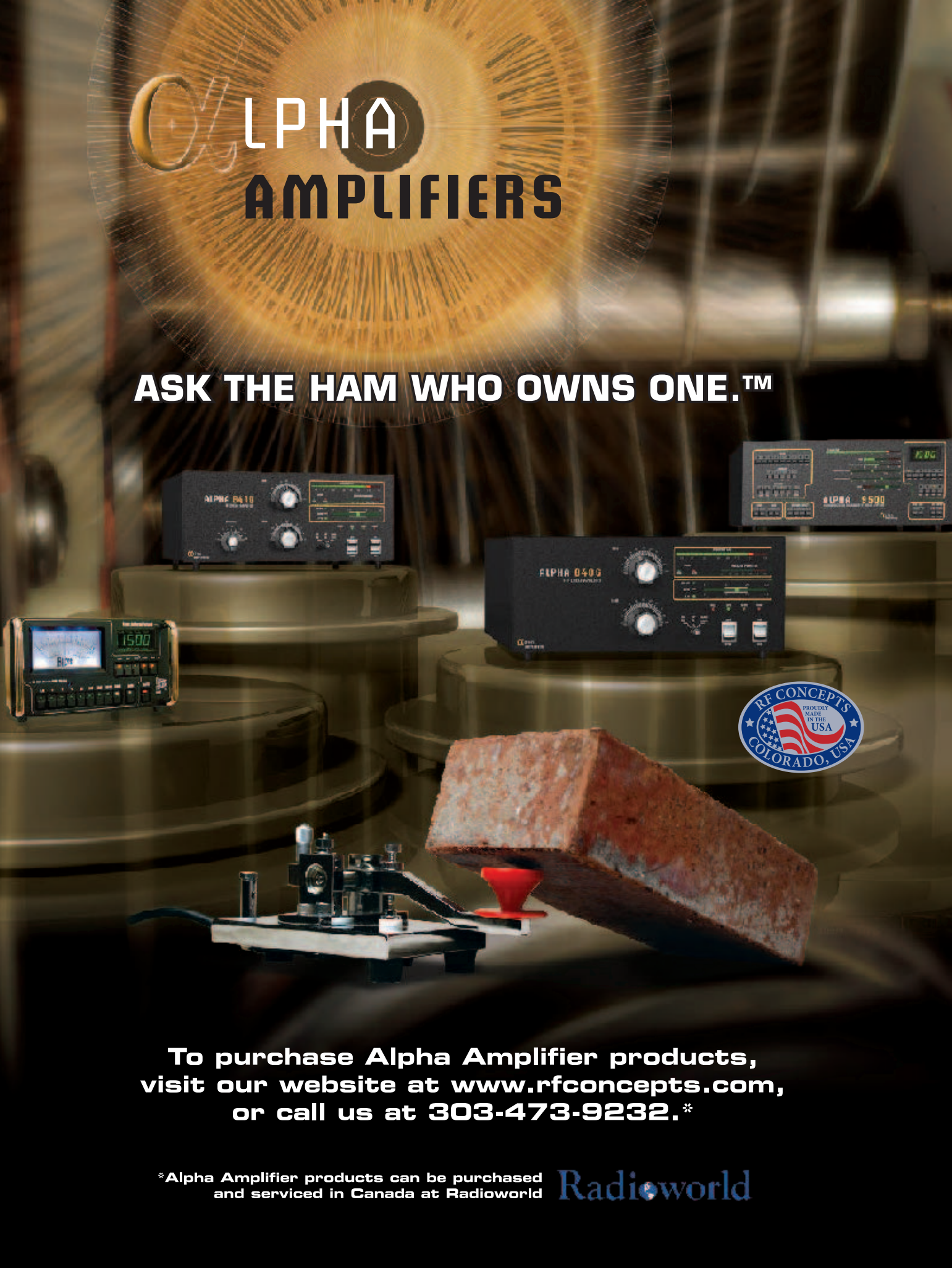
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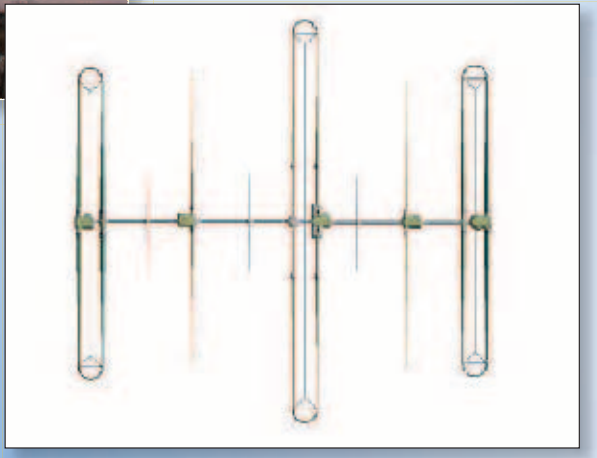

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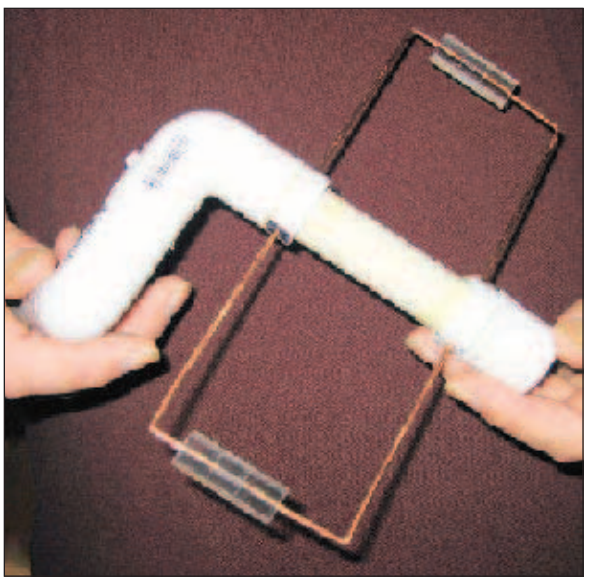
Moxon Mighty Mite

Tiny terrestrial TV antenna pulls in over-the-hill stations and shows promise for the 70 cm band.

J. Barry Shackleford, W6YE



"But it's so small," exclaimed my wife when I showed off my solution for recapturing the local programming that had disappeared from our satellite TV provider. The programming was switched to a digital TV subchannel and our only recourse was to use a terrestrial antenna. I knew from experience during pre-satellite days that reception would be problematic due to our hilly location.

Somewhat apprehensively, I plugged the tiny Moxon antenna into the ATSC terrestrial antenna input of the tuner supplied by our satellite TV provider. This was plan C and reputations were at stake here — mine, and by proxy, that of the ARRL. After some fiddling with the three axes of the antenna mount that I had cobbled together from PVC pipe fittings, a glorious digital TV picture appeared on the screen — reputations saved!

Levity aside, it's hard to beat the price performance of this antenna that can be built for pocket change, requiring only a few feet of #12 AWG house wire and some PVC parts.

Before describing the construction of this UHF Moxon, we'll look at some background and design aspects of the Moxon antenna and Amateur Radio applications in the 70 cm band.

The Moxon Antenna

The shape that amateurs identify as a "Moxon antenna" is actually one of a number of configurations that Les Moxon, G6XN (SK), referred to as "two element close-spaced beams."[1] The Moxon made its *QST* debut in an article by L.B. Cebik, W4RNL (SK), in which he discussed design parameter variations and their effect on performance.[2] L.B. called his antenna a "Moxon rectangle" — perhaps to distinguish it from the other shapes described in Moxon's book.

The year after he first introduced the Moxon rectangle in *QST*, L.B. described Moxon VHF/UHF satellite receiving antennas.[3,4] His 435 MHz antenna was constructed using #12 AWG house wire and PVC tubing.

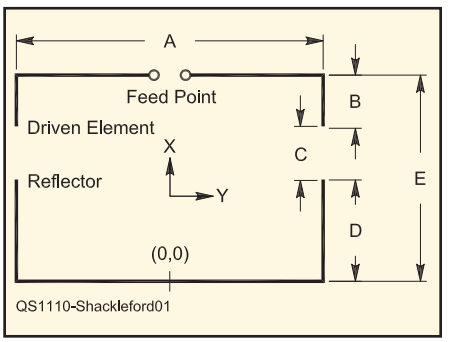


Figure 1 — Moxon antenna schematic. The coordinate system (main lobe on x-axis) and dimensions A–E are those used by the *MoxGen* antenna synthesis tool.

MoxGen

Dan Maguire, AC6LA, used an algorithm by Cebik to create a free downloadable tool called *MoxGen* that calculates the antenna's dimensions as a function of frequency and element diameter.[5] The tool also generates both *EZNEC* and *NEC* models.[6]

Cebik's algorithm targets antennas that have a Z_0 of 50 to 54 Ω, a reactance of less than 1 Ω, a free-space gain in the range of 5.95 dBi to 6.05 dBi and a front to back ratio (F/B) greater than 35 dB.

His methodology considered a range of conductor diameters from 10^{-5} to 10^{-2} λ. He created seven antenna designs that met his target criteria logarithmically spaced across this range. He then used a mathematical technique known as regression analysis to "fill in the space" between the seven discrete designs.[7]

Regression analysis simply tries to fit a continuous curve through a series of data points with a minimum of error. The continuous curve can then be represented by a simple equation, allowing antenna dimensions in the design range to be readily calculated.

Dimensional Sensitivity across the 70 cm Band

MoxGen dimensions are listed to the nearest 0.01 inch. I was not sure how critical these dimensions are, so I created three *EZNEC* models for a 435 MHz antenna — M0, M1 and M2:

- M0 served as the baseline and used unmodified dimensions from *MoxGen*.
- M1 was used to explore the antenna's sensitivity to variation of a single dimension. I varied the end point of dimension B nearest the gap, with all other end points unchanged.
- For M2, I flipped a coin to add either +0.1 inch or –0.1 inch to the x and y coordinates of the corners and end points of the M0 model. This represented a build with "relaxed tolerances."

For the baseline model, M0, the dimen-

[1]Notes appear on page 33.

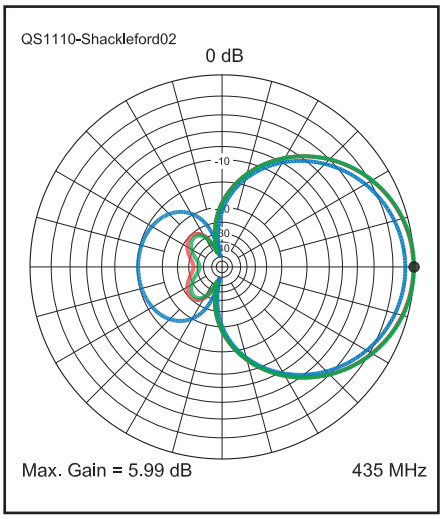


Figure 2 — Free space *EZNEC* composite azimuth plots for M0 (red), M1 (green) and M2 (blue).

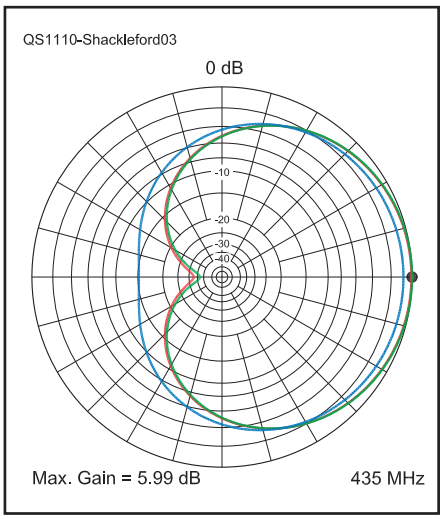


Figure 3 — Free space *EZNEC* composite elevation plots for M0 (red), M1 (green) and M2 (blue).

sions in inches as shown in Figure 1 were A = 9.73, B = 1.25, C = 0.49, D = 1.88 and E = 3.62, where E = B + C + D. The maximum free-space gain was 5.93 dBi with a F/B of 32.69 dB. The free-space Z_0 was 53.78 –*j* 1.307 Ω. The composite free space azimuth and elevation plots for the three cases are shown in Figures 2 and 3.

SWR plots for M0 and a variation with 0.25 inch diameter elements are shown in Figure 4. As would be expected, the implementation with larger diameter elements has a greater SWR bandwidth. However, somewhat surprising is the downward shift of the optimum SWR point away from the design frequency of 435 MHz (approximately 1 MHz for #12 AWG wire and 9 MHz for 0.25 inch rod). This may be due to the curve-fitting algorithm and approaching the 10^{-2} λ element-diameter limit of the data set. Figure 5 shows the F/B variation for the two implementations.

Figure 6 illustrates the effect of ground on the antenna. Realistically, this can only be considered an approximation since minor variations in the ground angle, buildings and even automobiles parked in the neighborhood will have a significant effect on the pattern. Once the antenna is properly aimed at a fixed station, however, you can count on 5 or 6 dB over the free-space maximum gain.

For the M1 experiment, the length of the B segment was varied in 0.01 inch steps from 2.34 inches to 2.47 inches straddling the *MoxGen* nominal length of 2.37 inches. The maximum gain and front/back ratio was noted for each length. Figure 7 is a plot of F/B vs the B segment length. In the vicinity of the M0 baseline a variation of 0.01 inch the B segment length results in nearly a 1 dB change in the F/B. The maximum F/B occurred with a length of 2.43 inches. At this length the Z_0 was 49.88 – *j*10.84 Ω and the gain was 5.99 dB. Over the experimental range the gain varied linearly from 5.90 dB at 2.34 inches to 6.03 dB at 2.47 inches.

For M2 there are 2^{16} – 4 possible geometry perturbations possible in the x-y plane by the method I described above. The "4" represents diagonal displacements of the baseline model that do not alter the geometry. For this particular instance, the gain was reduced to 5.19 dBi and the F/B was reduced to 13.42 dB.

It seems from these few trials that if you are only interested in forward gain then adequate gain can probably be had with fairly loose construction tolerances. However, if you want to realize the full potential of the antenna then fairly tight construction tolerances appear necessary. Don't despair — in the Construction section (see **www.qst-in-depth**) I'll describe some machinists' techniques that will enable you to build to 0.01 inch tolerances with hand tools.[8]

Feeding the Moxon

The Moxon is an inherently balanced antenna, yet the applications that I have seen only feed it with unbalanced coax. I'm sure that the fact that it can be designed to have a 50 Ω impedance has a lot to do with this.

John Stanley, K4ERO, recently described a class of "hairpin" balanced antenna system tuners that perform well in the 70 cm band.[9] John pointed out that parallel feed lines such as open wire line can outperform large diameter coax, and do so at a fraction of the cost. He posed the question: If balanced tuners were available, would ladder line be as popular at VHF (and, by implication, the 70 cm band) as it has become at HF? I believe the question is worthy of consideration. If you think about it from a cost perspective, feeding an antenna that cost pennies with low-loss coax that can cost several dollars per foot really does not seem like a "balanced" arrangement.

At UHF, line loss and SWR are more critical than at HF and should be considered if

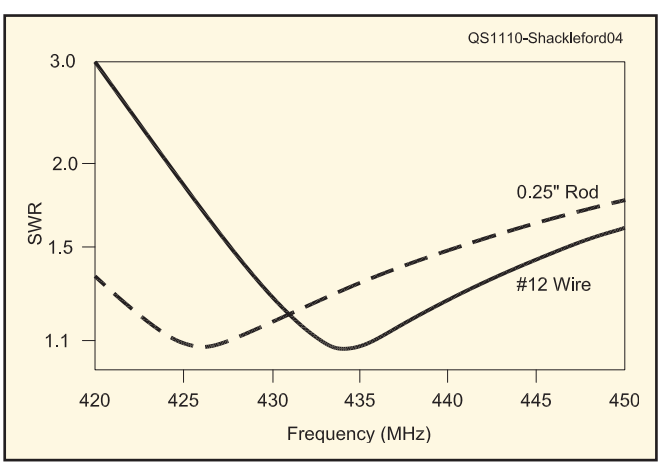


Figure 4 — SWR plots for two *MoxGen* designs targeted at 435 MHz.

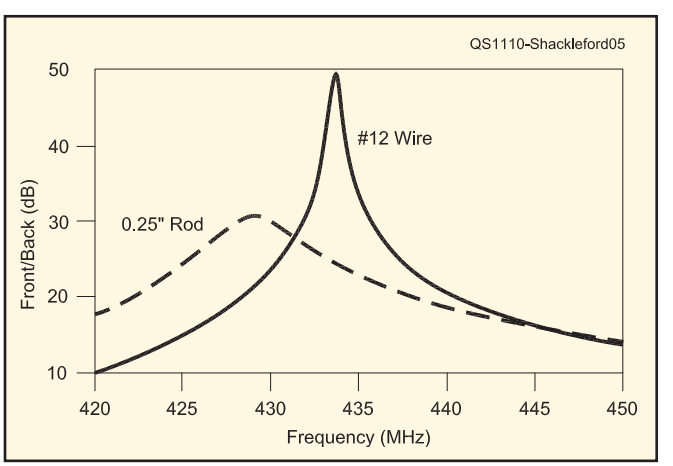


Figure 5 — F/B plots for two *MoxGen* designs targeted at 435 MHz.

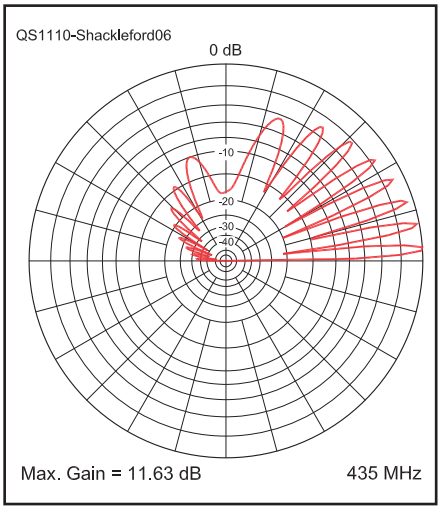


Figure 6 — Elevation plot for M0 over real ground. The height above ground was 4 wavelengths or 108 inches.

feeding a Moxon in the 70 cm band. Figure 8 shows three possible feeding schemes for a 435 MHz Moxon that we'll look at below:

(A) 50 Ω coax augmented with a ferrite bead common mode choke;

(B) a hairpin tuner driving a 300 Ω balanced open wire line with a transition to 50 Ω at the antenna via a 122 Ω quarter wave transmission line transformer; and

(C) a hairpin tuner driving the 300 Ω balanced open wire line as in (B), but with a fixed-value hairpin tuner at the antenna to transform the 300 Ω Z_0 of the open wire line to the nominal 50 Ω Z_0 of the Moxon.

Coax (Figure 8A) is certainly the most popular method of driving a Moxon. Ferrite beads strung on the coax at the antenna will help to mitigate current flow on the outside of the coax shield, preventing the shield from radiating and distorting the antenna pattern.[10] At 435 MHz, however, cable attenuation can be significant even if matched. Referring to *The ARRL Antenna Book*, Chapter 24, Figure 23, the loss of RG-8 is approximately 6 dB per 100 feet.[11] Since the SWR is probably less than 1.5, we can ignore the additional loss due to SWR as shown in Figure 14 of the same chapter. [But make sure the coax is really matched at the antenna end, or the loss can get much higher. — *Ed.*]

Reducing the loss further requires the use of coax hardline, which, as noted earlier, can be fairly expensive. Again referring to Figure 23, the loss for matched ½ inch 50 Ω hardline at 435 MHz would be approximately 1.9 dB per 100 feet.

Open wire line (Figure 8B) can also be used to feed the Moxon at 435 MHz. However, a matching arrangement such as the hairpin tuner is needed to match the 50 Ω output of the transmitter to the 300 Ω impedance of the open wire line. At the antenna end of the line, a quarter-wave transformer is used to match the open wire line to the Moxon. The Z_0 of the quarter-wave transformer should be $(300 \times 50)^{0.5}$, or about 122 Ω.

At 435 MHz, a quarter wavelength is only about 17.2 cm or slightly more than 6¾ inches. As shown in Figure 9, the 122 Ω quarter wave section could variously take the form of:

(A) dual coax section (in this case it may be easier to fabricate the open wire line to match either the 200 or 450 Ω impedance of the transformer;

(B) strip lines on a PC board;

(C) parallel conductors with a D/d ratio of about 1.57, with D the center-to-center spacing and d the diameter of the conductors; or

(D) a single coaxial conductor with a D/d ratio of 7.7, with D in this case the inside diameter of the outer conductor and d the outer diameter of the inner conductor.

Other impedances and ratios can be determined graphically or calculated directly.[12] For closely spaced parallel conductors the impedance is more accurately calculated as 120 arccosh (D/d) rather than the more common formula 276 log (D/d).

Hamspeak

ATSC — Set of standards developed by the Advanced Television Systems Committee for digital television transmission

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

SWR — Standing wave ratio. Measure of how well a load, such as an antenna, is matched to the design impedance of a transmission line.

UHF (Ultra-high frequencies) — The radio frequencies from 300 to 3000 MHz.

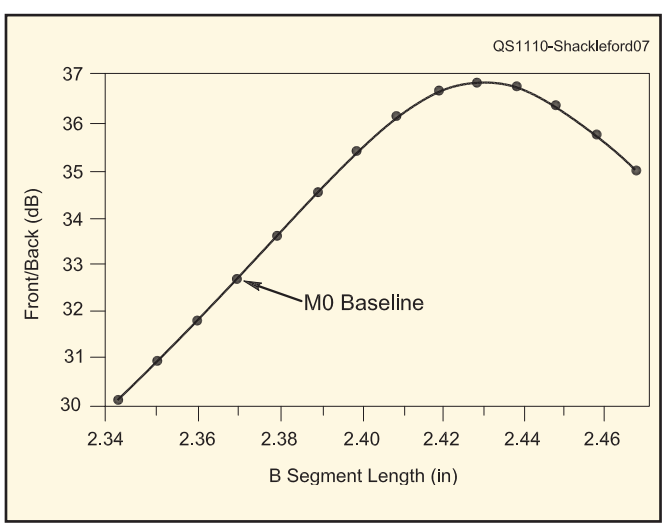


Figure 7 — A variation of 0.01 inch in the length of the B segment can result in nearly a 1 dB change in F/B.

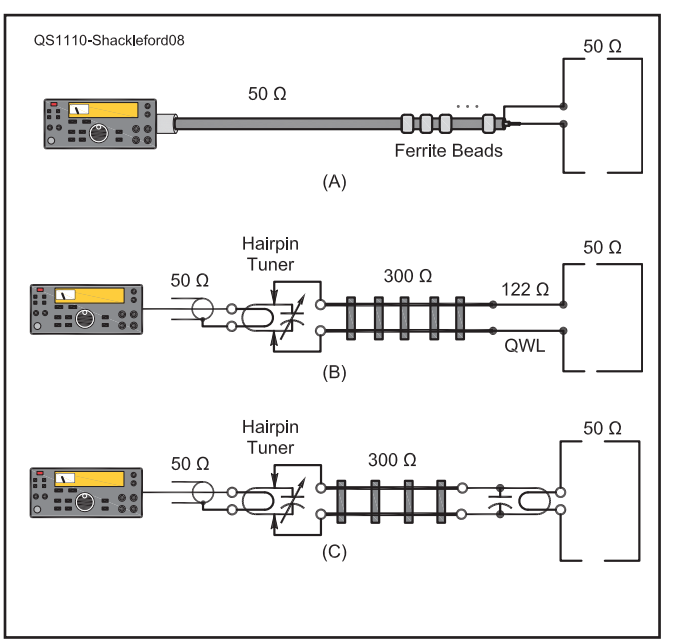


Figure 8 — UHF Moxon feed: (A) coax; (B) hairpin tuner, open wire line, quarter wave line; (C) fixed hairpin tuner replaces the quarter wave line.

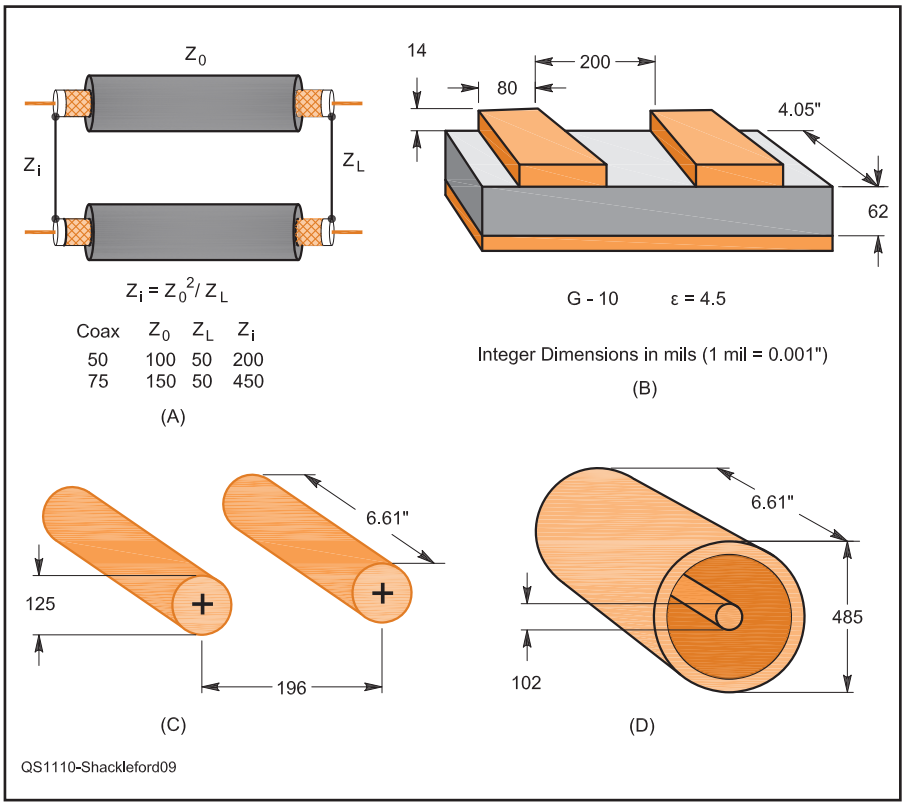


Figure 9 — Various quarter wave transformers: (A) parallel coax; (B) microstrip; (C) parallel lines; (D) air dielectric coax.

The characteristic impedance of a coaxial line with an air dielectric between conductors is 138 log (D/d).

To calculate the loss of this feed system, we'll consider the losses of each of the components: the hairpin tuner, the cable attenuation of the open wire line, the radiation loss of the open wire line and the quarter wave transformer.

The hairpin tuner loss as measured by John is about 0.6 dB.

The cable attenuation of the open wire line can be determined by *TLW*, or an online calculator such as the one at **vk1od.net/calc/tl/twllc.htm**.[13] The attenuation for 300 Ω #12 open wire line is 0.786 dB per 100 feet. Higher Z_0 open wire line will have less loss.

Radiation loss from open wire line was discussed in Experiment 96 of *QST*'s Hands-On Radio column.[14] If we substitute $I^2 \times R$ for the radiated power and divide both sides of the equation by $I^2 \times R$ where R is the characteristic impedance Z_0 of the open wire line, we get an expression for the relative loss of the line that varies from 0 (none) to 1 (total): $160 (\pi \times D/\lambda)^2 / Z_0$, where D is the center-to-center spacing of the open wire line and λ is the wavelength in the same units as D. For our example, the relative loss would be $160 (3.14 \times 0.5/26.25)^2 / 300$ or about 0.0019, which is about 0.008 dB, or for our purposes, negligible.

The loss of the quarter wave transformer section is also small — probably less than 0.2 dB.

A fixed hairpin tuner (Figure 8C) can be substituted for the quarter wave transformer to match the open wire line to the Moxon antenna. The open wire line is shorted in the form of a loop and comprises one of the components of the tuner. A fixed capacitor is placed across this loop and the coupling is adjusted by varying the overlap with that of the loop associated with the antenna. John measured the loss at about 0.3 dB.

The use of a hairpin tuner with a balanced feed line opens up design regions in which the Moxon is no longer 50 Ω-resonant, but may have enhanced performance as demonstrated by the M1 experiment.

UHF TV Application

I used *MoxGen* to calculate the dimensions for channel 27, which is assigned the band from 548 MHz to 554 MHz.[15] I arbitrarily chose the center of the band, 551 MHz, as the working frequency for *MoxGen*, even though the ATSC carrier is listed at 549.31 MHz. It's worthwhile to check the actual channel that your local tation is using (our "channel 26" uses channel 27).[16]

Construction

Detailed construction information is provided in the version on the QST-in-Depth website.

Acknowledgment

I owe a special note of thanks to John Stanley, K4ERO, for his efforts in reviewing this article and for the many excellent suggestions he provided. The section on feeding the Moxon would not have been possible without John's ideas, the experiments he graciously performed and his ever patient tutelage.

Notes

[1]L. Moxon, G6XN, *HF Antennas for All Locations*, 2nd ed, RSGB, 1993, Chapter 5.
[2]L.B. Cebik, W4RNL, "Having a Field Day with the Moxon Rectangle," *QST*, Jun 2000, pp 38-42.
[3]L.B. Cebik, W4RNL, "A Simple Fixed Antenna for VHF/UHF Satellite Work," *QST*, Aug 2001, pp 38-41.
[4]L.B. Cebik, W4RNL, Technical Correspondence, *QST*, Oct 2001, pp 78-79.
[5]**www.ac6la.com**
[6]Several versions of *EZNEC* antenna modeling software are available from developer Roy Lewallen, W7EL, at **www.eznec.com**.
[7]**www.cebik.com/content/a10/moxon/moxgen.html** (registration required).
[8]**www.arrl.org/qst-in-depth**
[9]J. Stanley, K4ERO, "Hairpin Tuners for Matching Balanced Antenna Systems," *QST*, Apr 2009, pp 34-36. Also reprinted in J. Hallas, W1ZR, *The ARRL Guide to Antenna Tuners*, 2010, Chapter 15, pp 17-19. 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**.
[10]J. Hallas, W1ZR, "Getting on the Air — Feeding a Balanced Antenna with Coax Cable," *QST*, Jan 2011, pp 61-62.
[11]R. D. Straw, Editor, *The ARRL Antenna Book*, 21st Edition. Available from your ARRL dealer or the ARRL Bookstore, ARRL order no. 9876. Telephone 860-594-0355, or toll-free in the US 888-277-5289; **www.arrl.org/shop**; **pubsales@arrl.org**.
[12]*Reference Data for Radio Engineers*, 6th Edition, Howard S. Sams, 1975.
[13]*TLW* (transmission line for windows) software is one of many provided with *The ARRL Antenna Book*, 21st Edition (see Note 10).
[14]H. W. Silver, NØAX, "Hands-On Radio — Experiment 96, Open Wire Transmission Lines," *QST*, Jan 2011, pp 59-60.
[15]**en.wikipedia.org/wiki/Television_channel_frequencies**
[16]**www.fcc.gov/mb/engineering/maps/** (stations in your area, interactive maps).

ARRL member Barry Shackleford holds an Amateur Extra class license and is an ARRL Technical Advisor. He has BSEE, MSEE degrees and a PhD in computer science. Barry is a retired Department Scientist from Hewlett-Packard Laboratories with more than 20 technical publications and over 30 US and international patents issued or pending. You can reach him at **w6ye@arrl.net**.

Automating the Ameritron RCS-10 Remote Antenna Switch

Let your radio's computer port make sure you're on the right antenna.

Pete Smith, N4ZR

Sooner or later, as your ham radio interests expand, you'll want more than one antenna. You can run a coaxial cable for each one from the shack out to wherever your antennas are, but pretty soon that gets expensive. A number of manufacturers have met this need with remote antenna switches. These use a control box in the shack, a relay box outside that does the switching, a single coaxial cable to the relay box and a control cable between the control box and the relay box.

Auto is Better

Okay, so now you've decided to install a remote antenna switch. Why *automate* antenna switching? Well, as soon as you have more than one antenna, there's always the chance that you will select the wrong one. Have you ever called and called a DX station, only to discover that you were on the wrong antenna? Have you ever heard a high voltage arc in your amplifier, and only then realized that you had the wrong antenna connected? If you have (and I have, often), you can understand why it would be nice to have the security of knowing you're on the right antenna, particularly when you're DXing or contesting.

Recently, I bought an Ameritron RCS-10 remote antenna switch. This unit offers remote antenna switching for up to eight antennas. It also can respond to binary encoding. The use of binary encoding makes it possible to use ordinary four conductor telephone wire instead of expensive seven or eight conductor cable between the controller in the shack and the remote relay box. See the sidebar for an explanation of how binary coding works.

When I got the RCS-10 in hand, I started

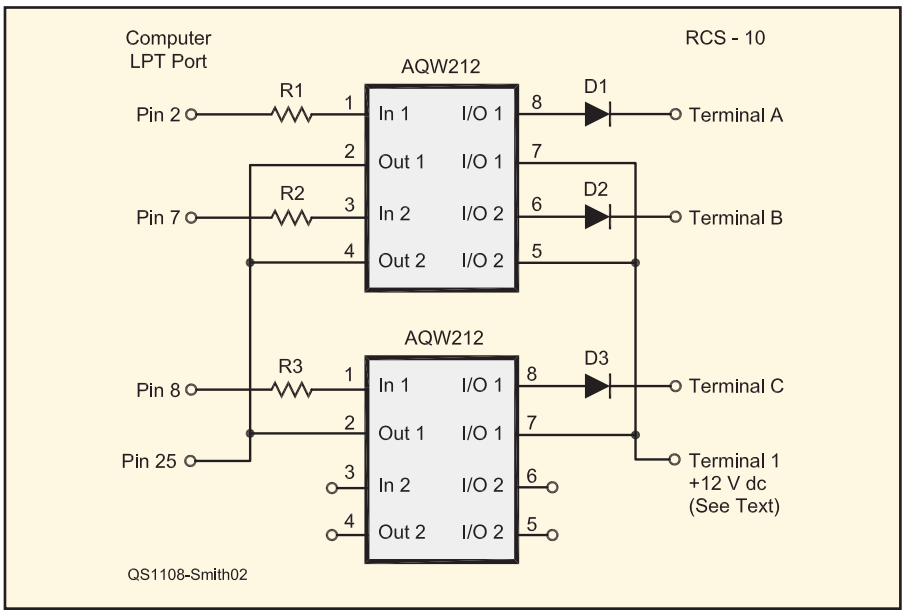


Figure 2 — Schematic and parts list of the binary driver unit. Mouser parts are available at www.mouser.com.

D1-D3 — 1N4001 diodes.
R1-R3 — 470 Ω to 1 kΩ, ½ W. Adjust as needed for reliable operation, depending on cable length and wire size.
U1, U2 — NAIS AQW212 solid state relay (Mouser 769-AQW212).

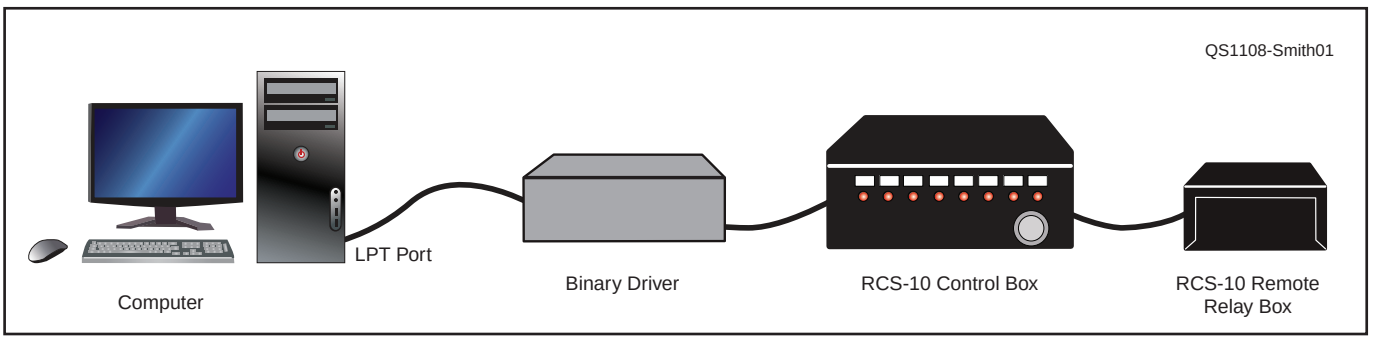


Figure 1 — Block diagram shows where the binary driver fits into the station.

Figure 3 — The binary driver unit. The DIN jack input from the computer is on the bottom, while the diode-isolated outputs are at the top. The solid state relays are the two small 8 pin ICs in the center of the perfboard.

What Is this Binary Thing, Anyway?

Binary is a method of encoding numerical data in which each digit is represented by its own binary sequence — that is, by a series of 1s and 0s. While it can be used to represent very large numbers, in this case we are only interested in switching up to 8 antennas, so a single 3 digit "word" will work. Three binary digits give you a total of 8 possible values, ranging from 000 (0) to 111 (7). If you had more wires available between your control box and the relay unit, you could switch many more antennas. For example, five (four signal plus a common) wires would permit up to 16 combinations from 0000 (0) to 1111 (15), but for most of us, eight antennas are enough.

As Table 1 illustrates, applying 12 V dc to one or more of three control lines, with a common ground reference, gives eight unique combinations to control the RCS-10's relay box. The relay box then uses a clever relay configuration to "decode" and select one of eight antennas. The antenna 1 position (code 000) is used to select automatic operation.

Table 1
Logic Table

Terminal	*Ant 1*	*Ant 2*	*Ant 3*	*Ant 4*	*Ant 5*	*Ant 6*	*Ant 7*	*Ant 8*	*Current*
A	0	1	0	1	0	1	0	1	160 mA
B	0	0	1	1	0	0	1	1	80 mA
C	0	0	0	0	1	1	1	1	40 mA

Note: The terminals A, B and C are on the RCS-10 control box, and also connect to the cable going to the relay switchbox. The fourth conductor is common. "1" means that 12 V dc is sent to the relay box, while "0" means that no voltage is supplied.

thinking about ways to automate it. Most logging software, as well as Kenwood, Yaesu and Elecraft radios, provide band information in binary format, the same as that used by the RCS-10. I thought it should be possible to manage automated band-switching without the expense of a separate band decoder.

There's this Little Problem

Of course, there are always a few complications. In this case, the binary information provided by the parallel port on my computer (or by my radio) was at 3.3 V dc and low current, while the RCS-10 needed 12 V dc and up to 280 mA. After some thought and consultation with knowledgeable friends, I came up with a design to do this job.

The trick was to convert these low-level signals to binary and supply enough current to drive the remote relay box. I also wanted to provide a measure of electrical isolation between the computer port and the antenna switch. The solution was to use two NAIS AQW212 solid state relays, each an 8 pin DIP that contains two optical isolators. The difference here is that the output sides of the isolators are MOSFET transistors, arranged so that they can switch either ac or dc at up to 600 V. At 12 V, each section can handle 350 mA, plenty for our purposes. One optical isolator is left over, but could be used for other purposes, of course, such as transceiver PTT or CW keying

The rest of the circuit is downright simple. Figure 1 is a block diagram, showing where the binary driver fits between the computer and the RCS-10 control box. Figure 2 is the schematic diagram of the binary driver. Current limiting resistors keep the input current demand low, while diodes on the output isolate the switching circuitry from the RCS-10 if manual switching is in use. The required relay voltage is provided from the RCS-10, which has a one-of-eight voltage output for use with band-pass filters and other remote devices. In the ANTENNA 1 position, 12 V dc is provided to the automated switching, while no power is provided in any other position. This avoids any risk of confusing the relay box with conflicting messages.

In Practice

As shown in Figure 3, construction is not critical. I built the circuit on a piece of junk perforated board and placed it in a small

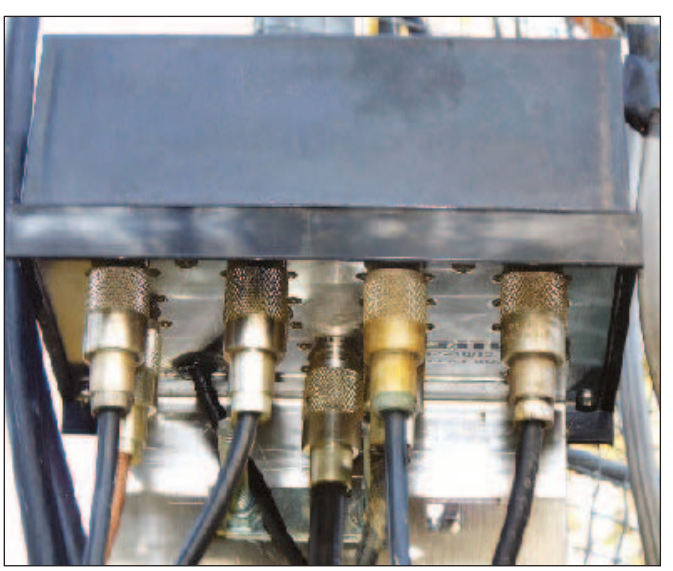


Figure 4 — Close-up of the RCS-10 remote relay box, with cables attached and ready to go.

Figure 5 — The RCS-10 remote relay box, mounted on my tower.

Minibox enclosure. A DIN jack accepts the input signals from pins 2, 7 and 8 of the LPT (parallel) port. This was the standard set by *NA* and *CT* logging software eons ago, and it is universally accepted. The bigger black cube in the photograph is part of another circuit that I built into the same box.

Figure 4 shows the remote relay box, with my five antenna cables attached, a single coax from the shack and the control cable. It is mounted at eye level on my tower for easy maintenance as shown in Figure 5.

With monoband antennas, the digital signals from the radio or computer correspond directly with the requirements of the band selection logic of the RCS-10. For use with a tribander or other multiband antenna, it's a little trickier — you would need to use logging software that allows more flexibility in the codes that are sent from the computer. For example, to select a tribander, you would need to tell the computer to send the same code word for 20, 15 and 10 meters. *N1MM Logger* and the *DXLab Suite* allow you to specify the meaning of each code word; other logging programs may also, but these are the ones I am familiar with.

Cost of the two ICs is about $15 — the rest of the parts came out of my junk box. Comparing that to the price of a conventional band decoder is pretty gratifying. In the process, you can learn about BCD encoding and optical isolators — and build something useful for your shack.

ARRL member Pete Smith, N4ZR, was first licensed at age 13 in 1954 as WN8QZR. He earned his Amateur Extra class license and received his current call in 1977. He operated abroad as HL9TM and 3B8DT during 15 years in the US State Department. He became interested in computer applications for Amateur Radio in the mid 1980s and wrote and marketed contest logging software for the Commodore 64 computer.

Pete retired as Director of International Relations for NASA in 1996. His primary Amateur Radio interests are HF contesting (mostly CW), ham radio software and writing about contesting. He writes the Reverse Beacon Network (RBN) blog (**reversebeacon.blogspot.com**)*, maintains the World HF Contest Station Database* (**conteststations.com**)*, and was the Contesting Software columnist for* National Contest Journal (NCJ) *from 2004 to 2010. He is also a member of the Potomac Valley Radio Club.*

You can reach Pete at 96 Willow Well Ln, Kearneysville, WV 25430 or at **n4zr@contesting.com**.

New Products

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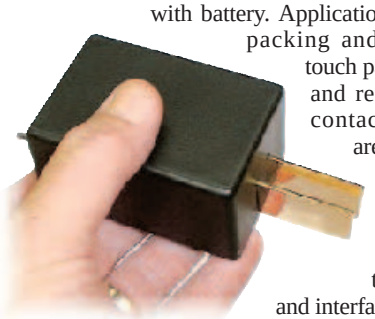
♢The MiniTouch Paddle, Model P6, is a small and responsive touch paddle that measures 2 × 3.5 × 1.5 inches and weighs 4.5 oz with battery. Applications include field use, backpacking and mobile operation. The touch paddles have zero movement and require no adjustment or contact cleaning. Paddles are solid metal with an easy-to-clean gold plating. Model P6 operates from an internal 9 V battery, draws 1.4 mA and interfaces with any logic level input to an electronic keyer. Price: $45. For more information or to order, visit **www.cwtouchkeyer.com**.



HEIL ELITE SERIES MICROPHONE

♢Heil Sound introduces the Gold Elite dual element microphone for use with AM, FM, and SSB transceivers. The WIDE position is specified for 60 Hz to 16 kHz response with +4 dB midrange peak at 2.5 kHz to produce clear speech articulation. The NARROW position selects the new Heil HC 5.1 element with response focused on midrange speech articulation while rolling off the low end response at 200 Hz. A "soft touch" PTT switch provides smooth, noise-free transmitter control. The diecast body is finished in matte black lacquer and topped with a gold grill. The mic requires the Heil CC-1 mating connecting cable. Price: $160. For more information, visit **www.heilsound.com**.

RIGBLASTER ADVANTAGE RADIO INTERFACE FROM WEST MOUNTAIN RADIO

♢The RIGblaster Advantage from West Mountain Radio features a simplified PC interface and expanded rig control radio compatibility. This new addition to the RIGblaster product line incorporates an internal sound card; single plug-and-play USB cable connection to PC for audio, rig control and power; rig control interface for CAT/CI-V as well as RS232 through a DB9 port; and front panel mounted transmit power level, receive audio level and VOX delay adjustment knobs. Price: $200 including cables. For complete product details, go to **www.westmountainradio.com**.

A Receive-Only Antenna Adapter

If your transceiver doesn't have one, this simple adapter will add the capability.

Gerald Fasse, W8GF

Today's low to mid-price HF transceivers offer performance and features that were not even available a few years back. I recently upgraded my station transceiver to a Yaesu FT-950 HF and 6 meter transceiver. I have been very happy with it in almost all regards. It shouldn't be a surprise, however, that the lower priced radios can't offer all the features of their top of the line brethren. One feature I miss that some higher priced units offer is the capability to use separate antennas for receiving and transmitting. The FT-950 transceiver is typical of many in its price range in this regard.

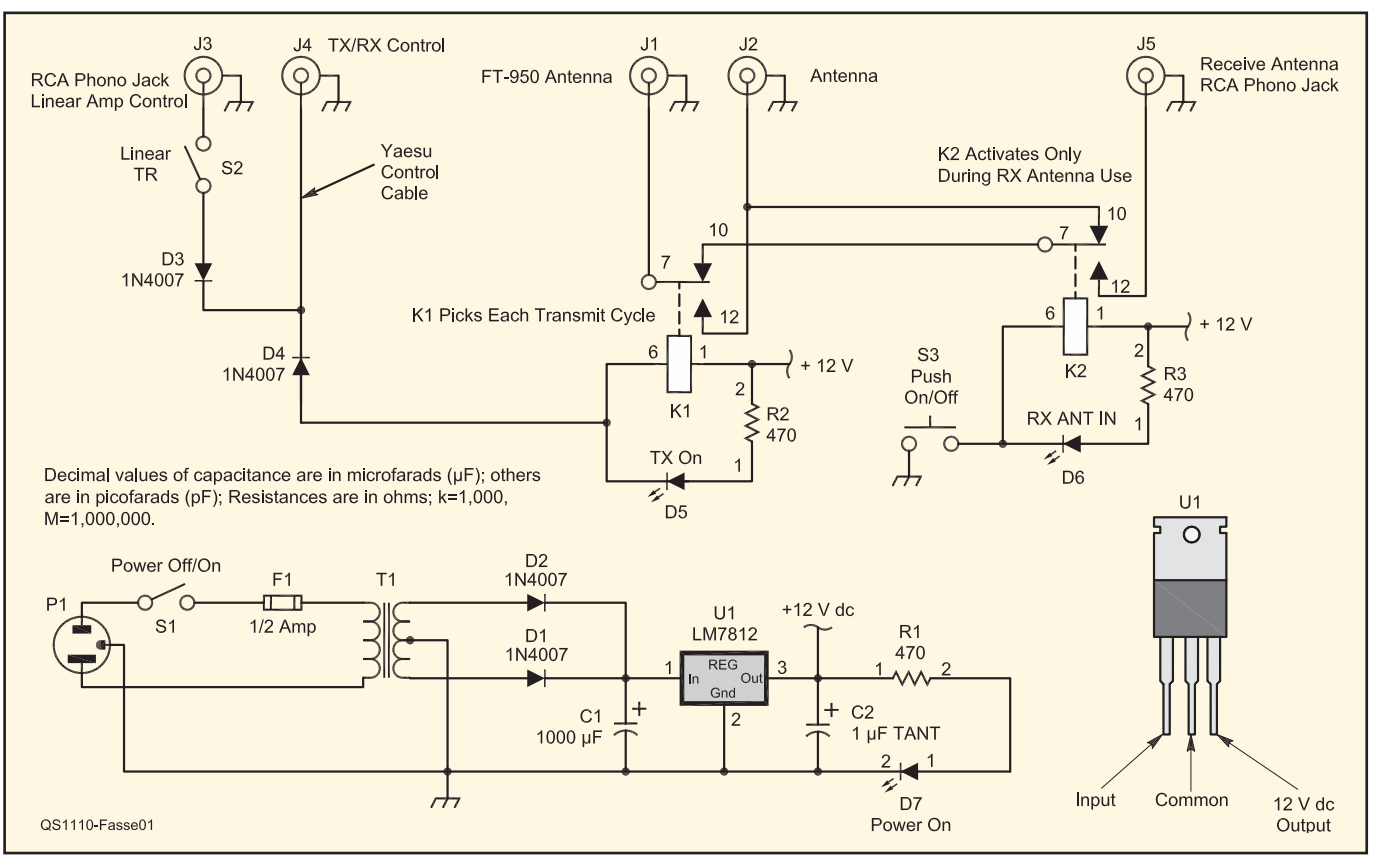


Figure 1 — Schematic diagram and parts list for the receive antenna adapter. Parts are available from Mouser at www.mouser.com.

C1 — 1000 µF, 25 V electrolytic capacitor.
C2 — 1 µF, 16 V tantalum capacitor.
D1-D4 — Silicon diode, 1N4007 or equivalent.
D5-D7—LED indicators; see text.
J1, J2 — UHF single hole mount jack.
J3-J5 — RCA type jack.
K1, K2—SPST relay (Omron G6E-134P-ST-US-12 — see text).
R1-R3 — 470 Ω, ½ W resistor.
S1, S2 — SPST toggle switch.
S3 — SPST push-button switch.
T1 — Power transformer, 28 V ct, 100 mA.
U1 — LM7812 voltage regulator.

Why Separate Antennas?

Many amateurs happily operate for years using the same antenna for transmission and reception. In fact, using the same antenna for both is almost always the recommended approach for the higher portion of the HF spectrum where taking advantage of an antenna's directional characteristics during reception and transmission can be an advantage.

For those trying to work weak signals on 160 meters and the lower HF bands, however, the situation can be different. On those bands an antenna that works well for transmission may not be the best choice for reception. Specialized receive antennas for the lower frequencies typically have less gain than a transmitting antenna, but are designed to pick up even less noise resulting in an improved signal-to-noise ratio (S/N).

Such antennas come in a number of flavors. The first may have been the *Beverage*, a terminated wire mounted close to the ground and usually multiple wavelengths long.[1] For those without the needed real estate for a Beverage, there are a number of compact alternatives that can fit in a small lot and still enhance received S/N.[2,3]

Adding that Receive Port

I decided to construct an antenna adapter that would safely allow the use of an external receive antenna with my transceiver. Essentially the adapter uses a pair of miniature, fast-switching, SPDT signal relays and a few peripheral parts. The miniature switching relays are Omron devices available from Mouser Electronics.

The price is higher for these relays than for some others, but focusing on price was not considered prudent in this application. Less expensive relays were used initially with poor results, including insufficient switching speed compared to the time for the transceiver to come to full output. Relays don't like to be switched while RF power is applied to their contacts. Further, contact resistance was erratic, resulting in erratic external receive antenna function.

The Omron miniature relay part number G6E-134P-ST-US-12 ($3.84 each) was carefully tested and outperformed all others. Switching time of most others tested was in the order of 10 ms while the Omron unit switches in 5 ms. The average power output rise time is slightly beyond 10 ms in my transceiver and most others that I have looked over. Under full break-in CW operation, any relay will get a real test of endurance.

After several months of use, including under DX contest conditions, no problems have been observed. Omron specifications state this relay has a life expectancy of greater than 100,000,000 mechanical operations. Steering diodes D3 and D4 protect the relay contacts in the transceiver from any inductive spikes from the relays being opened.

Shunting relays K1 and K2 with diodes or other means of inductive kick suppression are not used in this application because such diodes have a tendency to retard relay drop out time. LED lamps L1 and L2 together with R2 and R3 help in reducing any residual inductive spikes to a sufficient degree. A good selection for a push-on push-off switch (S3A) is Alco P/N MPA103D04 also available from Mouser. Its ratings are more than satisfactory in this application and it should last many years. A simple SPST toggle switch would also be practical should the builder prefer.

Interface and Design Details

Adapter switching is provided using the ANTENNA TUNER jack on the rear apron of the FT-950 or FT-450. Pin 2 provides a ground connection when the transceivers are in the transmit mode.[4] A single pole toggle switch included on the front panel of the receive antenna adapter and an RCA jack on the rear allows use of a linear amplifier in addition to the adapter switching function. In addition to spike blocking, diodes (D3 and D4) allow dual operation of the antenna tuner jack pin.

If you switch a linear, you should make absolutely sure the linear amplifier control port requirement does not exceed +60 V dc and 200 mA (check the manual for your transceiver if other than the FT-950 to determine your radio's limits). Most modern linear amplifiers meet this specification. Many older units do not!

Two LED indicators are included on the front panel of the adapter. The red LED indicates the transmit function is enabled, while the green LED provides indication of receive antenna operation.

A schematic of the adapter with a parts list is shown in Figure 1. The adapter can be constructed on perf-board easily enough. For those who want a totally finished look, Mouser offers a number of inexpensive instrument enclosure options including their part number 40UB102. Figure 2 shows the completed unit in the enclosure with cover removed. Figure 3 shows the rear panel. This enclosure offers plenty of room and even a beginner should be able to duplicate the adapter with good results.

Power Supply Options

I chose to include a self-contained traditional power supply with transformer and full wave rectifier within the enclosure. It would also be possible to provide the needed dc power through other means.

Hamspeak

Beverage antenna — Long (typically greater than a wavelength) horizontal receiving antenna situated around 6 feet above the ground. Named after the inventor, this antenna is directive, receiving vertically polarized signals that travel along the antenna. Signals are weak, but the noise is even weaker, resulting in an improved signal to noise ratio compared to most more efficient antennas.

Full break-in (QSK) — Radiotelegraph operation in which the sending operator can listen to the channel in between sent dots and dashes. This enables the other operator to "break in" to ask for a repeat or a clarification. It also allows the sending operator to adjust speed or suspend operation in the presence of noise or interference.

Wall wart — Small power supply unit for low power equipment with integral plug for standard ac wall socket. Colloquially named due to its appearance as a protrusion from a wall socket.

[1]Notes appear on page 39.

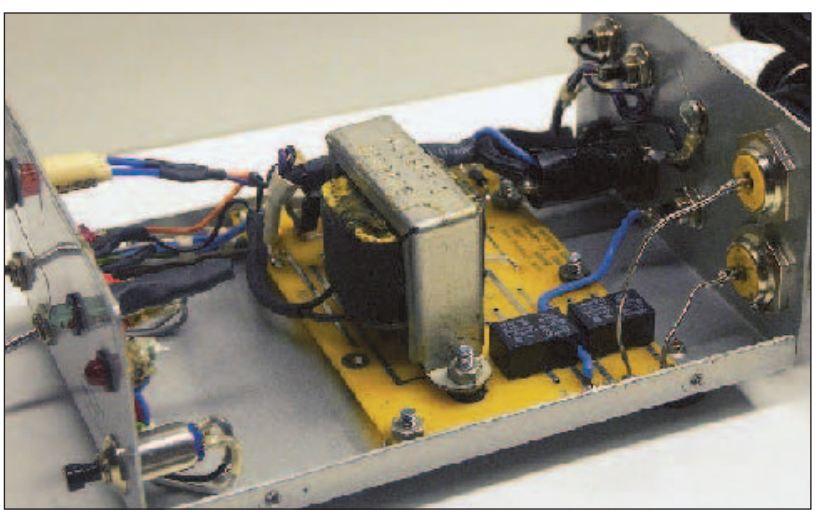


Figure 2 — Inside view of antenna adapter. The front panel is on the left.

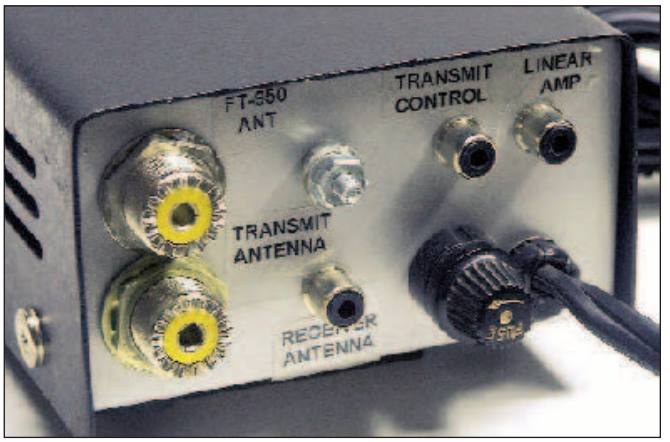


Figure 3 — Rear view of the adapter showing interface connector locations.

One could use an external wall wart instead of the built-in power transformer. The relays require 14 to 18 V dc with reasonable regulation and low ripple. Current requirements are approximately 100 mA. If the wall wart provides the appropriate dc voltage with sufficient voltage regulation, the internal LM7812 regulator could be eliminated along with filter capacitor C1, rectifier diodes D3 and D4. The wall wart dc output should be connected directly to the terminal shown going to the output pin of U1 (LM7812). Capacitor C2 should remain in the circuit. Now, instead of an ac line cord on the rear apron, you will need to add a suitable jack for the wall wart plug.

Another possibility is to snitch the required voltage from the FT-950. Pin 1 of the LINEAR or TUNER connector on the FT-950 rear apron can provide +13 V dc.

A Few Cautionary Notes

■ Do not use this device on the high power side of your linear amplifier. The relays specified will not survive the first dot or syllable of your first transmission. It is strictly intended for use between your transceiver output and antenna or linear amplifier input.

■ Attempting to use this device with vacuum tube era equipment could have unfortunate consequences and is not recommended. This is because power output rise time is not controlled as in more modern solid state equipment and, as noted earlier, hot switching will quickly destroy the relay contacts Also, modern solid-state equipment is designed to fold back RF output in case a high SWR is encountered and this feature is not common with older vacuum tube technology.[1]

On the Air

Now, with this device, I am able to use an external receive antenna (K9AY in my case) and can rapidly switch between antennas to secure the best signal to noise condition. By the way, my shunt loaded 78 foot tower used for transmission provides a better signal to noise ratio than my normal receiving antenna under some low band propagation conditions. Thus the ability to switch quickly between antennas is important.

My other station transceiver has a built-in receive antenna feature and the receive antenna adapter described here works equally well. One point further — many other transceiver types provide a grounded circuit output to control a linear amplifier and can be used to operate the adapter as designed here. Check your user operating manual for details.

Older linear amplifiers are another story. In case of the Heath SB200 and SB220, several modifications are described on the Internet that will allow their use with this receive antenna adapter. Most recent Kenwood and ICOM transceivers are candidates for the adapter described here. It is simply a matter of reviewing specifications to identify control functions etc. I tested my ICOM IC-7000 transceiver with the adapter with good results. If your transceiver has provisions for controlling a linear amplifier it probably will work with this adapter.

Notes

[1]H. Beverage, ex W2BML (SK) and D. DeMaw, W1FB (SK), "The Classic Beverage Antenna, Revisited," *QST*, Jun 1982, pp 11-17.
[2]F. Koontz, WA2WVL, "Is This EWE for You?" *QST*, Feb 1995, pp 31-33. Feedback, *QST*, Apr 1995, p 75.
[3]G. Breed, K9AY, "The K9AY Terminated Loop — A Compact, Directional Receiving Antenna," *QST*, Sep 1997, pp 43-46.
[4]A suitable and simple cable for the FT-950 and FT-450 radios is available on the Internet from several sources including W7YEN at **stores.ebay.com/W7YENs-AMATEUR-RADIO-HELPERS**.

ARRL member and Amateur Extra class operator Gerry Fasse, W8GF, was first licensed as W8UCI in 1954. Later, before he obtained his current call he was W8PX. He is at the top of the DXCC Honor Roll, holds 5BWAZ, 160 Meter DXCC, 6 Meter DXCC, WAC and WAS.

Gerry attended the Electronics Institute of Technology and Wayne University in Detroit. He is a self employed designer of machine tool control hardware and software. You can reach Gerry at 11320 Darla Ct, Warren, MI 48089-1028 or at **w8gf@aol.com**.

Feedback

◊ In "Yet Another Crystal Calibrator — The YACC-1-2-3" [Sep 2011, pp 43-46], the author notes that a couple of errors crept into the article. First, the reference (p 46) to 10 V dc on the base of Q1 referred to an earlier design version and does not apply to this version. For this design, the base voltage will be less than 1 V. Next, in Figure 2, pin 8 of J1 should connect to pin 10 of U1, not to ground. The table of J-1 pin assignments for pin 8 should read CLK Drive P0.3. Also, the U1 part number should read C8051F300. The PC boards are correct and the programmed CPUs provided by the author will be the correct devices. The author notes that he has kits available for either unit at his cost. Contact him at **millerke6f@aol.com** for more information.

◊ The cover type for the article "A Suspended Quarter Wave 40 Meter Vertical Monopole [Aug 2011, pp 34-36], should have said "Only Two Radials Needed for this Wire Vertical."

◊ In "The Doctor is IN" [Aug 2011 pp 50-51], the response to WA2VJL should have indicated that out of phase condition is indeed straightforward, except for the different lengths of coax needed on each band.

◊ In the 2011 ARRL DX Phone Contest Results [Sep 2011, pp 82-87], the Don Wallace, W6AM Memorial Award (World 14 MHz Phone) plaque, sponsored by the Central California DX Club, was left out of the Sponsored Plaques table. The winner of the plaque is HK1X. In addition, the winner of the 7th Call area Single Operator High Power Phone plaque was incorrectly listed as K5RR. The actual winner is K7RL. Finally, two Cuban stations were inadvertently left out of the Top Ten results table. CO2JD earned 5th place World in the Single Operator, 80M category and CO8ZZ earned 10th place World in the Single Operator, 40M category.

◊ *Clarification:* With regard to my July 2011 article ["Gain Twist 75 Meter Mobile Monobander," pp 39-42], the antenna is comprised of both homebrew and commercial components. I use the Hi-Q quick coupler for mounting all my antennas, and my capacitance hat is similar to the Hi-Q eggbeater caphat. — *Jerry Clement, VE6AB*

The Care and Feeding of a 3-500ZG Amplifier

Are you running your amplifier filament voltage too high? This simple fix can extend your amplifier tube life, perhaps by a factor of 10.

Charles Rankin, WA2HMM

Don't you just hate it when the tubes don't light up? The 3-500ZG high power HF triode tube is a work horse. It is a common glass envelope tube that is used in many high power amplifiers. How about having to frequently buy 3-500ZG tubes? Not me — buying a single new one is enough after popping the one in my amplifier. "They ain't cheap." Michael, N9EAO, in "Frugal, Not Cheap" in the March 2010 *QST* Correspondence column, stated he was frugal. I am also frugal.

Finding the Problem

My first thought was that the filament supply had died, but a quick spot check indicated it was working. I checked the drive power level into the amplifier. The input power was not even near the maximum.

Measurements

If it weren't overdriven, the filament voltage was there, and I know VSWR was not the cause — what could it be? Further checking uncovered the following after a few *Google* online searches.

According to Eimac, each 3% increase in filament voltage, above the 4.8 V needed to achieve full power output, will reduce the useful emission life of a directly heated amplifier-tube by 50%. The 3-500ZG is a directly heated amplifier-tube.[1]

Before going any further, let me caution you. High voltage is dangerous, and may be lethal. Meaning it probably *will* kill you — switch to safety! If you are not familiar with working around high voltage, get help from someone who is.

I have an Ameritron AL-80B, a 1 kW PEP output HF linear amplifier that uses a single 3-500ZG. I unplugged the power cord and removed the cover. See Figure 1. Looking at the bottom, the filament choke is in the lower right corner with the black wires connected to it.

- With the use of my meter's clip leads connected to the two black leads from the filament choke, I set out to measure the filament voltage. See Figure 2.
- Keep one hand in your pocket.
- Make sure there is a 3-500Z with a good filament in the socket. Plug the amplifier back in, and place the POWER switch to ON.
- With an insulated rod, depress the INTERLOCK switch and measure the filament voltage with a digital voltmeter of appropriate accuracy. I measured 5.3 V on my 3-500ZG filament connections.
- Release the INTERLOCK switch, place the POWER switch to OFF, and unplug the amplifier.
- Wait at least ½ hour before touching anything in the amplifier. This time should allow the power supply capacitors to discharge. Using an insulated tool, carefully short the plate cap to the chassis. This will discharge any remaining voltage in the power supply capacitors.

The black wires from the choke go to pins 1 and 5 on the 3-500Z socket. When my AL-80B amplifier is operated from 240 V, 60 Hz, the measured 5.3 V exceeds Eimac's maximum filament voltage rating (4.8 V) by

[1]R. Measures, AG6K, "Circuit Improvements for the TL-922," **www.somis.org/922.html**.

Figure 1 — Bottom chassis view of my AL-80B. The filament choke is in the lower right in this photo.

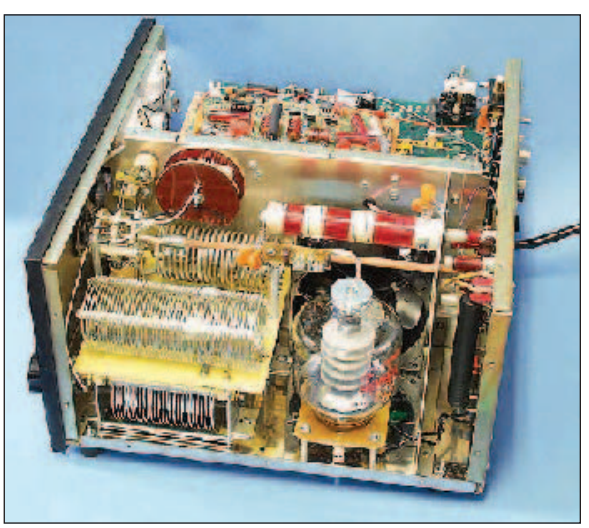


Figure 2 — Measuring the filament voltage at the output of the filament choke.

Figure 3 — Low value filament resistor made from THHN house wire installed at input of filament choke to reduce filament voltage.

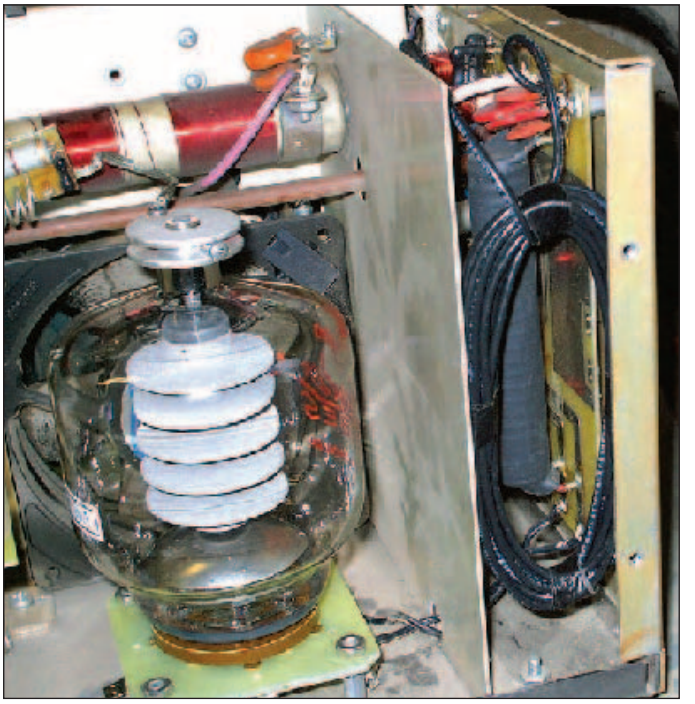


Figure 4 — Final position of the filament resistance wire, connected in series with the transformer side of the filament choke.

0.5 V or 10.4%. Per Eimac's application note, this could shorten the tube life by a factor of around 10. This means buying 10 times as many tubes over the life of the amplifier.

The Fix is In — So How to Reduce the Filament Voltage

The simplistic approach is to reduce the filament voltage by lowering input voltage to the filament transformer. But if you have only one transformer with multiple windings, as is the case in my AL-80B, what to do? If we reduce the input voltage, all the other windings will be affected too.

Placing additional resistance in the output of the filament winding will lower the voltage. We want to get as close to 4.8 V as we can.

This can be accomplished by using the resistance of a length of wire. I used #14 AWG THHN household wire, as that is what I had on hand. I usually use it to build my wire antennas. The only real requirement for the wire is that it can handle the 15 A filament current.

I went to *Google* again, and searched on wire resistance. I found that approximately 12 feet of #14 AWG wire would provide enough series resistance to lower the voltage to 4.8 V. I wound an air core coil, using tape to secure the turns together. There are two white wires. I unsoldered the one closest to the stand-off (AL-80B filament transformer winding). I temporarily installed the coil in the filament line. See Figure 3. [Make sure you put the resistance on the transformer side of the filament choke where a bypass capacitor is also located or it will change the input impedance of the amplifier. — *Ed.*] Returning to the "Measurements" procedures/caution section, I rechecked the filament voltage. It now measured 4.81 V.

Since the resistance of copper increases significantly with temperature, the amplifier should be allowed to reach full operating temperature before a final measurement is taken and the length adjusted as needed.

A more permanent solution was required. First I compressed the coil to make it narrower for a better fit. Then I placed it between the RF section shield and the rear chassis wall, as shown in Figure 4. [Alternately, a commercial wire wound power resistor of the same value will have a much lower temperature coefficient and could be substituted. — *Ed.*]

Photos by the author.

ARRL member and Amateur Extra class licensee Charlie Rankin, WA2HMM, was first licensed in the late 1950s as WV2HMM. He received his Amateur Extra class license later on. He enjoys DXing on the HF bands (current DXCC count of 329) and 2 meter mobile in his cars or pick-up. He works for Motorola, in the Holtsville, New York facility, where he runs the GTEM Lab. (EMI/EMC). He is a charter member of the Symbol Technologies Amateur Radio Club (STARC). Charlie has a US patent for a "Universal Dipole," which is used for testing at wide area network radio frequencies (GSM, DCS, PCS). Charlie can be reached at 165 Hickory La, Smithtown, NY 11787-4429 or at **crankin@dialup4less.com**.

Hamspeak

Directly heated cathode — Vacuum tube in which the filament is also used as the cathode in contrast to an indirectly heated cathode, a separate element that fits over the filament.

Filament — One element of a vacuum tube. The filament is electrically heated, as in the filament of a light bulb, to allow the release of electrons that are controlled by and flow towards other tube elements.

Interlock — Type of automatically actuated switch. In equipment with dangerous voltages, designed to remove voltages if covers removed to protect personnel.

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

THHN insulated wire — Wire designed for ac power distribution in buildings. THHN stands for thermoplastic high heat-resistant nylon coated, describing the composition of the insulating material. The wire itself comes in a number of sizes and can be found either solid or stranded. It is frequently used for antenna construction because of its low cost.

The DK7PE Jumper Beam

Just because you travel doesn't mean that you have to suffer with poor antennas.

Rudolf Klos, DK7PE

Operating out of Africa back in the eighties I very often found tall buildings to be the ideal location for efficient low band antennas using different kinds of sloping wire antennas. While on the higher bands I usually put up with a simple sloping Windom antenna even though results were not entirely satisfactory.

The Jumper Dipole

One day back in 1984 while I operated out of Burkina Faso (XT2CW), the 10 meter band was wide open. My sloping Windom favored only two directions, while others directions were attenuated to varying degrees. This effect is a result of the antenna length (40 meters) compared to the wavelength of the 10 meter band.

To serve all directions north of the building, from west to east equally, I needed a different system. Having no access to the hotel roof, the only solution I could imagine was a vertical dipole fixed on a 40 foot fiberglass pole hanging out of the balcony, about 90 feet above ground.

Comparing the signals between both antennas confirmed the great advantage of the vertical dipole compared to the Windom. It covered a 180° sector in the directions not blocked by the building, and produced a much stronger signal.

Back home in Germany I improved the system by making it operational on multiple amateur bands. A 40 meter half wave dipole was cut into smaller dipoles up to the 10 meter band. So I only had to open or close the connectors (jumpers) to get the correct length for a particular band.

The Jumper Beam

Fixing this vertical dipole in front of a big building out of concrete and steel must have an advantage in form of at least a little additional gain, as any rear energy that isn't absorbed must be reflected somewhere — even though the properties are hard to predict.

So why not put a real, perfectly cut, reflector behind the vertical dipole and a director in front? It was easily done. The result was a full size three element wire beam that covered all bands between 40 and 10 meters by only opening or closing the jumper connectors and winding up any spare antenna wires.

My 40 foot fiberglass pole was big enough to build a three element beam for any band from 30 to 10 meters. On 40 meters the ideal spacing between each element is around 30 feet, making it a bit too large for my 40 foot pole. On 40, however, I can make a two element (director and driven element) Yagi if I wish.

Construction and Deployment

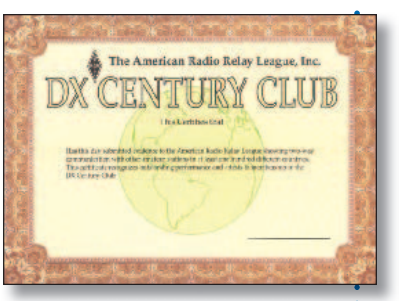
To keep this antenna as light as possible (less than 2 pounds) I use #20 AWG cop-

Hamspeak

Balun — A *bal*anced-to-*un*balanced transformer. Generally used to couple from a balanced antenna such as a dipole to an unbalanced (with respect to ground) transmission line, such as coaxial cable.

Director — One of the elements of a multielement parasitic directive antenna. The director receives energy from the driven element (attached to the feed line) and reradiates it to combine in the direction of the director. The director is usually shorter than ½ wavelength.

Driven element — Antenna element in a multielement parasitic array that is connected to the transmission line.



DXCC award — Award offered by the ARRL for demonstrated proof of legitimate amateur contact with stations in 100 countries or entities, as identified on *The ARRL DXCC List*.[1] See **www.arrl.org/awards/dxcc** for more information.

Half wave dipole — Antenna approximately half a wavelength long, usually fed by connections to each side at the center. Often used as an antenna itself, it is also a reference standard for the performance of other antennas.

Reflector — One of the elements of a multielement directive antenna. The reflector receives energy from the driven element (attached to the feed line) and reradiates it to combine in the direction away from the reflector. The reflector is usually longer than the driven element.

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

Windom Antenna — A wire antenna fed with a transmission line, or single wire, at about ⅓ of the distance from one end. It is intended to operate reasonably well on even harmonic (multiples) bands of its half wave frequency. For example, a 130 foot Windom will work on 80, 40, 20 and 10 meters. See **www.smeter.net/antennas/windom2.php**.

[1]*The ARRL DXCC List.* Available from your ARRL dealer or the ARRL Bookstore, ARRL order no. 7617. Telephone 860-594-0355, or toll-free in the US 888-277-5289; **www.arrl.org/shop/**; **pubsales@arrl.org**.

Figure 1 — Detail of the jumper connection. The connector is an automotive push-on type. The plastic insulator position is adjusted to keep the weight off the connection.

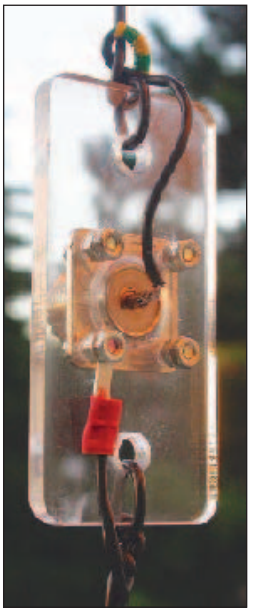


Figure 2 — Feed point details. The direct coax connection seemed to work as well as a balun and reduced the weight.

Table 1

Element Dimensions (feet)

Band (m)	*Director*	*Director Spacing*	*Driven Element*	*Reflector Spacing*	*Reflector*
10	15.61	3.51	16.30	7.02	17.09
12	17.61	3.97	18.37	7.90	19.25
15	20.86	4.70	21.71	9.35	22.83
17	24.27	5.44	25.29	10.89	26.54
20	31.23	7.02	32.54	14.04	34.14
30	43.85	9.74	45.23	19.48	47.46
40	62.45	14.00	65.08	N/A	Not Used

Figure 3 — Details of balcony attachment. Adjustable locking straps are used to secure both the bottom of the pole and the fulcrum on the balcony rail.

per wire that makes a perfect compromise between breaking strength and weight. The jumpers are made with connectors from the automotive industry (see Figure 1). The lengths that I found worked best are shown in Table 1.

In the first versions I used a balun to feed the balanced antenna with coax. But except for the higher weight I didn't see any difference in performance. That's why I no longer use a balun and directly feed the system with lightweight RG-58 coax cable as shown in Figure 2. I have found that the cable can easily handle up to 700 W with a matched antenna. Even attenuation on higher bands isn't an issue as the coax length seldom exceeds 50 or 60 feet between balcony and room.

Even though this antenna is a light weight antenna, the pole must always be properly secured onto the balcony railing and on the inner end with an appropriate counter weight or locking straps as shown in Figure 3. I very often found an armchair or something similar available. By moving this object I could even change the beam's direction from Japan to Europe and then to North America, depending on the building's orientation.

Usually I take tension belts to give the system the required stability. Light winds are not a problem for the antenna as the elements move with the wind. If a strong wind arrives, however, the system is taken down within a few minutes.

By the way, I never had a chance to simulate or professionally measure the antenna's gain, nor the difference in using a balun or not. I have found that the performance of this antenna is far better than from the single element. Perhaps one day some antenna specialist will have the ability and the equipment to measure this antenna professionally.

I am often asked what antenna I am using on my DXpeditions. This is one of my favorite ones!

Photos by the author.

Rudi Klos was first licensed in December 1973 as DK7PE. At age 16, he was one of the youngest radio amateurs in Germany, having been granted special permission to waive the usual age requirement of 18. He enjoyed working DX, having radio contact with other amateur radio stations more than 3000 km away. After he had worked 265 DXCC entities, he was eager to visit some of these exotic spots himself.

Egypt was the first rare DX country he operated from. In 1978, he was allowed to operate from the UN Camp in Ismailia on the Suez Canal. In almost 38 years of Amateur Radio Rudi has visited 150 and operated out of 123 different DXCC entities.

You can reach Rudi at Ulrichstrasse 26, 55128 Mainz, Germany or at **dk7pe@rooody.de**. *Check out his personal website at* **www.rooody.de**.

A Remote Impedance Matching Network

Reduce transmission line loss by matching your antenna at the antenna feed point.

Joe Ostrowski, KI5FJ

What could be simpler than depressing a button in the shack to match your antenna's impedance to the transceiver's desired 50 Ω? The design goals of this remotely located impedance matching network are an easy to use device that would handle 500 W of power, while keeping the number of parts to a minimum.

Impedance matching networks are often called antenna tuning units (ATUs) even though they do not tune an antenna. What they do is transform impedances. This misnomer will probably live with us forever!

I have used several ATUs for many years and after seeing the changing SWR with this ATU, I believe it is an effective design.

This article is written to inspire home brewers to revisit the design concept of simultaneously rotating both the ATU's coil and capacitors. See Figures 1 and 2.

System Design

This impedance matcher is intended to be used outdoors near the antenna. If you plan to use the ATU indoors, RF safety would dictate a metal enclosure to minimize radiation. A picnic cooler provides an outdoor moisture resistant enclosure. See Figure 3.

Another picnic cooler houses the 12 V battery for the motors. A minimum capacity of 7 Ah is required. If the ATU is used in the shack, a power supply capable of at least 5 A is required.

The differential capacitor consists of C1 and C2. Rotation of the shaft will cause C1 to increase while C2 decreases capacitance. The *differential T* ATU design is not new. There are at least two commercially available models for "in-the-shack" operation.

What is different about this design is that it can be located remotely at the antenna and has only one simple command signal. As you might know, locating the impedance matching network at or near the antenna reduces the feed line losses due to SWR. Less loss translates to stronger reception and transmission.

An external balun can be added to provide a balanced output and sometimes help match high impedances, although a 1:1 ratio balun, or common mode choke, is the best choice for some antennas with lower impedances.

How it Works

The magic hidden in this ATU is that the variable differential capacitor shaft rotates faster than the coil shaft. A 6:1 vernier reduction drive makes the capacitor turn slower but still faster than the coil. See Figure 4. The rotating capacitor applies all values from 30 to 300 pF while the coil rotates less than 90°. The resultant effect is that a wide variety of combinations of inductance (L) and capacitance (C) are tried to match the antenna.

The coil drive shown in Figure 5 consists of Erector Set like hardware. I am always amazed at what parts are available in my junk box. Most likely your design will dictate different parts and solutions to

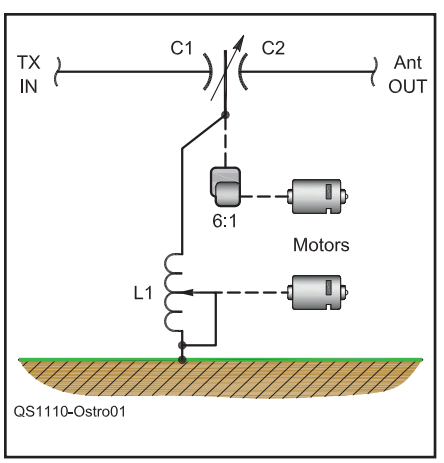


Figure 1 — Simplified schematic of the remote antenna tuner. Both motors turn together with the variable capacitor turning multiple revolutions for each turn of the rotary inductor.

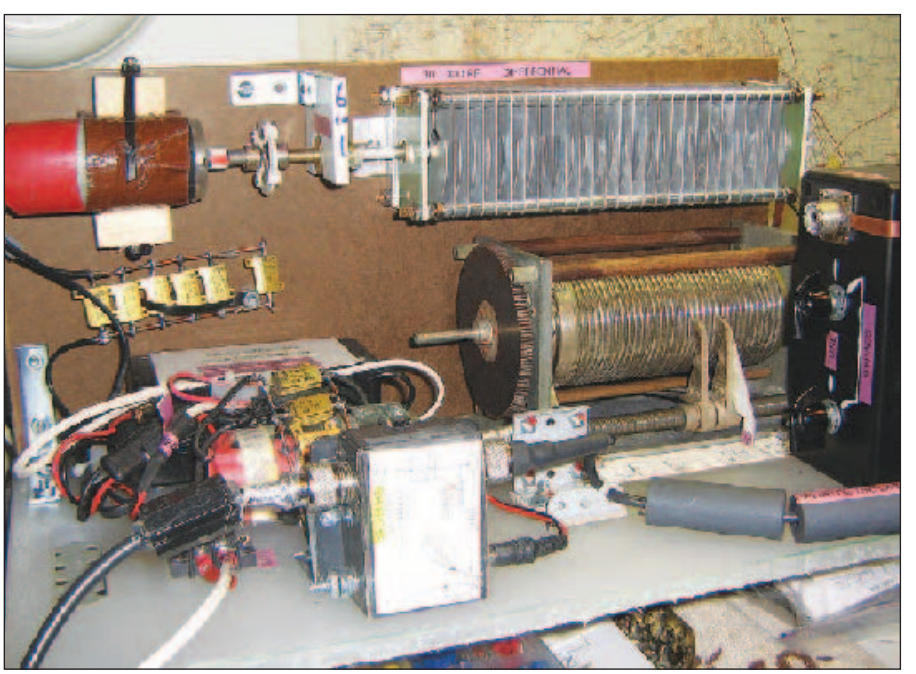


Figure 2 — View of the tuner's major components. The variable differential capacitor and its motor are at the top, the inductor below.

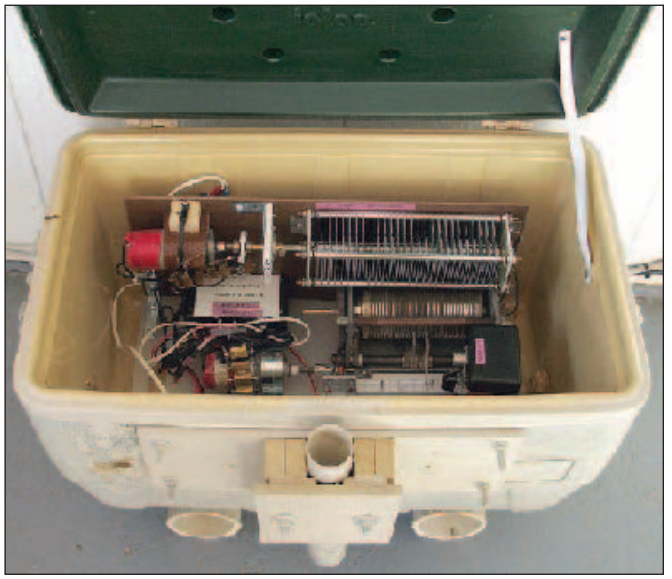


Figure 3 — A picnic cooler provides an outdoor moisture resistant enclosure.

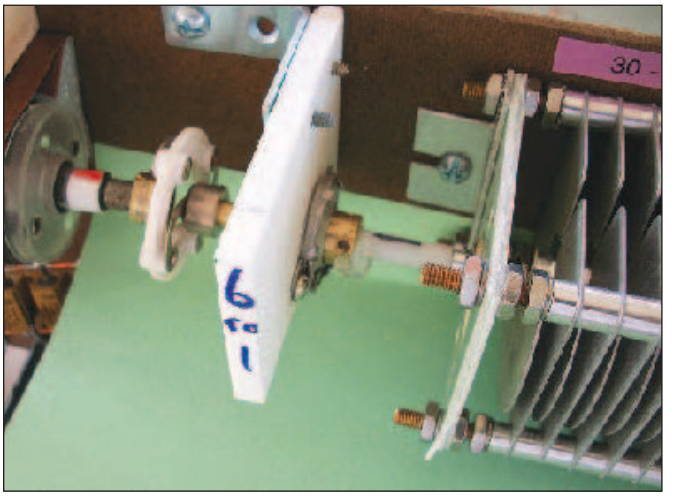


Figure 4 — A 6:1 vernier reduction drive makes the capacitor turn slower but still faster than the coil. The rotating capacitor applies all values from 30 to 300 pF while the coil rotates less than 90°.

the mechanical drives.

The command signal to rotate the motors is 12 V dc. The polarity of the signal, referenced to ground, determines the direction of rotation.

Making the Match

Simply selecting either up for clockwise (CW) or down for counterclockwise (CCW) rotation direction and depressing a button makes the magic appear!

My approach to finding the correct combination of L and C is to first rotate the coil CW to the minimum value of inductance. This is close to the desired position for the 10 meter band. Your design might include the addition of two limit switches to restrict the roller from exceeding travel at both ends of the coil.

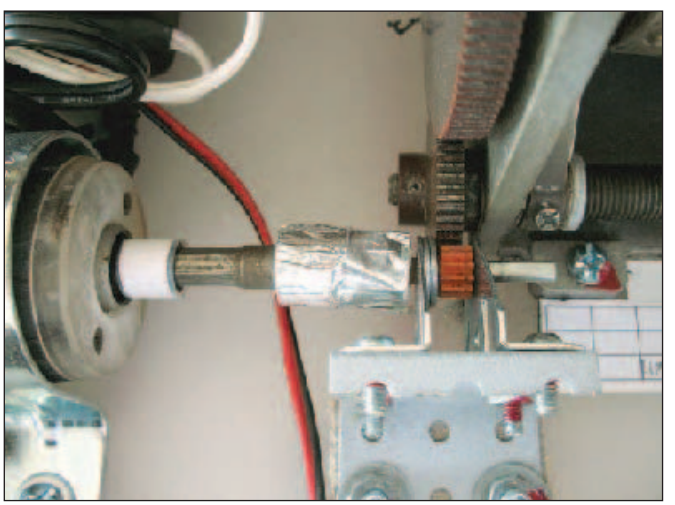


Figure 5 — Junk box gears are used to make the drive for the rotary inductor.

Observe the in the shack SWR while transmitting a low power, steady carrier. Rotate CCW to increase the inductance while the capacitance changes as well. As the correct coil position is approached, the SWR will begin to swing.

At this point, jog or pulse the momentary button switch to the lowest SWR reading while watching the SWR meter for a null. Continue pulsing until

Hamspeak

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

Balun — *Bal*anced to *un*balanced transformer or transition intended to convert signals from a balanced (with respect to ground) transmission system to an unbalanced (one side at ground potential, such as coax cable) transmission system.

Diode — Two element electronic device that passes current in one direction only. Used as a rectifier to change ac to dc, as a simple mixer, as a switch and for other functions. Available as either a vacuum tube, or more commonly now as a semiconductor device.

LED, light emitting diode — 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 **hyperphysics.phy-astr.gsu.edu/hbase/electronic/leds.html**.

RF safety assessment — Evaluation of intensity of radio energy emanating from a radio transmitter and comparison to allowed levels based on FCC requirements. Every Amateur Radio station is required to perform such an assessment. The process is described the ARRL book *RF Exposure and You*, and on the FCC website at **www.fcc.gov/oet/info/documents/bulletins/#65**.

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.

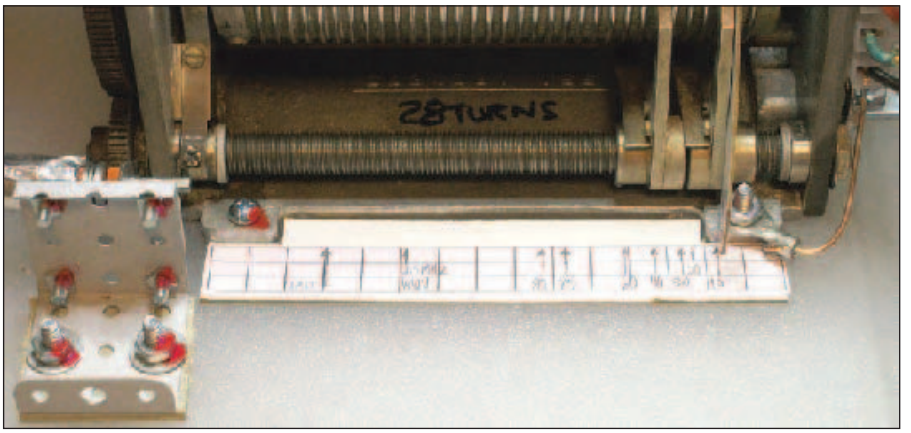


Figure 6 — The coil positions for the various bands are shown next to the inductor's roller drive.

another null is achieved. The new null should be at a lower SWR. Repeat the CCW search for the minimum null — close to a 1:1 SWR.

I find a perfect null (1:1 SWR) on all ham bands from 80 through 10 meters while tuning my 80 meter loop. The coil positions for the various bands are shown in Figure 6.

Assembly Details

The in-shack control box is shown in Figure 7. The wiring diagram is Figure 8. An ac adapter, a wall wart type power supply, provides 12 V dc. Your power supply need not be regulated; the only load is a single relay that draws about 75 mA.

Two bias Ts allow the dc control voltage to ride the shack-to-antenna coax cable. This approach eliminates a separate control cable. The T in the ATU is shown in the bottom center of Figure 2. The RF path through the bias Ts is shown in Figure 9. The control wiring in the ATU is shown in Figures 10 and 11. The lower right of Figure 10 shows the two steering diodes in an insulated sleeve.

One diode steers a positive command voltage to energize a DPDT relay. This relay provides the correct battery polarity for a CW motor rotation. The other diode steers a negative voltage to the other relay and results in CCW rotation. The bells and whistles are a bicolor LED, a monitoring jack and a ferrite choke.

The coil to capacitor connections are shown in Figure 12. The wiring diagram is Figure 13. The coil I used is a WWII era roller inductor type. The coil shorting is

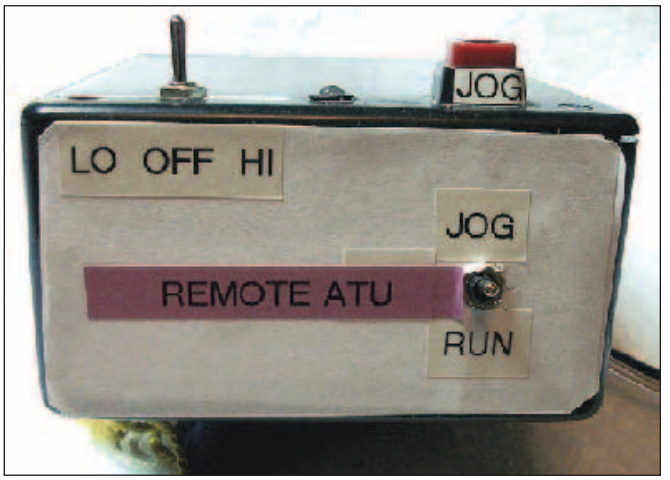


Figure 7 — The simple in-shack motor control box.

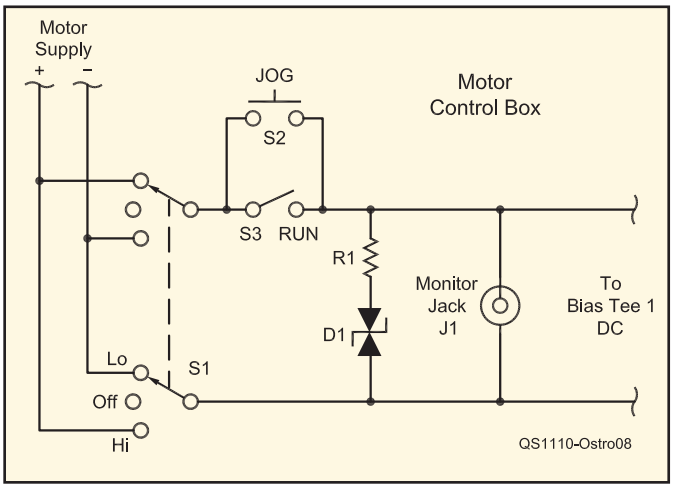


Figure 8 — Schematic of the motor control box.

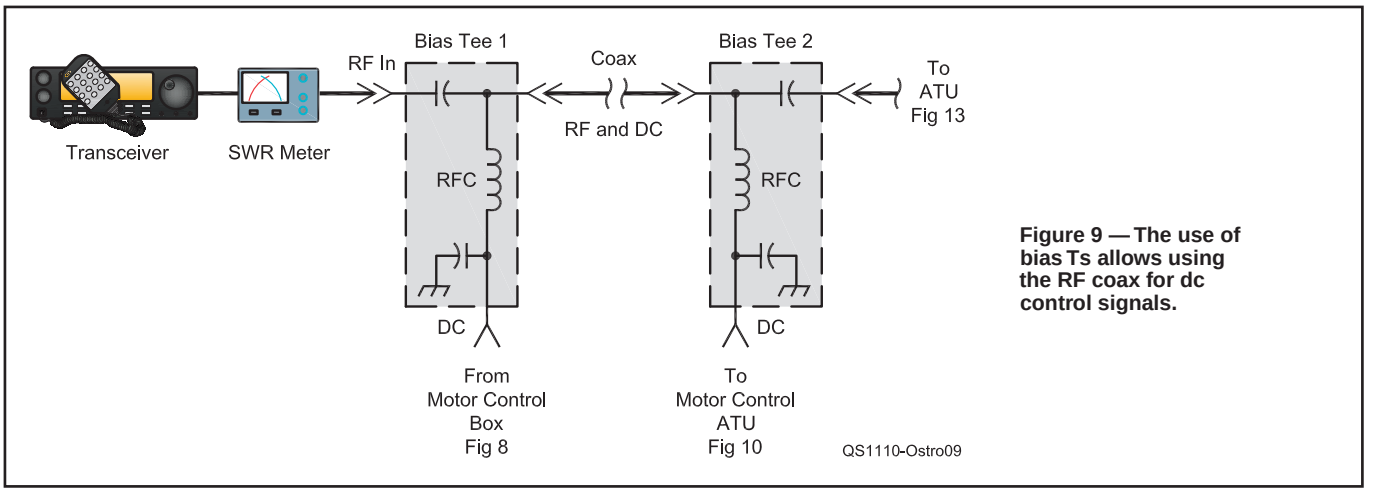


Figure 9 — The use of bias Ts allows using the RF coax for dc control signals.

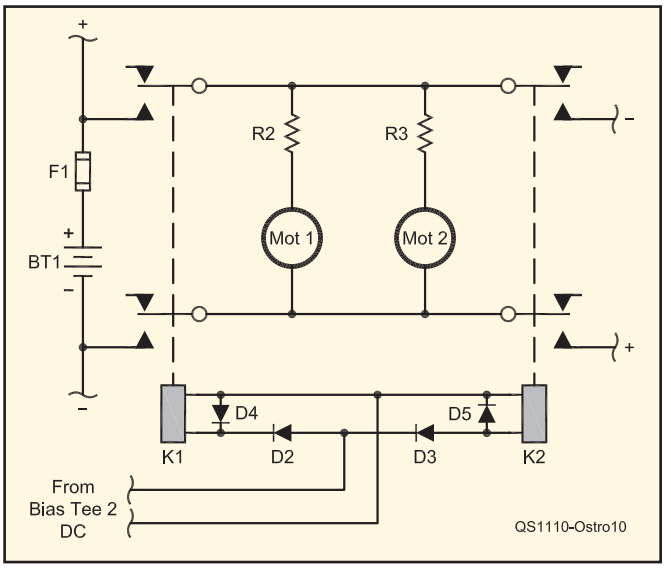


Figure 10 — The motor control wiring in the ATU.

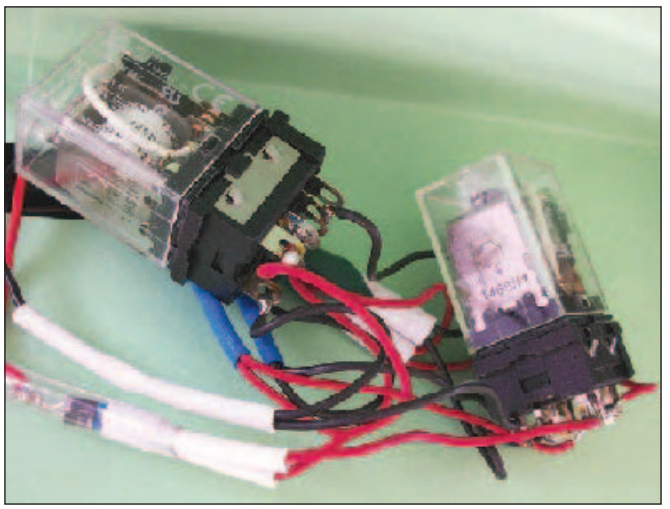


Figure 11 — View of the relays wired and ready to install

done by two tensioned bars, a very high current design. This treasure was mistakenly stored in the junk box. Your coil can be any roller inductor of about 30 turns. See the component list.

No attempt has been made to provide coil position information. In practice, it is simple to find the band you last matched and then rotate CW for up or CCW for down to another band. The most challenging aspect of this project was to find a suitable motor and couple it to the capacitor and coil.

The bottom line is this ATU design is a relatively simple approach to impedance matching. It uses no microprocessors or relays to switch RF components.

Joe Ostrowski, KI5FJ, holds an Amateur Extra class license and a FCC Commercial Operator license with Ship Radar endorsement. Joe was first licensed in 1963 as WN2GKU, as a teenager. He rejoined the hobby in 1990 and now operates all HF bands. While stationed with the US Air Force in England he operated as GØRPN. Joe can be reached at POB 691, Dona Ana, NM 88032 or at **ki5fj@arrl.net**.

Figure 12 — Detailed view of the interconnection of the tuning elements.

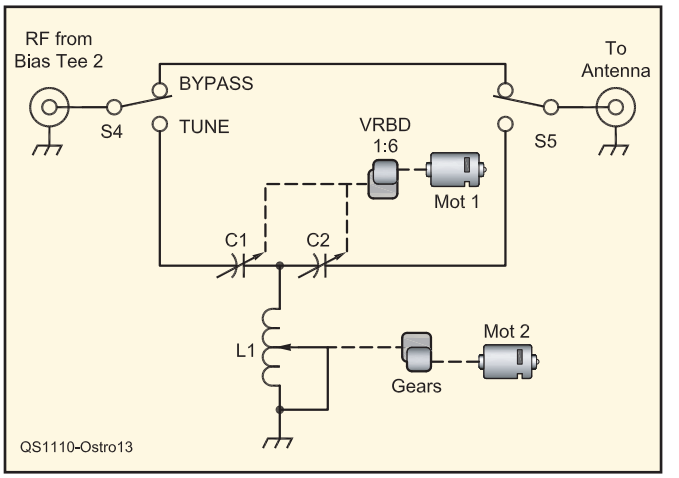


Figure 13 — Schematic diagram of the ATU portion of the remote unit and parts list of total project.

B1 — Battery, vehicle jump start type, 12 V, minimum of 7 Ah capacity (Harbor Freight 38391).
BT1, BT2 — Bias T dc power injector (MFJ-4116).
C1, C2 — Capacitor, differential type, 30-300 pF (MFJ-282-2015).
D1 — Diode, LED, bi-color (red-green) (Mouser 606-7011X1/5).
D2-D5 — Diode, 1N4005 (Mouser 821-1N4005).
F1 — Fuse, 10 A, fast blow (RadioShack 270-1015).
FB — Ferrite beads (Palomar FB-56).
J1 — Jack, RCA chassis mount (RadioShack 274-852).
K1, K2 — 12 V, 10 A DPDT plug-in relay with socket (Radio Shack 275-0218).
L1 —Roller inductor, approximately 29 µH (MFJ 404-1052).
Mot1, Mot2 — Motor from discarded Skil 2.4 V electric screwdriver.
PS1 — 120 V ac adapter with 12 V dc output to 500 mA (RadioShack 273-357).
R1 — 2.2 kΩ, ⅛ W resistor (RadioShack 271-007).
R2, R3 — 6 Ω resistor, five 30 Ω, 10 W resistors in parallel (Mouser 284-HS10-30).
S1 — DPDT switch, center-off (RadioShack 275-664).
S2 — SPST switch, momentary contact (RadioShack 275-1547).
S3 — SPST switch (RadioShack 275-645).
S4, S5 — SPST switch, ceramic (Surplus Sales of Nebraska SWR-B-52108).
Vernier reduction ball drive, 6:1 (MFJ-729-0142-1).

The Folded Skeleton Sleeve on Other Ham Bands

Joel R. Hallas, W1ZR

My recent article on the folded skeleton sleeve antenna generated a lot of interest.[1] Many wondered about using the design on other bands. I modified my *EZNEC* model and prepared designs for the bands requested, as well as some that I thought might be of interest to those who haven't yet requested them. The resulting dimensions are shown in Table 1. As shown in Figure 1(A), A is the overall width of the antenna while B is the length of the higher frequency parasitically coupled dipole. C is the gap size.

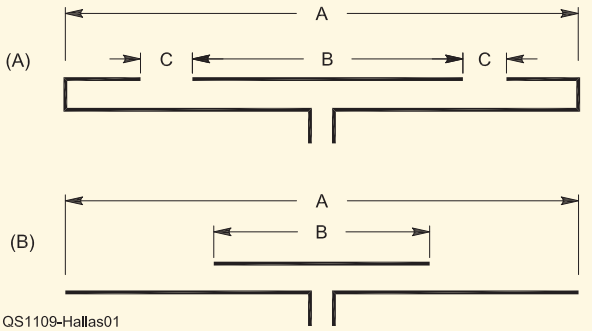


Figure 1 — At (A), configuration of folded skeleton sleeve antenna keyed to the dimensions in Table 1. At (B), the *unfolded* skeleton sleeve antenna uses full size elements for each band.

Builder Beware

Note that, unlike the design in the May article, I have not actually constructed these versions, so it is likely that some tweaking will be required. I would expect that they will be quite close, however. Also, as with wire dipoles, a single antenna will not cover all of 80 meters. I thus have one oriented toward the voice segment of the bands (75/40) and one lower in frequency (80/40).

As noted in my earlier article, this design should be adaptable to any of the various parallel window lines. The line I used was marked "JSC WIRE & CABLE #1317 18 AWG 19 STRAND MADE IN USA."[2] The conductors were stranded copper plated steel — a good choice for both flexibility and strength. If a different type of cable is selected, I would expect that differences in wire dimensions and dielectric properties would necessitate some changes in the lengths shown in order to achieve resonance on each band.

Give Credit Where It's Due

Since writing the original article, I have found that the concept of coupling to a single conductor, rather than the two or more of the traditional skeleton sleeve, was first described by Gary Breed, K9AY (of receiving loop fame) in an old *ARRL Antenna Compendium*.[3] He called it a "coupled resonator antenna." It could also be called a "half skeleton sleeve." The skeleton sleeve has been around for many years and has a parasitic element for the higher frequency on each side of the lower frequency directly fed element. In most cases, there is no particular benefit to two coupled resonators, although they more closely resemble the original surrounding sleeve.

The Plot Unfolds

The folding in of the ends of the original was done in order to make a coax fed antenna more compact than full size, suitable for small lots or for travel use. There is little reason not to do so. If size is not an issue, however, both dipoles can instead be made about full size. This configuration is shown in Figure 1(B) along with some examples in Table 1.

The unfolded version will have a slight edge on both bandwidth and gain on the lower band. In addition, the 40/20 unfolded version can work as well as any full size 40 meter dipole on 15 meters, potentially making it a three band arrangement (the 40/20 folded version doesn't come close). As many have found, a 40 meter dipole doesn't really work well on both 40 and 15, but it can be pressed into service. Usually the best results will be had if it is pruned for minimum SWR on 15 meters (typically 2.5 to 3:1) and tuned with an antenna tuner to work on both bands. If you don't use a tuner, pick your two favorite bands and enjoy.

With the exception of the 40/20 meter version, I assumed that the window line would be used for both dipoles in the unfolded version with the unused wire carefully cut away. For the 40/20 meter unfolded version, I actually built one using bare wire for the low frequency dipole section beyond the coupled resonator with the dimensions shown. For long term use, I think the elimination of the solder joint in mid span will aid longevity, and suggest making it all out of window line. That one I haven't built.

If you build one or more and get them trimmed to frequency, please send me "as-built" measurements details. I will compile them onto a page on the QST-in-Depth website.[4]

Table 1

Folded Skeleton Sleeve Antenna Dimensions (Figure 1A)

Bands (Meters)	*A (Feet)*	*B (Feet)*	*C (Inches)*
80/40	111.4	61.5	12.0
80/10	96.0	15.4	9.6
75/60	110.6	81.4	3.6
75/40	107.0	60.8	7.2
74/41 (MARS)*	100.2	59.8	7.2
40/30	58.0	43.0	6.0
40/20	56.3	30.8	4.0
30/20	42.0	30.7	7.8
30/17	40.8	24.1	5.5
20/17	30.6	24.0	4.2
20/15	29.6	20.5	9.1
20/10	27.6	15.4	3.6
17/15	24.3	20.5	9.0
17/12	23.6	17.4	9.6
15/10	10.0	7.7	4.2
10/6	14.4	8.3	5.6

Unfolded Skeleton Sleeve Antenna Dimensions (Figure 1B)

Bands (Meters)	*A (Feet)*	*B (Feet)*
40/20	64.0**	30.8
20/17	32.0	24.0
15/10	10.65	7.65

*Military affiliated radio system
**64 feet for uninsulated 40 meter extension, 63.4 if windowline used for full length.

Notes

[1]J. Hallas, W1ZR, "Getting on the Air — A Folded Skeleton Sleeve Dipole for 40 and 20 Meters," *QST*, May 2011, pp 58-60.
[2]Mine came from Davis RF. Their part number is LL450-553. See **www.davisrf.com/ladder.php**.
[3]G. Breed, K9AY, "The Coupled-Resonator Principle: A Flexible Method for Multiband Antennas," *The ARRL Antenna Compendium*, Vol 5, pp 109-112. Available from your ARRL dealer or the ARRL Bookstore, ARRL order no. 5625. Telephone 860-594-0355, or toll-free in the US 888-277-5289; **www.arrl.org/shop/**; **pubsales@arrl.org**.
[4]**www.arrl.org/qst-in-depth**

PRODUCT REVIEW

ICOM IC-7410 HF and 6 Meter Transceiver

Reviewed by Rick Lindquist, WW3DE
NCJ *Managing Editor*
ww3de@arrl.org

The ICOM IC-7410 is the now discontinued IC-746PRO writ larger — at least physically, since this radio does not include 2 meter capability. In nomenclature it follows the IC-7400, never marketed in North America but which served as the IC-746PRO in other parts of the world, including Europe.[1] ICOM continues to capitalize on this excellent and popular radio foundation with the nearly simultaneous release of the IC-9100, a higher tier model that *does* include 2 meters, 70 cm, an optional 23 cm module, satellite features and a heftier price tag. So, you could say the IC-7410 is the IC-9100 for the rest of us.

ICOM's description of the IC-7410 as "an excellent balance of technology and performance" may suggest some measure of compromise, but it's quite capable. Keep in mind, too, that ICOM has incorporated the incremental technological improvements — faster signal digital signal processing, no waiting for the radio to "boot up," for instance — that have been showing up in offerings preceding the IC-7410, such as the IC-7600.

What's It Like?

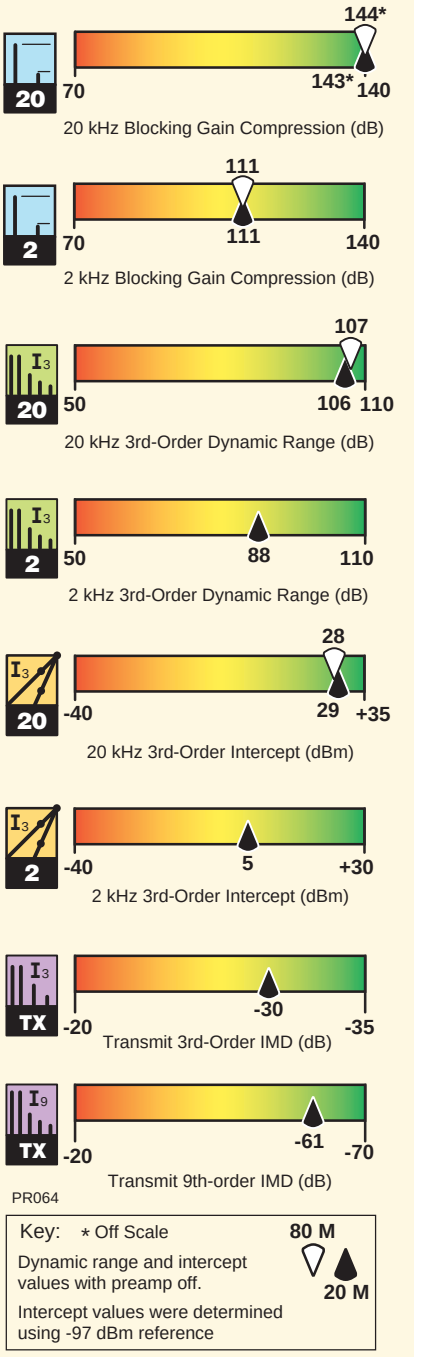
Given its slenderized form factor you could find yourself doing a bit of juggling to fit the longish IC-7410 comfortably on your operating desk. It's narrower by about an inch from the IC-756PRO series or IC-7600 models, but it's certainly deeper. I managed to perch it atop my IC-756PROIII, so I could do some side-by-side (so to speak) comparisons, but I ended up using a mirror to locate rear-panel connector since the newer radio extends about two inches beyond the edge of its older relative.

The '7410 offers a pleasing countenance, with a 10.25 × 6 cm monochrome display window, accented on the left and bottom edges with an inset ogee-style half frame. This is not the more commodious color display of the IC-7600 or even of the PROIII, but it is quite sufficient. The IC-7410's frequency readout seems larger than life within the slightly smaller display screen. The metallic F-1 through F-5 buttons immediately below the display window are easier to differentiate from the MODE buttons that I am always pressing in error on my PROIII. ICOM slightly offset the function buttons from the five MODE buttons, to minimize this possibility on the '7410.

The hefty main tuning knob possesses the sort of solid counterbalanced feel that puts the

[1]R. Lindquist, N1RL, "ICOM IC-746PRO HF/VHF Transceiver," Product Review, *QST*, May 2002, pp 72-78. This review and reviews of the other ICOM transceivers mentioned here are available to ARRL members online at **www.arrl.org/product-review**.

Key Measurements Summary



Bottom Line

The IC-7410 replaces the IC-746PRO and adds an improved receiver, much faster DSP performance and new features to the mix, but drops 2 meter coverage. Although the new radio does a lot, the '7410 user interface will be familiar to users of current ICOM radios.

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

operator in the driver's seat. The knob has a substantial, easy-to-grip, rubberized outer ring plus the now customary tuning dimple, and I preferred it to the PROIII's main tuning knob. It's possible to manually adjust the tuning dial tension with a slider beneath the knob — no screwdriver needed! ICOM followed through elsewhere on the front panel with larger knobs that offer a more positive sense of control. Even the inner concentric controls are easy to maneuver.

The front panel's bold lettering contrasts nicely with the dark, smooth (easy-to-clean) finish, making legends easy to read. This is a welcome improvement from earlier ICOM designs, which sometimes sacrificed utility at the altar of style. I especially appreciated the conspicuous round XFC and TS buttons, which are much easier to access than on the PROIII. (Press XFC to listen to your transmit frequency when split; TS changes the tuning step.)

The four "stem" controls on the front panel's lower lip are shorter and sturdier than on earlier ICOM models, although it can be a bit difficult to discern the unpainted pointers on these shafts. The stem controls' legends are *above* the shafts and much easier to read than the ones on the PROIII. These make available adjustments for (L–R) KEY SPEED, BK-IN DELAY, COMP and MONI GAIN. I appreciated not having to dig to adjust the keyer speed.

None of the front panel buttons on the IC-7410 are illuminated (for example, to indicate that a given function is enabled). I missed this. You must rely instead on smallish text legends along the lower portion of the main display (below the frequency readout) to determine if a function is enabled. That display can get pretty busy once you've switched on a few things. This forces the operator to pay pretty close attention. I found it extremely easy to neglect to disable the NOTCH feature, for example, after having used it earlier.

The menu system on the IC-7410 hearkens back to the system ICOM introduced with its revolutionary IC-706 series in the mid 1990s. IC-706 and '746 users will feel nearly immediately at home with this interface, although it is easier to use than the initial incarnation. In fact, the radio itself is a bit of an amalgamation of the PRO and '706 series — not that there's anything wrong with that — and some of its finest features remain hidden until you need them. The menu text consists of light, segmented characters. These are serviceable but not always easy to decipher. I found the similar menus on the IC-706 series more readable.

There are actually three menus, all accessible via the front-panel MENU button: Press it quickly, and the M1 and M2 menus allow selecting a few common parameters using the F-1 through F-5 keys. These F key selections are mode dependent. For example, in SSB mode M1 has a TBW (transmit bandwidth)

Table 1
ICOM IC-7410, serial number 02001081

Manufacturer's Specifications	Measured in the ARRL Lab
Frequency coverage: Receive, 0.03-60 MHz; transmit, 1.8-2.0, 3.5-4, 5.33200, 5.34800, 5.35850, 5.37300, 5.40500, 7-7.3, 10.1-10.15, 14-14.35, 18.068-18.168, 21-21.45, 24.89-24.99, 28-29.7, 50-54 MHz.	Receive and transmit, as specified.
Power requirement: 13.8 V dc ±15%; receive, 3 A (max audio); transmit, 23 A (100 W out).	13.8 V dc; receive 1.9 A (no signal, max audio), 1.7 A (backlight off); transmit, 18 A (100 W out). Operation confirmed at 11.4 V dc (89 W output).
Modes of operation: SSB, CW, AM, FM, RTTY.	As specified.

Receiver

SSB/CW sensitivity: 2.4 kHz bandwidth, 10 dB S/N: 0.1-29.99 MHz, 0.16 µV; 50-54 MHz, 0.13 µV.

Receiver Dynamic Testing

Noise Floor (MDS), 500 Hz DSP filter, 3 kHz roofing filter:

	Preamp off	*1*	*2*
0.137 MHz	–129	–135	–136 dBm
0.505 MHz	–134	–141	–142 dBm
1.0 MHz	–134	–141	–142 dBm
3.5 MHz	–135	–142	–144 dBm
14 MHz	–134	–141	–143 dBm
50 MHz	–131	–140	–142 dBm

Noise figure: Not specified.

14 MHz, preamp off/1/2: 13/6/4 dB

AM sensitivity: 6 kHz bandwidth, 10 dB S/N: 0.1-1.799 MHz, 12.6 µV; 1.8-30 MHz, 2 µV; 50-54 MHz, 1.6 µV.

10 dB (S+N)/N, 1-kHz, 30% modulation, 6 kHz bandwidth:

	Preamp off	*1*	*2*
1.0 MHz	1.27	0.56	0.51 µV
3.8 MHz	1.15	0.49	0.43 µV
50.4 MHz	1.84	0.68	0.57 µV

FM sensitivity: 15 kHz bandwidth, 12 dB SINAD: 28-29.7 MHz, 0.5 µV; 50-54 MHz, 0.32 µV.

For 12 dB SINAD, 3 kHz deviation, 15 kHz bandwidth:

	Preamp off	*1*	*2*
29 MHz	0.54	0.21	0.18 µV
52 MHz	0.56	0.25	0.20 µV

Spectral display sensitivity: Not specified.

Preamp off/1/2: –94/–101/–109 dBm.

Blocking gain compression: Not specified.

Gain compression, 500 Hz bandwidth, 3 kHz roofing filter:

	20 kHz offset *Preamp off/1/2*	*5/2 kHz offset* *Preamp off*
3.5 MHz	144/138/136 dB	118*/111* dB
14 MHz	143/140/135 dB	117*/111* dB
50 MHz	139/139/134 dB	117/111 dB

Reciprocal mixing (500 Hz BW): Not specified.

20/5/2 kHz offset: –101/–88/–78 dBc.

ARRL Lab Two-Tone IMD Testing (500 Hz DSP bandwidth, 3 kHz roofing filter)**

Band/Preamp	*Spacing*	*Input Level*	*Measured IMD Level*	*Measured IMD DR*	*Calculated IP3*
3.5 MHz/Off	20 kHz	–28 dBm	–135 dBm	107 dB	+26 dBm
		–14 dBm	–97 dBm		+28 dBm
14 MHz/Off	20 kHz	–28 dBm	–134 dBm	106 dB	+25 dBm
		–13 dBm	–97 dBm		+29 dBm
		0 dBm	–64 dBm		+32 dBm
14 MHz/1	20 kHz	–34 dBm	–141 dBm	107 dB	+20 dBm
		–20 dBm	–97 dBm		+19 dBm
14 MHz/2	20 kHz	–40 dBm	–143 dBm	103 dB	+12 dBm
		–27 dBm	–97 dBm		+8 dBm
14 MHz/Off	5 kHz	–36 dBm	–134 dBm	98 dB	+13 dBm
		–24 dBm	–97 dBm		+13 dBm
		0 dBm	–28 dBm		+14 dBm
14 MHz/Off	2 kHz	–46 dBm	–134 dBm	88 dB	–2 dBm
		–97 dBm	–29 dBm		+5 dBm
		0 dBm	–23 dBm		+12 dBm
50 MHz/Off	20 kHz	–23 dBm	–131 dBm	108 dB	+31 dBm
		–12 dBm	–97 dBm		+31 dBm

Receiver	Receiver Dynamic Testing
Second-order intercept point: Not specified.	Preamp off/1/2, +65, +65, +65 dBm. 52 MHz, +77 dBm.
DSP noise reduction: Not specified.	Variable, 20 dB maximum.
Notch filter depth: Not specified.	Manual notch: 52 dB, Auto notch: 55 dB, attack time 100 ms.***
FM adjacent channel rejection: Not specified.	29 MHz, 77 dB†; 52 MHz, 79 dB.†
FM two-tone, third-order IMD dynamic range: Not specified.	20 kHz offset, both preamps on: 29 MHz, 77 dB†; 52 MHz, 79 dB†. 10 MHz channel spacing: 29 MHz, 115 dB, 52 MHz, 114 dB.
S-meter sensitivity: Not specified.	S9 signal at 14.2 MHz: preamp off, 50 µV; preamp 1, 23.4 µV; preamp 2, 8.9 µV.
Squelch sensitivity: SSB, <5.6 µV, FM, <0.32 µV.	At threshold, both preamps, SSB, 0.63 µV; FM, 29 MHz, 0.1 µV; 52 MHz, 0.1 µV.
Receiver audio output: >2 W into 8 Ω at 10% THD.	2.04 W at 10% THD into 8 Ω. THD at 1 V RMS, 0.85%.
IF/audio response: Not specified.	Range at –6 dB points, (bandwidth):‡ CW (500 Hz): 280-795 Hz (515 Hz). Equivalent Rectangular BW: 509 Hz. USB: (2.4 kHz): 197-2770 Hz (2573 Hz). LSB: (2.4 kHz): 200-2770 Hz (2570 Hz). AM: (6 kHz): 165-3138 Hz (5946 Hz). AM: (9 kHz): 163-4496 Hz (8666 Hz).
Spurious and image rejection: HF and 50 MHz, (except IF rejection on 50 MHz): >70 dB.	First IF rejection: 14 MHz, 105 dB; 50 MHz, 81 dB. Image rejection: 14 MHz, >144 dB; 50 MHz, >141 dB.

Transmitter	Transmitter Dynamic Testing
Power output: HF and 50 MHz: SSB, CW, RTTY, FM, 2-100 W; AM, 2-27 W.	HF: CW, SSB, RTTY, FM typically 1.2-102 W, AM, 0.27-27 W; 50 MHz: CW, SSB, RTTY, FM, 1.2-95 W, AM, 0.2-24 W.
Spurious-signal and harmonic suppression: >50 dB on HF, >63 dB on 50 MHz.	HF, >70 dB; 50 MHz, >70 dB. Meets FCC requirements.
SSB carrier suppression: >40 dB.	57 dB.
Undesired sideband suppression: >55 dB.	>70 dB.
Third-order intermodulation distortion (IMD) products: Not specified.	3rd/5th/7th/9th order (15 m, worst case): HF, 100 W PEP, –30/–35/–54/–61 dB; 50 MHz, 100 W PEP, –31/–34/–43/–59 dB.
CW keyer speed range: Not specified.	6 to 48 WPM.
CW keying characteristics: Not specified.	See Figures 1 and 2.
Iambic keying mode: Not specified.	Mode B.
Transmit-receive turnaround time (PTT release to 50% audio output): Not specified.	S9 signal, 85 ms at speaker, 16 ms at accessory jack.
Receive-transmit turnaround time (tx delay): Not specified.	SSB, 45 ms; FM, 8 ms.
Composite transmitted noise: Not specified.	See Figure 3.

Size (height, width, depth): 4.6 × 12.3 × 13.5 inches; weight, 22.5 pounds.

Price: $2000; FL-430 (6 kHz) and FL-431 (3 kHz) roofing filters, $125 each.

*No blocking occurred up to threshold of receiver overload.
**ARRL Product Review testing now includes Two-Tone IMD results at several signal levels. Two-Tone, 3rd-Order Dynamic Range figures comparable to previous reviews are shown on the first line in each group. The "IP3" column is the calculated Third-Order Intercept Point. Second-order intercept points were determined using –97 dBm reference.
***Single beat note. Reduces two beat notes up to 55 dB with attack time depending of separation of signals, typically 400 ms.
†Measurement was noise-limited at the value indicated.
‡Default values, sharp setting (smooth setting is available). Bandwidth and cutoff frequencies are adjustable via DSP. CW bandwidth varies with PBT and pitch control settings.

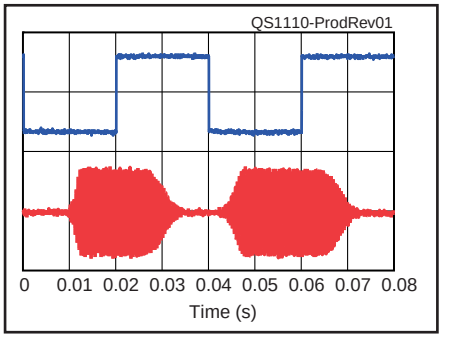


Figure 1 — CW keying waveform for the IC-7410 showing the first two dits in full break-in (QSK) mode using external keying. Equivalent keying speed is 60 WPM. The upper trace is the actual key closure; the lower trace is the RF envelope. (Note that the first key closure starts at the left edge of the figure.) Horizontal divisions are 10 ms. The transceiver was being operated at 100 W output on the 14 MHz band.

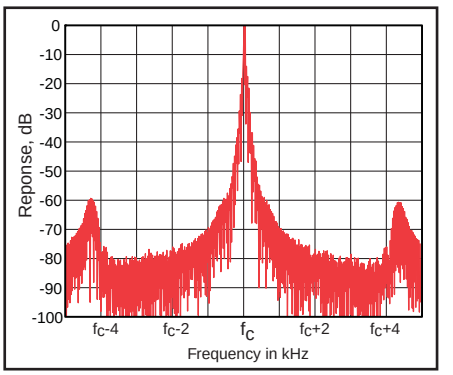


Figure 2 — Spectral display of the IC-7410 transmitter during keying sideband testing. Equivalent keying speed is 60 WPM using external keying. Spectrum analyzer resolution bandwidth is 10 Hz, and the sweep time is 30 seconds. The transmitter was being operated at 100 W PEP output on the 14 MHz band. This plot shows the transmitter output ±5 kHz from the carrier. The reference level is 0 dBc, and the vertical scale is in dB. Note that the keying sideband level rises slightly at the edges, to the –60 dB range.

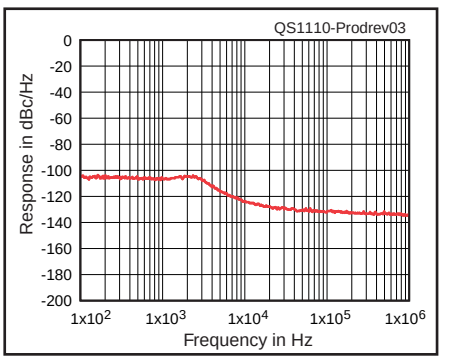


Figure 3 — Spectral display of the IC-7410 transmitter output during composite noise testing. Power output is 100 W on the 14 MHz band. The carrier, off the left edge of the plot, is not shown. This plot shows composite transmitted noise 100 Hz to 1 MHz from the carrier. The reference level is 0 dBc, and the vertical scale is in dBc/Hz.

choice on F-4, while in CW mode, the same key opens one of two selectable KEY menus, and in RTTY mode it opens the decoder screen. Pressing and holding the primary MENU button takes you into SET MODE, letting you enable or adjust those parameters less-traveled. I found menu scrolling to be counterintuitive. You press the ∨ key to ascend the menu tree and the ∧ key to descend.

The power supply connector is not compatible with earlier ICOM gear, so if you're upgrading from a previous model (such as my '756PROIII) you'll need to change some station wiring. The ACC (accessory) socket is a 13 pin DIN connector. ICOM included a compatible DIN plug with color coded pigtails, obviating the need to solder directly to the connector. The SEND jack to key a linear amplifier is an RCA phono connector. The contacts are rated for a maximum of 16 V at 0.5 A, compatible with any modern power amplifier. The rear-apron ground connection uses a fairly short Phillips head screw with two flat washers and one lock washer on its shaft. A wing nut would have been easier to manage.

Two SO-239 coax antenna ports are available on the rear apron. If your station setup only requires a single coax connection to your transceiver, you can disable the unneeded port, so you don't inadvertently transmit into an open load. Very thoughtful! The IC-7410 does *not* provide the means to connect a separate receive antenna, such as a Beverage.

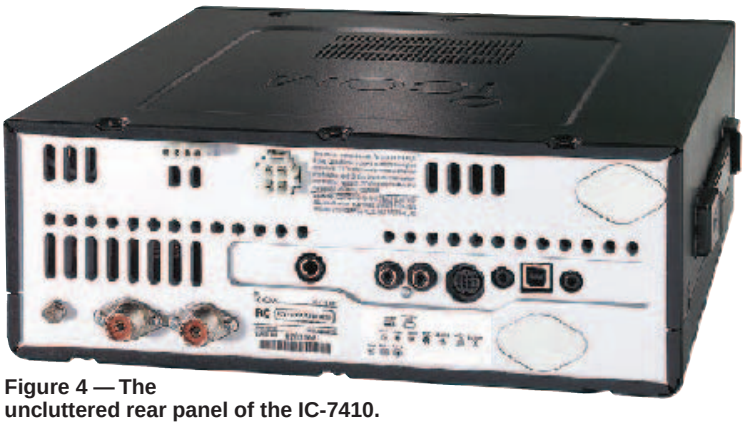


Figure 4 — The uncluttered rear panel of the IC-7410.

How Does It Play?

If I had just one word to describe the IC-7410 it would be *competent*, and the numbers from the ARRL Lab support this impression — not the best but *very* good. In reciprocal mixing testing for two-tone IMD (see Table 1), the IC-7410 stacks up as essentially identical to the IC-7600, and blocking gain compression was superior. The '7410 pretty much blows away the IC-746PRO's much older technology, but it's right on par with the higher tier IC-7800, at least in terms of two-tone IMD on 14 MHz. The numbers are even very good on 50 MHz.

ARRL Lab Engineer Bob Allison, WB1GCM, noted an oddity while testing the '7410's blocking gain compression at 5 kHz and 2 kHz spacings. "I experienced receiver overload at the point when the blocking signal caused the audio to drop by about 0.5 dB, such that strong noise jumps up at this threshold and the desired signal becomes absent," Allison recounted. "Raising the level of the blocking signal further caused an unrelated audio tone to bleed through." For example, he said, if the radio is tuned to 14.020 MHz (preamp off) and a 50 dB over S-9 signal shows up at 14.018 MHz, the receiver will overload. "Needless to say," Allison added, "the blocking figures are still very good."

Allison reports that he was unable to detect *any* receiver images during lab testing. He further notes that the receiver actually is *usable* down into the VLF range — 30 kHz (–99 dBm minimum discernable signal). "Many receivers tested are pretty dead down there," he said. "This receiver is very sensitive at 137 kHz and 505 kHz — spots where some nations already allow amateur activity. You may think that that doesn't matter much, but it does if you're using an active antenna or a small loop antenna."

Flexible DSP IF filters and twin passband tuning (PBT) with a graphical display of passband setting have become hallmarks of this generation of ICOM transceivers. The IC-7410 augments these with optional narrow filters for the 1st IF (64.455 MHz), which install easily. Each has a unique socket, so you cannot inadvertently install them incorrectly. While ICOM does not refer to these as *roofing filters* in the *Instruction Manual*, the display does show an R ahead of the current filter setting. This appears to be a "rose by another name" situation, since the net effect is the same. Narrower filters at this point in the circuit will reduce the impact of other in-band signals on the signal you're trying to pull out, especially when the band is busy (think Field Day or pileup).

Pressing and holding the F-5 button changes the optional 1st IF filter selections — stepping through the default 15 kHz (roofing filter passband), 6 kHz and 3 kHz settings. Quickly pressing the F-5 key changes the second IF (36 kHz) DSP filter contour from "sharp" to "soft." It takes a little practice to make this button do just what you want, and you may have to squint at the display to see the setting itself.

The sharp and soft contours did not make much difference to my ear on CW signals, although narrow filter settings seem more likely to sound "ringy" in the sharp profile as opposed to the soft. You may detect a smoother, even more pleasing sound with SSB audio by enabling the soft contour on a given DSP filter setting. The soft setting also seems to ameliorate some noise profiles.

By the way, the IC-7410's noise reduction (NR) appeared superior to the PROIII's NR. That makes sense, since the IC-7410 is more closely related to the IC-7600 and its more advanced DSP technology.

I thought a few things could be improved. The IC-7410 offers two levels of RF preamplification but just one level of attenuation. I missed having multiple levels of attenuation to deal with noise and interference on the low bands. The AGC attack, at least at default settings, seemed a bit severe. Static crashes actually killed the audio momentarily until it recovered. The speaker crackled a bit at higher AF GAIN settings.

Worth Mentioning (or Repeating)

The IC-7410 retains the most useful features of its predecessors. Take the *voice squelch control* (VSC), for example, introduced with the IC-746PRO. The VSC checks all signals for "voice components" before it breaks squelch. This feature is really cool, especially if you tend to monitor an HF frequency for activity (for example an emergency or traffic net). This means, too, that while scanning, the radio does not stop on every carrier, cable birdie or kerchunker, and it's available on AM and FM, as well as on SSB.

The automatic antenna tuner is excellent. It uses variable capacitors instead of clacking relays, and it works essentially as advertised — quickly and quietly. It can be set to auto start on HF or to start when PTT is activated on a new frequency. You can even set "band edges" for an especially narrowband antenna system. A rear-apron jack allows connection of an external ATU as well.

While the '7410 does not have a spectrum scope, it does have what ICOM dubs a *simple band scope* (SCP). At first glance, this might not seem a very useful operating aid, but it certainly came in handy during the ARRL June VHF QSO Party. I was expecting it to operate much in the same manner as the similar utility on the IC-706 series, but it's *way* faster. At any of the available settings it scanned the given swath of spectrum nearly instantly, leaving "blips" on the horizontal line representing signals detected (the receiver is muted during scanning). The scan limits depend upon how closely you want the band scope to check for signals — every

1 kHz, 2 kHz, 5 kHz etc. You then tune to the blip to hear what's there. You can use this tool to seek activity on one of the three band stacking registers, then swapping to a second band register to dial up the signal without tuning away from your original frequency.

You can monitor SWR and *relative* power output (there's no level or percentage readout) at the same time, although I still prefer a "real" meter or at least a digital representation, such as the virtual meter on the IC-7600. The IC-7410 has an LCD bargraph style meter, which can be set up to hold peaks for 0.5 second. Speaking of SWR, the IC-7410 lets you read and graph your antenna system's SWR curve, right on the screen. You can plot up to 13 points in various steps. Transmit briefly to plot the SWR on each step, and when you're done, the screen will graphically display the SWR profile of the antenna system under test.

As with the IC-7600, the IC-7410 offers a single USB connection to your computer. This link may be used to control the radio from your logging program or other software and/or to route audio to and from the radio or decoded RTTY to your computer. To make use of it you first must download and install the USB-to-UART bridge driver from the ICOM website, where you select the driver that's appropriate for the radio and your computer's operating system. This is a reasonably trouble free process. It did take a bit of juggling and tweaking to get the software to recognize the radio, however.

I was able to use the USB interface to control the radio (I checked it out with *N1MM Logger* and *Ham Radio Deluxe* — *N1MM* has a specific IC-7410 driver, but *HRD* does not) and to play "canned" contest audio files from my PC at the same time (sorry, phone contesters, but the IC-7410 does *not* have a voice-keyer). As with the IC-7600, however, you cannot set the USB interface to route the audio from your contesting software and from the microphone at the same time. The menu lets you pick one source or the other (or ACC, which lets you feed audio to the radio via the accessory jack on the rear apron, or MIC, ACC, which lets you route audio simultaneously via both inputs). It's possible to work around this by programming some rather clumsy CAT strings. As we suggested in the IC-7600 review, however, this appears to be a software issue, not an ICOM issue.[2]

Various and Sundry

Transmit bandwidth is adjustable, but it sounded good to other ops at the default settings when I was using my Heil ProSet Plus! headset. There are adjustable NAR, MID and WID ranges plus ESSB. You also can adjust high-pass and low-pass filter settings for received audio.

While the IC-7410 does not have a voice keyer, it does have an excellent CW memory keyer that is similar in implementation to those in the '746 and '756 series radios. You can set the menu to display either the memory keyer "root" menu first or the "send" menu first. As with other ICOM radios, CW keyer memories are loaded by using the function keys and tuning knob to select and enter characters one at a time. This takes some getting used to. As with past ICOM transceivers of this heritage, you still must roll your own external keypad to access your CW memories without going through the menu.

The radio is capable of full-break-in (QSK) CW, although as a veteran CW operator I didn't find it much better than semi-break-in.

The radio can decode RTTY signals, but it needs an external encoder to transmit it (FSK or AFSK). The IC-7410 makes it a bit easier to use sound card based data modes, and you can use the USB connection to pass baseband audio between the radio and your computer. One thing you cannot do, however, is use the terrific twin-peak RTTY filter system when running AFSK. (This filter boosts the MARK and SPACE frequencies for better copy.) You can only use it when operating true FSK, accessible via a rear-panel connection.

Press the SPEECH key, and a pleasant, digitized female voice announces the frequency, mode and S-meter reading. The menu gives you a choice of hearing these in English (default) or Japanese. Voice speed and volume are adjustable. In addition you can set this feature to announce the mode each time you press a mode button, and you can disable the S meter announcement. This is a terrific feature for visually impaired operators! For the North American market, ICOM may want to consider adding Spanish and French to its list of available languages.

ARRL Lab testing determined that the dial accuracy was dead on. The SET MODE also offers a means to tweak the radio onto the calibrator's frequency to keep it honest, but you shouldn't have to do that. The manual says this factory setting differs for each radio. In this same vein the IC-7410 has a built-in calibrator. Somehow I had managed to switch it on while fumbling thorough some menus. Hearing the calibration signals made me wonder if I'd broken the radio.

I had to engage in a delicate dance between the MIC GAIN and COMP settings. You don't want to use too much compression — good advice with any radio — since there's plenty to go around. The compression metering puzzled me, though, as I never could get it to kick up into the higher reaches of the scale at any combination of settings. The COMP control is one of the little "stem" controls, while the MIC GAIN is a genuine front-panel knob (this is a stem control on the PROIII and similar radios).

Other observations:

- You can set "user band edge" frequencies — a total of 30 band edge frequencies. These may come in handy in households where not all operators hold Amateur Extra class tickets.
- The radio includes a transmit time-out timer (*a la* your handheld VHF-UHF transceiver) with a choice of 3, 5, 10, 20 or even 30 minutes if you're especially long-winded!
- There are separate "Quick Split" menus for HF and for 50 MHz.
- The main tuning dial has two settable rates making rapid frequency excursions. These are essentially "fast" and "faster."
- The SET MODE lets you lock out either the manual or automatic NOTCH (there are separate settings for SSB/CW and AM). This eliminates the need to toggle through both when you really only use one notch mode, as I tend to do.
- If the power amplifier temperature gets too high, the IC-7410 will cut its output power in half and display LMT above the TX icon on the display. I never saw this happen.
- A look at the rear apron reminded me of the times I'd purchased a new vehicle without some of the features of the top-of-the-line model. On the dashboard and elsewhere were "blanks" to plug the spots where the controls for the optional luxury features, such as heated seats or mirror defrosters, would go. Similar blanks are prominent on the IC-7410's rear panel, since the radio shares a chassis with the IC-9100. These blanks cover the spots where you'd find interfacing connections for VHF and UHF accessories available on the IC-9100.

Beating the Heat

ICOM took pains with the IC-7410 to address problems of semiconductor failures that some IC-746 series transceiver owners have reported. For the driver, the IC-746, including the PRO, employed a µPC1678G (330 mW dissipation at a supply voltage of 5 V dc). These were said to run hot, making them more subject to premature failure. The finals were 2SK2975s. As does the IC-756PROIII and its successor IC-7600, the '7410 uses a pair of RD15HVF1 HF MOSFETs (12.5 V and rated at 15 W typical output with 0.6 W maximum input) as the driver and a pair of RD100HHF1 HF MOSFETs for the power amplifier. These units can put out 100 W apiece.

The upgraded device complement in the IC-7410 coupled with a much larger heat sink, copious vents on the top of the case, and a quiet, efficient blower ought to minimize significantly the possibility of heat-related component failure. The design of the heat sink is the primary reason why the IC-7410 is longer, although a bit narrower, than its

[2]R. Lindquist, WW3DE, "Product Review — ICOM IC-7600 HF and 6 Meter Transceiver," *QST*, Nov 2009, pp 54-59.

predecessors in the IC-746 series and the IC-756 series. ICOM does advise users not to place anything on top of the IC-7410.

And Furthermore . . .

Where does the IC-7410 fit into the larger Amateur Radio transceiver market? While the IC-7410 occupies the middle ground in terms of price, its performance definitely trends toward that of higher-tier transceivers.

An IC-7410 goes for approximately $2000 at the big outlets, and the optional 6 and 3 kHz filters are about $125 apiece. In the end, parsing the feature sets of ICOM's similar models will be part of anyone's buying decision. Do I want 2 meters and UHF capability? Would I rather have a subreceiver? Should I go with all the filter options? At its price point — even factoring in the optional filters — the IC-7410 would prove a worthy choice for value-conscious casual and serious operator alike, or as a second radio. An ARRL staffer who used the radio may have summed it up best: "Very impressive performance *and* looks!"

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

ICOM IC-7410

If you own a tablet or smartphone with the appropriate application, scan this QR Code to see a video overview of the IC-7410. You can also watch this video on your computer by going to:

http://youtu.be/jLa7kizlAYM

Coaxial Dynamics Model 81041 USB Wattmeter

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

The model 81041 USB wattmeter is one of a wide variety of units in the Coaxial Dynamics family of RF power measuring devices. All use plug-in directional line-sampler elements that fit into a section of rigid coaxial line, either within or external to the meter. As with other instruments of this genre, rotating the directional probe changes the direction of measurement. Rotate the element one way to read forward power; rotate it 180° to read reflected power. What immediately sets this unit apart from the Bird 43 wattmeter many hams are familiar with is that there are sockets for two elements, often called slugs.[2] (Some Bird units other than the model 43 offer a similar dual element configuration.)

Some other differences are that this unit has a 4.5 inch meter with a mirror scale, allowing more precise readings than with the Bird 43's 2.25 inch meter. In addition, this particular model includes a USB connection that can provide the readings of both slugs to a PC loaded with the included PC software. (Coaxial Dynamics offers less expensive single slug, analog only, units as well.)

The review unit was equipped with type N female connectors, although that's easily changed. A wide variety of optional "Quick Match" connectors is available, including UHF, BNC, SMA, TNC and others. Most are available in male or female styles.

In other respects, the Ohio-made Coaxial Dynamics and Bird units share many characteristics. In addition to a common architecture, the Coaxial Dynamics wattmeter slugs can be used interchangeably in Bird meters, as can the coaxial interface connectors. We did confirm that they came from the same ancestors.

[2]J. Hallas, W1ZR, "Array Solutions AS-43A Digital Upgrade Kit for Bird 43 Wattmeter," Product Review, *QST*, Feb 2011, pp 59-60.

Why Two Slugs Can be Better than One

We ordered our meter with two HF (actually 2-30 MHz) slugs — one calibrated for 1000 and one for 100 W full scale. In normal use, the higher power slug is inserted on the left, labeled FORWARD while the lower is on the right labeled REFLECTED. This makes sense since, in the usual coax environment, a nominally matched condition is expected. In normal operation, reflected power is a small fraction of forward power. The accuracy of the meter is determined by the accuracy of the individual slugs, typically rated at ±5% of full scale (for example, ±50 W for the 1000 W slug). Using a lower power element in the second position allows a more precise and more accurate reading of the reflected power than if the 1000 W slug were rotated to take a reflected power reading in the usual low reflected power environment. In addition, having two slugs allows the software (described later) to have both readings available simultaneously to allow automated calculations of SWR and return loss.

But you don't really need two slugs. A single slug in either position can still be rotated with the switch left in the same position to read both forward and reflected power in the traditional single slug mode. This could prove handy for the case in which the reflected power is higher than anticipated, perhaps pending antenna adjustment. The full scale 100 W rating of the reflected power slug in our 1000/100 setup allows measurement of a maximum SWR of a bit less than 2:1.

In our 1000/100 setup, the 100 W slug could also be used by itself for both forward and reflected readings with a typical 100 W transceiver on line without the power amplifier. It could also be useful if you had occasional need for measurements in a different frequency and/or power range than the slugs you usually had in place — you would only have to buy a single slug for occasional use. In this case, the software would have access only to a single measurement and could not make calculations, but from $75 to $140 per slug, this may be a good compromise for infrequent measurements.

Bottom Line

This is a very nice wattmeter with some extra features that you are likely to appreciate. It does not offer the absolute accuracy of more recent instruments, but will be familiar and handy to many. The provided PC software is useful, but we hope that more will come.

Lab Testing Results

Table 2 shows the results of our lab tests of the meter and slugs. As noted, at some power levels and frequencies, the meter did

Table 2

Coaxial Dynamics Model 81041 USB Wattmeter, serial number 1010

	Manufacturer's Specifications	*Measured in the ARRL Lab*
Frequency range: 0.45-2300 MHz.*		Depends on sensor.
Power range: 0.1-10,000 W.		Depends on sensor.
Power requirement: Less than 100 mA via the USB port.**		As specified.

Actual Forward Power	Measured Forward Power		
Frequency (MHz)	2	14	28
100 W Sensor			
5 W CW (±5 W):	5.8	6.0	6.0
50 W CW (±5 W):	50	53	53
90 W CW (±5 W):	91	100	100
1000 W Sensor			
50 W CW (±50 W):	60	60	60
500 W CW (±50 W):	470	500	480
900 W CW (±50 W):	830	940	870
SWR accuracy*			
1:1 SWR:	1.0:1	1.0:1	1.0:1
2:1 SWR:	2.0:1	2.0:1	2.1:1
Insertion loss:	2 MHz and 14 MHz, 0.01 dB; 28 MHz, 0.02 dB; 1.3 GHz, 0.1 dB.		

Size (H×W×D): 7.3 × 5.0 × 4.0 inches. Weight: 4.5 pounds.

Price: 81041 wattmeter, $579; 100 and 1000 W elements, $105 each.

*Measurements made with 2-30 MHz 100 W and 1000 W power sensors.
**When the computer interface is used, power is supplied via the USB port. No power is required for standalone operation.

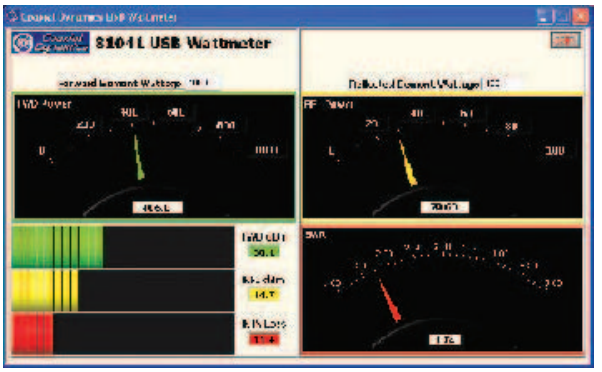


Figure 5 — The basic Coaxial Dynamics USB PC wattmeter software screen. Note that it shows both forward and reflected power as well as derived SWR and return loss calculations. The calculations are spot on. Bar graphs of forward power, reflected power and SWR are also provided as shown.

not provide indications within its accuracy specification. It is also worth noting that the design of this meter's line sampling structure has a very low insertion loss — there's nothing worse than your power meter burning up power.

Using the Wattmeter

I found the basic analog wattmeter easy and convenient to use. The response time of the meter is just fine, even for use while adjusting an antenna tuner, for example. Flipping a switch to change between forward and reflected power readings is certainly faster and easier than rotating the slug in a more traditional meter. The large mirrored meter scale made taking readings easy and precise.

Meter scales are provided with full scale indications of 10, 25 and 50. The operator is required to note the range rating on each slug in use to know what the actual power reading is. Thus with our 1000/100 W slugs, on forward power 10 = 1000 W, while reading reflected power, 10 = 100 W.

The unit is equipped to read average power only. It is specified to work with CW or FM transmitters and will not measure PEP levels from SSB or AM transmitters. This means that the key must be held down until the measurement is taken, or until the software responds to the data (see below). Coaxial Dynamics offers other units with PEP reading capability.

As with most single needle wattmeters, the meter provides measurement of forward and reflected power directly in watts. If you need to know the SWR without the PC software, you will either need to make a quick calculation or use a nomograph. The instruction booklet provides the formula as well as a nomograph.[3]

Software

The PC software, including provided USB interface drivers, came up fine on my shack's *Windows XP* computer. Pointing the *found new hardware* prompt toward the CD drive loaded the drivers. The CD provided was labeled V 1.0.1. The *readme.txt* file on the CD has more thorough software installation instructions than in the manual.

The program has a single operating screen as shown in Figure 5. To operate, you enter the power rating of the forward and reflected slug in the windows at the top of each of the virtual panels and it's ready to measure. Well — sort of. I found that the initial indication on the PC display would usually overshoot — sometimes 200% or more. It would eventually settle down to the proper value, but I had to keep the transmitter key-down for longer than should have been necessary — a potential problem for those with low duty cycle rated amplifiers. Coaxial Dynamics is working to resolve this problem and expects to have a new software version available soon. Once it settled down, the readings tracked with the analog scale and the calculations of SWR, return loss and forward and reflected power in dBm were accurate.

In addition to showing the display of the current conditions, the software allows "logging" the data. This means storing a copy of the panel in the figure for later viewing. Handy, but it would seem a table of all stored results would make comparisons easier.

The manual indicates that the software will run under *Windows Vista, 2000, XP* or *NT* environments. I can only confirm that the software worked on my *XP* based computer. I can also confirm that while the main program runs on my *Windows 7* based office machine, the drivers are not recognized. The Coaxial Dynamics support website does not provide any drivers, so I dropped a note to their support function to see if *Windows 7* drivers were available. They are looking into this, but expect it to be resolved shortly as well.

Documentation

The unit comes with an instruction booklet of 11 pages. It briefly goes over all required steps to install and operate the unit. I didn't feel the need for any more information, although I've been using this type of instrument for more than 50 years. If you've never seen one before, a bit more instruction might be needed. On the other hand, the first time I used one, it was handed to me without a manual and I was up and running almost immediately.

Manufacturer: Coaxial Dynamics, 6800 Lake Abram Dr, Middleburg Heights, OH 44130; tel 800-262-9425, 440-243-1100; **www.coaxial.com**.

[3]J. Hallas, W1ZR, "SWR, Reflected Power — What Do They Mean?" *QST*, Jun 2011, p 36.

W1ZR

THE DOCTOR IS IN

Q Ed, NRØP, asks: Because of my lot size and orientation, my antenna mast is right outside the window near my ham shack. I feed my antenna with 6 feet of coax through the wall, then a 1:1 balun feeding 450 Ω window line to the top of the 43 foot mast. That in turn feeds the 134 foot inverted V dipole. I previously used a 1:1 air wound balun for the transition between coax and balanced line, but found a bunch of ferrite beads in the basement. I then created a 1:1 balun using those over the coax — all 23 of them, as I wanted to work 160 meters as well as the other bands. That seemed to work as well as the air wound balun. Now my questions:

I haven't tried a large ferrite core wound with coax as a 1:1 balun. Which of these three baluns would put the most power into the antenna and, alternately, what is the loss of the various balun types?

A In terms of loss in the coax baluns, there are two parts to the answer:

1. *Transmission loss*. This is the loss in propagating the desired signal through the balun. For the case of coax in or on ferrite, the desired differential mode — inside the coax — acts just as if the ferrite isn't there, so it's just a question of the length of coax in the two cases. Usually the turns on the core use somewhat more coax than using the beads, but the difference is usually slight.

2. *Loss of signal due to unbalance*. If the balun works perfectly, and the antenna is balanced, all the power that comes out the coax goes to the antenna. Any lack of balun effectiveness results in some power going down the outside of the coax. This is not actually power lost — perhaps better called power misdirected. It can reduce the effectiveness of a Yagi by distorting the pattern, by changing the pattern of other antennas or worse — cause RFI to alarm and other household systems or even station equipment. On the receive side, signals picked up on the shield from household systems can cause interference to your reception.

The part 2 problem is a bit trickier. The coax balun, really a "common mode choke," works by putting a high inductive reactance in series with the outside of the coax shield, forcing most of the current to go toward the antenna. The inductance of the turns wound on a core (see Figure 1) goes up with the square of the number of turns, while inductance of the beads (see Figure 2) goes up linearly with the number of beads. Thus five beads gives five times the inductance of a single bead, while five turns on a toroid gives 25 times the inductance of a single turn.

Sounds like the toroid would work better, but there is a limit. The choking at higher frequencies is reduced by any capacitance coupling around the inductance, which is minimal with beads, but goes up with the number of turns on the toroid, less so if neatly wound in a single layer. Thus the toroid will do better at lower frequencies, while the beads usually win at the high end of HF into VHF.

I do not have any performance data on air-wound baluns. My understanding, however, is that they are best suited to situations in which the transmission line impedance is closely matched to the balun design impedance, usually 75 Ω. This is definitely not the case with an inverted V used on multiple bands. I can't imagine that they would offer any benefit in comparison to either coax type.

One other issue to be aware of is that foam insulation (low loss) coax such as RG-8X, for example, should not be used on toroids, or in any application that requires tight radius turns. The soft foam will not keep the center conductor in the center, and it may eventually migrate to the shield and could short out or arc over in the worst case. Such coax will work fine with ferrite beads, however.

Figure 1 — A coaxial common mode choke, a 1:1 balun. This example is made by winding the coax around a ferrite toroid core.

Q Ken, KI4HZL, asks: I am a little confused on the actual dimensions of dipole antennas. I have seen many illustrations of a half wave dipole antenna showing the two quarter wave sections that make up the dipole with an insulator in between. The feed line is connected to the dipole on each side of that center insulator. The dimensions are usually shown from end to end, as if the insulator weren't there. I would think that the actual length of each half of the dipole should be from the actual point of feed line connection to the end of the radiator and not from the center of the insulator separating the two radiators. Any help in clarification would be greatly appreciated.

A If you think about it, no matter how long the center insulator is, the feed line wires connecting to each half dipole

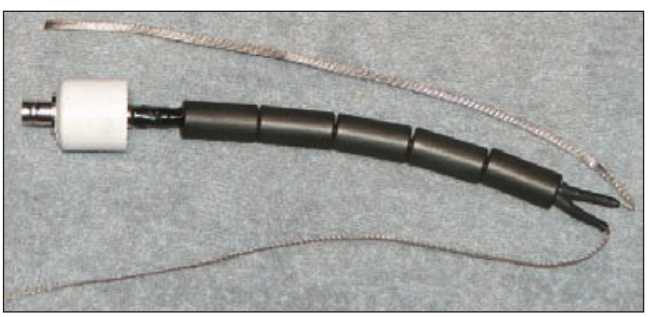


Figure 2 — Common mode choke made by sliding ferrite beads over the coax. This type has the edge at higher frequencies.

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

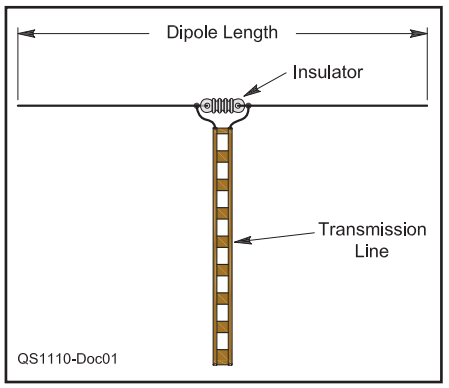


Figure 3 — The actual length of a dipole is the end-to-end length. The wires connecting the transmission line to each half antenna act like the part of the antenna at the insulator location.

act like part of the length of the antenna (see Figure 3). Thus, the length of the center insulator is not part of the equation and the end-to-end dimension is appropriate. The actual antenna may even appear a bit "longer" due to any slack in the connecting wires. This is even true for the case of balanced transmission line with wide spacing. The virtual antenna center is at the middle of the line.

Q Tom, W7LUU, noticed that most Yagis are constructed using aluminum as the material for the elements. He wonders if it would make much difference if he used different materials for making VHF and UHF Yagi elements. In particular he has available silver alloy rod and wondered if there would be much difference in gain or element dimensions if he used that instead of aluminum.

A I don't know the exact electrical properties of your material, but think we can cover it by looking at the differences in performance between a number of metals. *EZNEC* allows the specification of element material as part of its model definition.[1]

I used the *EZNEC* models of two antennas that were on the disk included with each copy of *The ARRL Antenna Book*.[2] One was a three element 2 meter Yagi, the other a 14 element 70 cm Yagi. I determined the free space gain of each using elements of different metals. The results are shown in Table 1. Note the gain figures of silver, copper and aluminum are quite close to that of a perfect conductor — not leaving much room for improvement without going into super cooling. A Yagi with stainless steel elements has noticeably, but not dramatically, lower gain. Stainless will show more difference in some other antenna types, such as short loaded monopoles, in which small loss resistance elements are a more important part of efficiency.

Table 1
Free Space Gain of Two Yagis Made of the Metals Shown

Metal	*Resistivity (Ω-M)*	*70 cm Gain (dBi)*	*2 Meter Gain (dBi)*
Perfect conductor	0	14.34	7.80
Silver	1.59×10^{-8}	14.31	7.76
Copper	1.74×10^{-8}	14.31	7.76
Aluminum	4.0×10^{-8}	14.29	7.75
Stainless	6.9×10^{-7}	14.16	7.58

As to other parameters, changing from zero loss to aluminum changed the resonant frequency of the 70 cm antenna downward by about 0.04%. My conclusion is that there is not much to be gained by going toward exotic materials in this type of antenna, nor much retuning required if a particular material is needed for strength or corrosion resistance.

◊Carl Luetzelschwab, K9LA, propagation contributing editor for The National Contest Journal, *had additional information in response to my answer to Blake, W8MNT, on sunspot effects.*

Carl notes: I read your question about sunspots and F2 region ionization in "The Doctor Is In" column in the July 2011 *QST*. The answer provided by the "Doctor" tied sunspots to solar flares and coronal mass ejections (CMEs), and the radiation they emit. While it's true that solar flares emit ionizing radiation and contribute to increased F2 region ionization, that effect is of an intermittent nature.

The major source of F2 region ionization is EUV (extreme ultraviolet). Overlying and surrounding sunspots are hot, bright areas called *plage* (the French word for beach, referring to the whiteness of these areas). Sunspots and plage are correlated — the more sunspots, the more plage areas. Plage areas emit copious amounts of EUV. This EUV radiation is at wavelengths shorter than 91.1 nm, and it ionizes atomic oxygen in the F2 region.

Flares can contribute to the F2 region ionization when they occur, but the primary driver is EUV. For the record, CMEs don't directly impact F2 region ionization. They can cause geomagnetic storms, which in turn can impact the F2 region ionization (in both a positive sense and a negative sense).

◊In the August 2011 column, I responded to the question from Victor, K3SHD, about the FCC Part 15 sticker in his 2 meter handheld transceiver. I noted that there are specific Part 15 requirements for scanning receivers and PC interface devices. Wilton Helm, W6TC, pointed out that this isn't the whole story.

Ham transmitters don't have to be certified, because they are licensed under FCC Part 97 for a service that is largely self disciplined and often involves homemade equipment. Thus homebrew as well as commercial amateur transmitters are not subject to FCC equipment authorization or labeling requirements.

Most modern (superheterodyne) receivers used in most services, and other equipment containing local oscillators or digital clocks above 9 kHz, are considered unintentional emitters. Such equipment is subject to absolute emissions limitations as specified in Part 15 and requires a notification sticker. Thus, a commercially made ham receiver, even if it is part of a transceiver, does require a sticker.

Hamspeak

Balun — Balanced to unbalanced transformer. Part of an antenna system that provides the transition between a balanced antenna such as a center fed dipole and an unbalanced transmission line, such as coaxial cable.

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.

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

Inverted V — Common name for a center fed dipole antenna in which the center is supported at a higher point than the ends, giving the appearance of an inverted letter V.

RFI — Radio frequency interference. Electrical signals that interfere with normal radio operation by appearing on radio receivers.

Toroid core — A circular donut shaped structure made from metal oxides in a ceramic material. It is used as the basis for inductors that have the property that they are self shielding in that the magnetic fields stay within the core.

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

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

[2]R. D. Straw, Editor, *The ARRL Antenna Book*, 21st Edition. Available from your ARRL dealer or the ARRL Bookstore, ARRL order no. 9876. Telephone 860-594-0355, or toll-free in the US 888-277-5289; **www.arrl.org/shop**; **pubsales@arrl.org**. By special arrangement with the *EZNEC* developer, even complex models of antennas provided with *The ARRL Antenna Book* can be run on the otherwise limited special demo sized version of *EZNEC* also provided with the book.

SHORT TAKES

The Last BIG Field Day

For most of us, Field Day is something we enjoy alone, or with a relatively small group of friends or club members. It often becomes as much a summertime social gathering as it is an emergency preparedness event.

On the other hand, there are groups that take Field Day *very* seriously. These operations look like military exercises, complete with several dozen participants and tangled logistics that would try the patience of an Army quartermaster.

One of the largest Field Day gatherings in the country takes place each year in Maryland. W3AO is a combined effort of the Potomac Valley Radio Club and the Columbia Amateur Radio Association, both from Baltimore. They have a tradition of large Field Day operations and in 2004 they entered as "50A." That's 50 separate transmitters on just about every band from 160 meters to daylight (actually, laser light).

Gary Pearce, KN4AQ, secured permission to record the huge 2004 event. Later he would go on to establish Amateur Radio Video News (ARVN), but it wasn't until this year that Gary finally found the time to review the miles of videotape and assemble a documentary titled *The Last BIG Field Day*.

40 Minutes of Fascination

According to the ARVN website, *The Last BIG Field Day* is designed for presentation at club meetings, but I found it just as enjoyable for private viewing. The documentary is edited with an eye toward crisp pacing. Gary doesn't allow the production to be bogged down with segments that linger too long on one individual or activity. Instead, *The Last BIG Field Day* moves along smartly from one scene to the next. I played the DVD for a couple of non-ham family members and it held their interest despite the fact that they had little idea of what they were watching.

The Last BIG Field Day is an objective view of a difficult operation. You see the ups and well as the downs, the triumphs and the challenges. This is more than a video of technology on parade. On the contrary, *The Last BIG Field Day* has a very human story to tell.

Gary not only shot and edited the documentary, he is the narrator as well. The result is a carefully crafted, professional production on par with any other documentary you're likely to see. *The Last BIG Field Day* is about 40 minutes in length, but the DVD also contains bonus content. From the main menu you can select additional interviews with the W3AO experts and participants, a 35 minute Super-8 movie of the Pacific Palisades Amateur Radio Club's 1971 Field Day and Field Day news stories and interviews by KN4AQ. The 1971 film was particularly entertaining, vividly reminding me of what it was like to do Field Day "old school."

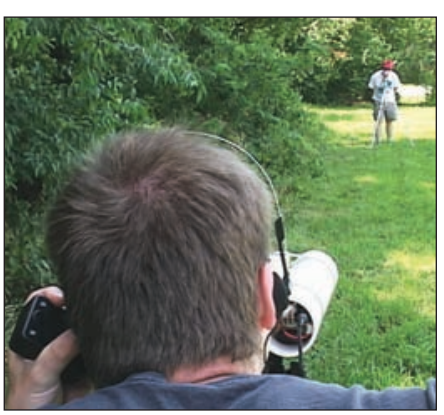
If your club is in need of something to spice up a meeting night, or if you'd just like to plant yourself on the couch and watch a fascinating Amateur Radio video, *The Last BIG Field Day* is well worth the $20 investment.

Manufacturer: Amateur Radio Video News, 508 Spencer Crest Court, Cary, NC 27513; tel 919-380-9944; **www.ARVideo News.com**. *$20.*

Frank Donovan, W3LPL, operating 20 meter phone at the W3AO 2004 Field Day.

VIDEO SCREEN CAPTURES — KN4AQ

The W3AO HF tent.



A laser contact between Adam Skutt, N3SLN (foreground) and Bill Heath, AI3Z.

VIDEO SCREEN CAPTURES — KN4AQ

Eight of the 10 HF towers, which are all in a single line down the center of the 1000 foot Field Day circle.

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

NØAX

HANDS-ON RADIO

Experiment 105
Gain-Bandwidth Product

"I feel the need for speed!" went the line in the movie *Top Gun* and that might apply to electronics designers, too, in their quest for circuitry that operates at higher and higher frequencies. The *speed* of a device also has an effect at frequencies far below the cutting edge of high-speed electronics and that is the subject of this month's column.

Gain-Bandwidth Product

Often abbreviated GBW or GBP, the *gain-bandwidth product* of a device such as an op-amp is used to specify how much gain the device can muster at different frequencies. "Faster" devices have higher GBW specifications. (Because gain is unitless, GBW has units of frequency — usually MHz.) The relationship between gain and bandwidth is a constant for any particular device because its ability to amplify a signal at a particular frequency is determined by the internal structures of the components that make up the device.

GBW is defined primarily for devices that have a simple, *single-pole* frequency response such as is illustrated in Figure 1 for a low-pass RC circuit. (For more information about frequency response and poles, review Hands-On Experiment #18 and *The ARRL Handbook's* chapter on Analog Fundamentals.[1,2]) Above the cutoff frequency, output amplitude rolls off at 6 dB for every doubling of frequency (an *octave*), equivalent to 20 dB/decade.

Op-amps behave similarly to the RC circuit because their manufacturers build in a *dominant pole* — even though it reduces gain at high frequencies. An op-amp (or other complex IC) is composed of very many components, each with its own frequency response and interacting with other components and the device's structure in different ways. By creating a dominant pole in the device's circuitry, the manufacturer and designer can be confident that all ICs of a specific model will behave in approximately the same way.

Individual transistors have a GBW, too, although it's usually specified as the *transition frequency*, F_T. For bipolar transistors, current gain is used, and for FETs, voltage gain is used. Transistors are generally used at frequencies well below their F_T for consistent performance. The basic concept is the same — how much gain at how high a frequency.

GBW of an Op-Amp

If we measure the *open-loop gain*, A_{VOL}, of an op-amp (without any feedback from an external circuit to reduce circuit gain), we would see that it has a very high value at very low frequencies. For example, the common TL082 op-amp has a typical A_{VOL} of 100 V/mV or 100,000 (100 dB). It also has a GBW of 4 MHz. Thus, we can predict that the TL082 can only produce that high gain up to a frequency of 4 MHz / 100,000 = 40 Hz.

The GBW can also be imagined as the frequency at which the gain of the device falls to 1, or its *unity-gain frequency*. If we measure the open-loop gain of a TL082 over a range of frequencies, the curve will look a lot like that in Figure 1 with f_C being approximately 40 Hz. The open-loop gain of the op-amp will fall to unity at approximately 4 MHz, rolling off at about 20 dB per decade beginning near 40 Hz. (4 MHz / 40 Hz is five decades of frequency and 5 × 20 dB = 100 dB.)

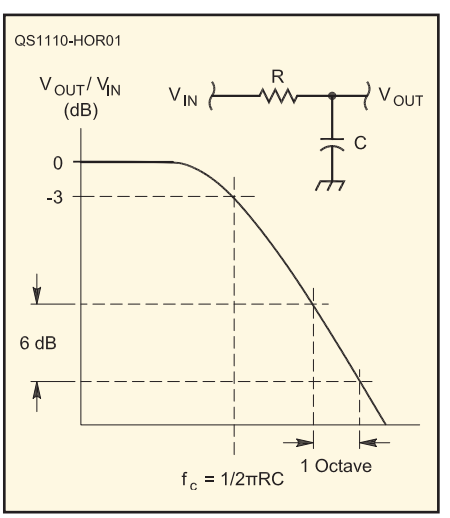


Figure 1 — The single-pole frequency response of a low-pass RC circuit showing the 6 dB/octave = 20 dB/decade rolloff above the cutoff frequency.

GBW in a Feedback Circuit

The relationship between gain and bandwidth of a device in a circuit that uses feedback to control frequency response, such as a band-pass amplifier, is a simple one:

Bandwidth = GBW / closed-loop gain

If you design the circuit for higher gain, the resulting bandwidth of the circuit will go down and vice versa. For example, if a device with a 10 MHz GBW is used in a circuit with a gain of 10 the bandwidth will be approximately 10 MHz / 10 = 1 MHz.

Unlike the high open-loop gain of a device such as an op-amp, which is difficult to measure, closed-loop gain and frequency response are both easy to observe. You can perform the experiment with actual components or by using a circuit simulator. I'll provide the circuit and then show the simulation results — it would be *really* great if you do both so as to "close the loop" of learning by designing, simulating, building, and then comparing!

Measuring GBW by Simulation

We're going to use the *LTspiceIV* circuit simulator described in Experiments #83 through #86. If you haven't yet downloaded and tried this straightforward simulator, now would be a good time. The price is right (free) and it does not occupy large amounts of disc space or require high speed processors to run. I'll assume from here that you're running the latest version of the program. (*LTspiceIV* automatically checks for the latest version each time it runs.)

The circuit we're going to simulate is shown in Figure 2. It's a simple amplifier circuit with gain A_V = –R2 / R1. (See Ex-

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

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

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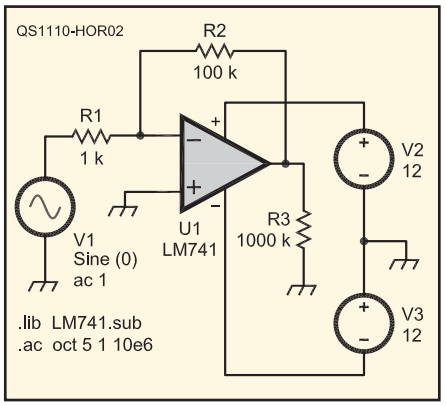

Figure 2 — An inverting op-amp amplifier circuit entered in the *LTspiceIV* schematic window. *SPICE* directives that define the LM741 op-amp model and perform an ac small-signal sweep are shown at the lower left.

periment #3 to learn how the circuit works.) Connect the circuit in the simulator, using the "opamp2" device to start with. Each of the dc voltage sources should be set to 12 V — note how the sources are connected to supply ±12 V. The input source should be configured as a sine source with a dc offset value of 0 V and the small signal ac amplitude set to 1.

To observe the effects of GBW on circuit performance, we're going to use two different types of op-amps; the LM741 and the LM318. Neither of these models is supplied with the simulator, but they are available on-line and are easy to add to your library. First, browse to the National Semiconductor Parametric Catalog for General Purpose Op-Amps at **www.national.com/cat/index.cgi?i=i//10**. The GBW column at the left of the window will be highlighted. Scroll to the LM741 and click the part number to open a window with all the information for that part. Download the PDF datasheet (the link is at the upper right) and then click the TOOLS tab at left. That opens another window for DESIGN TOOLS, including a *SPICE* model for the LM741. Download that file and save it to your *LTspiceIV* directory (usually C:\Program Files\LTC\LTspiceIV\lib\sub) as "LM741.sub."

Now go back to your simulation schematic and right click on the OP-AMP symbol. In the window that opens, change the VALUE to "LM741." Click the SPICE DIRECTIVE button on the far right toolbar symbol labeled .OP and enter ".lib LM741.sub." That text should appear on your schematic. From the SIMULATE menu, select EDIT SIMULATION COMMAND and select the AC ANALYSIS tab. The sweep type should be set to OCTAVE with five points per octave. The start frequency should be "1" and the end frequency "10e6" (1 Hz to 10 MHz). The schematic should now look just like Figure 2.

From the SIMULATE menu, click RUN and a blank oscilloscope window will appear above the schematic. Move the cursor over the schematic to the ungrounded end of R3 — a voltage probe symbol will appear. Position the probe on the wire connecting R3 to the output of the op-amp and click. Two traces will appear in the upper frequency response window — a solid one for gain and a dashed line for phase. With these initial values for R1 and R2, the circuit should have a maximum gain of 40 dB (gain of 100) and a cutoff frequency of around 10 kHz. The unity-gain frequency will be just below 1 MHz.

Move the cursor over the left-hand vertical axis. It will change into a ruler icon. Click, then set the maximum axis value to 40 dB and the minimum to 0 dB with tick marks every 5 dB. I also turned off the phase display for clearer viewing by moving the ruler cursor over the right-hand vertical axis, clicking, and then selecting DON'T SHOW PHASE. Print or otherwise save the frequency response — turn on the gridlines for easier reading of the frequencies and gains.

Now go back to the schematic and change the value of R2 to 10 kΩ (a voltage gain of 10 = 20 dB). Simulate and save the frequency response again. Change R2 to 2 kΩ (a voltage gain of 2 = 6 dB) and repeat. Compare the three graphs, as in Figure 3, and you will see that for all three circuits, the slopes of the responses very nearly line up and cross the horizontal axis quite close to each other. You can clearly see the op-amp's GBW limiting the gain at higher frequencies. (The responses don't line up exactly because of various circuit limitations internal to the op-amp.)

Finally, change the op-amp to an LM318 by downloading its *SPICE* model as described above and storing it in your library. Change the symbol value and the .LIB command as well. (I had to edit the *SPICE* model file's first non comment line to remove "/NS" from the device name — an edited version is available on the Hands-On Radio website.) Compare the circuit's frequency response using this high GBW op-amp (15 MHz) to that when using an LM741. You can experiment with many different op-amp types and circuits to see just how important GBW is to the final circuit performance.

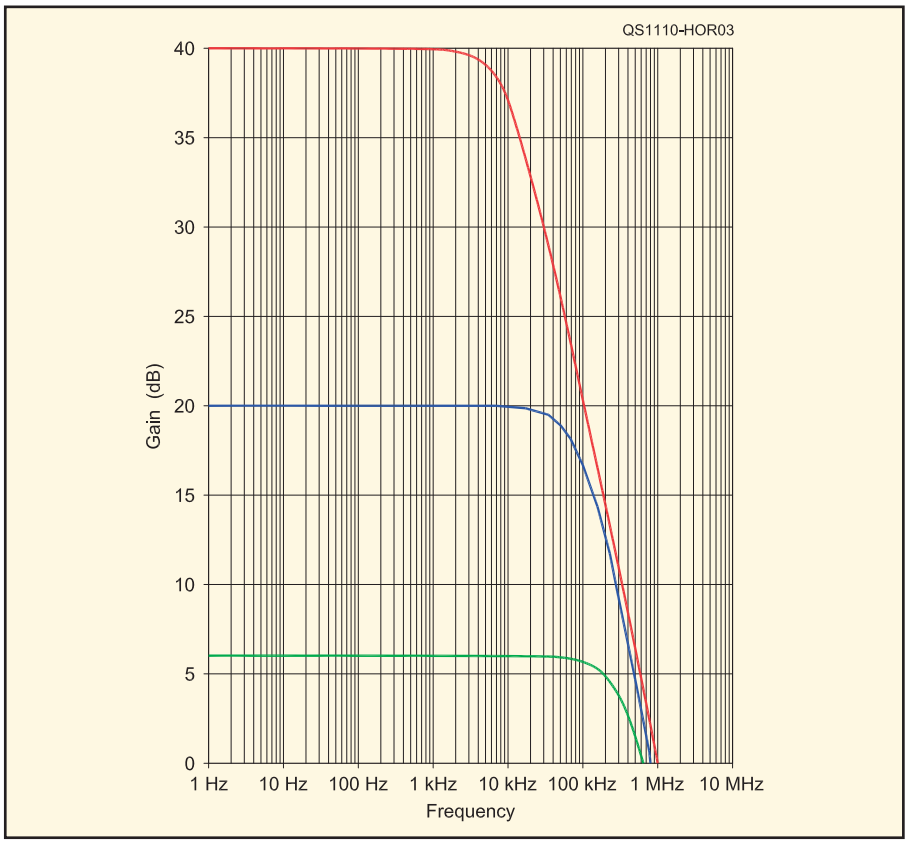

Figure 3 — Frequency response of the circuit in Figure 2 for three different gains of 40, 20 and 6 dB. The op-amp's GBW limits the circuit gain at high frequencies.

AG1YK

HINTS & KINKS

SOLDER FAULTS

◊After building a new or kit circuit board, carefully inspecting it and bravely powering it up, if it fails to perform, troubleshooting is in the offing. Of course, if some parts burn and smoke, are in the wrong places or are left out, it may not be difficult to locate the defects. On the other hand, if everything looks good and it just doesn't work, some hard-to-see faults may be present. First use a magnifying glass to check for solder shorts. If there are none, you must delve a little deeper.

Probably the most common soldering failure is to properly "wet" the foil or component lead (see Figure 1). Note that the solder fillet around the lead is bulb-shaped, rather than being smoothly feathered at both the lead and foil. The solder may be adhering to the lead in a small area, but not the foil, or vice versa, so little or no electrical connection is made. There are several causes:

- Failure to apply enough heat to bring the foil and/or lead up to temperature.
- A film of dirt, oxide or coating may be present, making soldering difficult.
- The lead may be large and act as a heat sink. This can result in overheating the foil.
- Insufficient flux was present for good soldering.

Broken Fillets

This fault may not appear until a finished board has been handled and installed, but it is very aggravating. It is difficult to see hairline cracks around component leads in otherwise good-looking solder fillets (see Figure 2). Note the cracks in what should be a well-soldered connection, where both the lead and foil have been wetted and the solder feathers out at the edges. Some causes for this fault are:

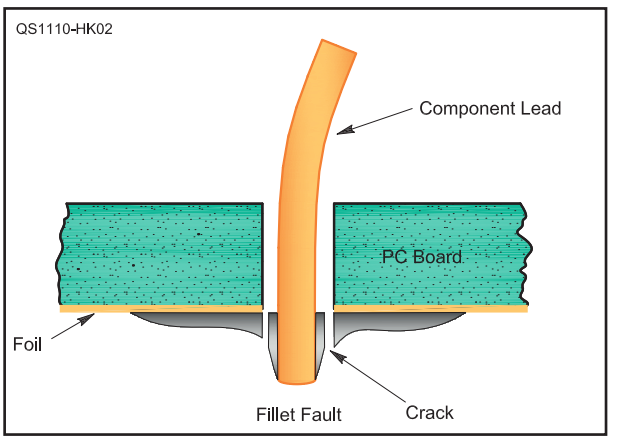

Figure 2 — This diagram shows what can happen if too much force is applied to a solder joint. Hairline fractures occur in the solder, electrically separating the lead from the foil.

- Side pressure was applied to the lead, cracking the solder.
- The solder fillet is too small. The thickness of the solder should be at least equal to the lead diameter.
- Trimming the lead with a side cutter, when the cutter is resting on the board, can pull the lead hard enough to crack the solder.

Surface Mount Device Faults

Looking at Figure 3, hairline cracks can occur at the terminals of surface-mount devices (SMD). They may be difficult to see, unless the device is broken at both ends and even then the break may not be obvious. This fault may be caused by:

- Bending of the soldered board, which stretches the surface-mounted devices, causing cracks in the solder or the device. If a 6 inch long board is arched a quarter-inch, it may damage SMDs.
- Failure to apply melted solder to both the SMD and the foil.
- Attempting to resolder SMDs, which often dissolves the metal end caps, especially when the solder does not contain silver. It is usually very difficult to reuse SMDs. Multilayered capacitors are especially susceptible, since each layer must be joined to the end caps.

Flat-pack Integrated Circuit Faults

These ICs have their leads

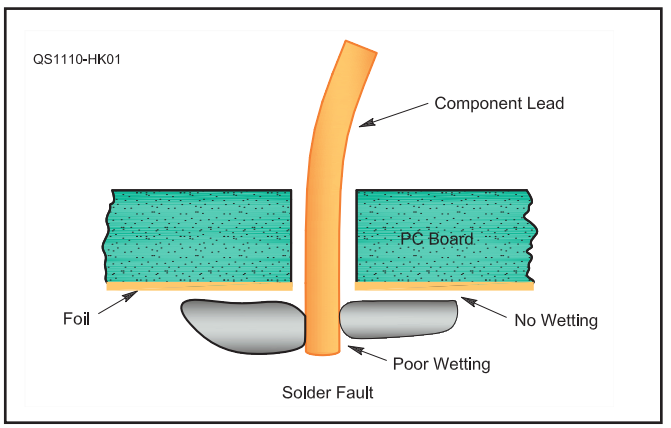

Figure 1 — This diagram shows how a lead may look soldered without actually providing an electrical connection between the component and foil.

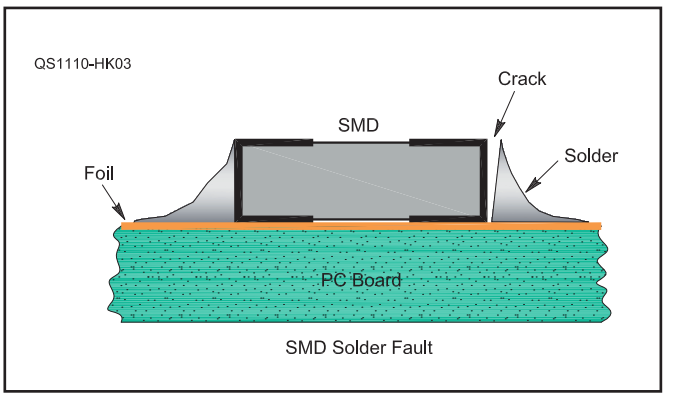

Figure 3 — When you are soldering SMD components, it is possible for the solder to build up, forming a gap between the component and the solder. Such a broken connection can be very hard to find.

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

formed to lie flat on the foil pads. In order to avoid solder shorts between leads the foil is tinned first, flux is applied and the IC is held in place while the leads are heated, usually in groups. When a lead is not soldered firmly, it fails. Bad joints may be detected by carefully prying the leads sideways a bit to detect looseness. Carefully resolder loose connections.

Foil Cracks

Hairline cracks in foil may be detected by shining a bright light on the foil side of the board and observing light leakage from the component side, provided that any solder resist lets light through. Foil breaks may be repaired by soldering a bit of wire across the break. Bridging the break with solder may fail if the board is flexed, stretching the solder patch.

Loose Pads

Pads that have broken away from the board do not offer support to component leads and may be reattached with a bit of epoxy. If a pad is separated from its foil lead, a piece of small wire may be soldered around the lead and to the foil then glued with epoxy.

Missing Plated-through "Barrels"

The inside surfaces of barrel holes are plated with copper on double-sided boards to connect the sides. If a barrel is missing, either the leads must be soldered on both sides or a piece of small wire may be installed on the component side foil and soldered to the lead before soldering the lead to the foil side. Care must be taken when removing leads and components to avoid pulling barrels. A solder-sucking tool is very handy for removing solder. If a multileaded component is to be removed, it takes a lot of care to avoid damage. If the leads are cut loose first, they can be removed one at a time with less board damage. — *73, Doyle Strandlund, W9NJD, 2849 N 035 W, Huntington, IN 46750-4012*

PIGGYBACK RF AMMETER

♢This Hints and Kinks submission resulted from one of my SWR bridges malfunctioning. My Yaesu FT-840 is fed with coax via an MFJ antenna tuner (**www.mfjenterprises.com**). This coupler also has a wire antenna binding post and a ground connection. I realized that by connecting a 0-1 A RF ammeter between the binding post and ground, I would get a power output indication. This could then be checked against a SWR bridge to confirm that maximum ammeter indication coincided with minimum SWR. I found this to be the case.

The RF ammeter was a military surplus unit that came from my junk box. A 12 V pilot light connected the same way will also work, just tune for maximum brightness. It didn't appear that there was much power output absorbed by the pilot light.

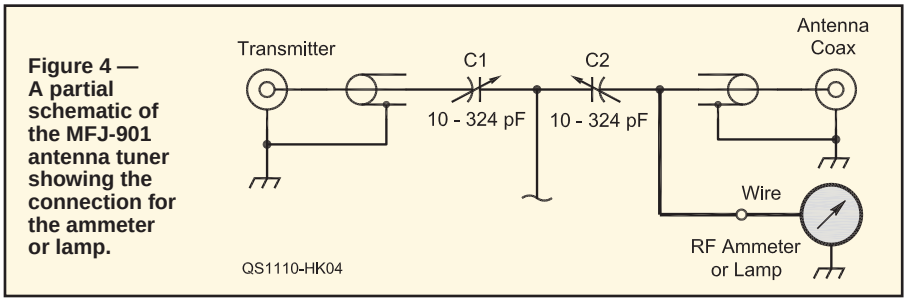

Figure 4 — A partial schematic of the MFJ-901 antenna tuner showing the connection for the ammeter or lamp.

I used an MFJ-901 for this experiment. As you can see in Figure 4, the wire antenna connector is also permanently connected to the center conductor of the coax connector. So this concept only works with antenna tuners configured like this.

The first ammeter I tried worked reasonably well, but this was not the case with higher value ammeters, especially metal-cased ammeters. Random RF interfered with the readings and I found (as stated in my *1968 Radio Amateur's Handbook*) RF ammeters either have to be in a plastic case or insulated from their metal cabinet.[1]

What seems to work best are lamps, particularly the 12 V variety. They can also be paralleled for higher power output. The 6.3 V pilot lights seem to work okay for low-power operation. I am going to put a couple of 12 V lamps in a Minibox for use with my MFJ-901. — *73, Mark Starin, K1RMC, 457 Varney St, Manchester, NH 03102,* **dstarin52@aol.com**

FAUX PHILLIPS TOOLING

♢The cross-head recess screws in Japanese radios are *not* Phillips head screws; they are JIS (Japan Industrial Standard). JIS screwdrivers are available from a number of sources online and they are not particularly expensive. The JIS recess is dimensionally different from the Phillips standard and it can be stripped very easily, especially if your Phillips screwdriver is worn. This is easily shown by placing a JIS screwdriver vertically in the recess and it will remain there when your hand is removed. This is something to keep in mind on any product manufactured in Japan. I learned this while working on my Japanese motorcycle after I had stripped the heads on a couple of screws. It was an expensive lesson. — *73, Chuck Percy, N7FZ, 3343 Laurel Mountain Rd, Murfreesboro, TN 37129-2548,* **n7fz@arrl.net**

TRAPPED RADIAL MULTIBAND ANTENNA

♢One of my favorite things to do is head for a campground and do some hamming while communing with nature. The problem was finding the right antenna.

I wanted 80-10 meter capability and something that would handle an amplifier, as you can't expect too much from portable antennas, especially if you're in mountainous terrain. I tried a long wire with a tuner but for high power it was too much equipment to haul around and required a campsite with a couple of hundred feet of space and trees in the right places. I also tried a multiband dipole, but I had wire all over the place, the trees weren't high enough and the SWR was high.

After reading as many reviews as I could find, especially on the eHam website, as well as the antenna "shoot-out" data from the HFpak website (**hfpack.com/antennas**), I settled on a Hustler 5-BTV antenna (**www.new-tronics.com**). I was lucky and found one on Craigslist for $50. I then tackled putting together a pair of radials for each band, which I thought was the minimum setup for getting out a reasonable signal. While the radials worked well, it quickly became obvious that all those radials were just too much to deal with for a portable setup.

It then occurred to me that using just a pair of trapped radials might be the ticket. I found John's, NU3E, article on a 5 band trap dipole (**degood.org/coaxtrap**) and built that for about $35. I raised it and tuned it as a dipole and then laid it on the ground attaching it to the vertical. Voila! It took a little retuning of the vertical but I now have a 5 band antenna that will handle my SB-200 without a tuner for all but a portion of 75 and 40 meters. The 75 and 40 meter bandwidths are a little narrow but if I want to use more of these bands I can run 100 W and use a tuner. The trap dipole/radials are each only 38 feet long and pose no problem at a campsite.

Not having to hang wire in trees is a plus but the bonus here is that if the trees are high enough and in the right place, I can put up just the trap dipole and not bother with the vertical. I attach the trap "radials" to the base of the vertical with a screw and wing nut, and attach them the same way to a piece of Plexiglas fitted with an SO-239 connector for dipole operation. All of this sets up and disassembles easily, another requirement for comfy portable operation.

The trap radials could likely be used with most vertical antennas, but not many could

[1] *The Radio Amateur's Handbook*, 1968, p 547.

handle the high power and cover five bands while needing no guys and being lightweight. The 5-BTV also disassembles quickly with thumbscrew pipe clamps. For the vertical ground mount, I coupled the 18 inch long, 1 inch diameter antenna mounting pipe to a ¾ inch steel pipe (also 18 inches long) so it would go in the ground a little easier. — *73, Paul Voorhees, W7PV, 10090 Misery Point Rd NW, Seabeck, WA 98380-9784,* **w7pv@arrl.net**

IN-TOWER MOUNTING OF HY-GAIN/CDE ROTATORS

♢The disappearance from the market of 2.0625 inch outer diameter (OD) tubular steel mast has made in-tower mounting of the HAM-V and CD-45 rotators problematic. Other models using a fixed mast clamp on top of the bell housing also have difficulties. These old designs were intended to clamp and rotate a 2.0625 inch mast, perfectly centered in the tower. Even with the 2 inch OD masts sold by some amateur dealers, shimming will still be required for the mast to turn on the rotational center of the rotator.

One popular mast choice for HF beams mounted a few feet above the tower top is common 1½ inch galvanized steel water pipe, in either Schedule 40 or the thicker walled Schedule 80. Nominally called "inch-and-a half," it's actually 1.9 inches OD. Again, these will require a shim placed into the rotator's V-clamp; otherwise, the rotation will be an ellipse rather than a circle and cause binding of any thrust bearing or tower-top sleeve bearing.

[Caution, steel water pipe is not designed for mast applications and may not provide sufficient bending strength for your application. For more information refer to the "Mast Strength" discussion in the *Antenna Book*.][2]

To calculate shim thickness, subtract the actual mast OD from 2.0625 inches then divide the result by two. For 1½ inch galvanized steel water pipe: 2.0625 − 1.9000 = 0.1625/2 = 0.08125 inch shim. Then the question is where to obtain the shim stock economically in a small quantity?

Home Depot and similar home improvement stores stock small galvanized steel reinforcing plates used in framing wood homes. Simpson Strong-Ties is one brand available at Home Depot in the lumber section. One each of the Strong-Ties LSTA12 (20 gauge) and LSTA36 (18 gauge) will provide enough 1.25 inch wide stock to cut two shims of each gauge stacked, the 20 and 18 gauge shims will measure 0.083 inches, less than 0.002 inches from optimum.

Fit both stacks into the V-clamp; bosses cast into the clamp where the U-bolts pass through will not allow the shims to lie flat, so mark the shims to later notch them with a nibbling tool or grinder. When the shim stacks lie flat in the "V," insert the mast, assemble the clamp with the shims in place and tighten the U-bolts. Total cost for material is under $4. — *73, Robert Wheaton, W5XW, 16015 White Fawn Dr, San Antonio, TX 78255-1042*

COLOR CODING POWERPOLES

♢Mal Eiselman's, NC4L, article on Anderson Powerpole connectors is very apt, due to their ever-increasing popularity among amateur operators.[3] If there is a caveat, it is the fact that the same housings are used for 15, 30 and 45 A contact assemblies. Further, a good portion of these connectors are used with multioutlet power centers like West Mountain Radio's RIGrunners (**www.westmountainradio.com**). Most of these come preinstalled with ATO fuses in various ratings. As a result, one could inadvertently plug a power cable into an outlet with the incorrect fuse rating. While this might not cause a problem, there is a very simple solution.

Anderson Powerpole connector housings are available in black, gray, violet, pink, brown, red, blue, yellow, green, orange and white. These correlate very nicely with ATO fuse ratings 1, 2, 3, 4, 7.5, 10, 15, 20, 30 and 40 A, respectively. The 5 A ATO fuse is tan colored and the remaining white housing could be substituted, if required.

The only remaining caveat is assembling the connectors as Mal suggests. If you do, it's impossible to cross connect them, even if both housings are the same color. Purists might insist on always using black as the negative, but that still leaves plenty of leeway for the most popular ATO fuse ratings of 3, 10, 15, 20 and 30 A. — *73, Alan Applegate, KØBG, 3202 Notting Hill Ave, Roswell, NM 88201-0403,* **k0bg@arrl.net**

EASY PTT

♢I needed a PTT switch on my desk that was easy to use with my boom microphone. I was in a Staples store to purchase some office supplies when I saw the perfect PTT switch: The Staples "That was Easy" talking button. I purchased an "Easy" button for $5 and returned home.

I placed the switch on my bench and opened it up. First, remove the battery cover and batteries. There are four small feet on the bottom; remove the feet to expose the screws. Before you open the case place a small mark with a pen to show yourself how to reassemble it. Remove the four screws and the case will come apart to expose the working switch and audio circuit. Next cut the circuit board as indicated (see Figure 5) with a small knife.

A ROBERT PANTAZES, W2ARP

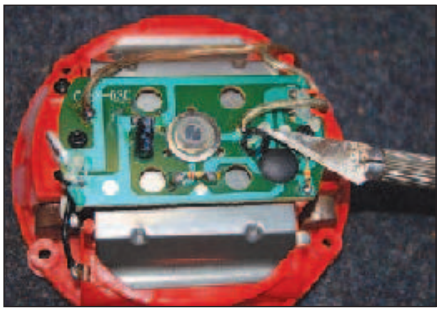

Figure 5 — The inside of the "Easy" button. The point of the knife blade indicates where the foil must be cut.

A ROBERT PANTAZES, W2ARP

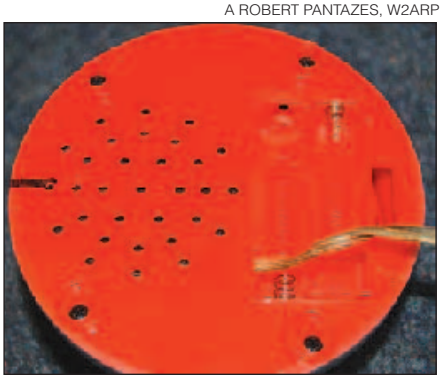

Figure 6 — The wires to your transceiver exit through the battery case.

Solder a very small wire on the vacant solder pad near the right side of the switch. The other wire is soldered to a vacant solder pad near the white wire to the battery compartment. Run the wires out the battery compartment (see Figure 6) and test with an ohmmeter. The "Easy" red plastic button has to seat into two slots of the cover to work properly. Reassemble and retest making sure the switch moves freely. Wire to your rig's PTT and you have a desk PTT switch for $5. — *73, A Robert Pantazes, W2ARP, 1 Madison Ave, Northfield, NJ 08225-1071,* **w2arp@arrl.net**

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[2]D. Straw, N6BV, Ed., *The ARRL Antenna Book* (Newington: 2007), pp 22-22 — 22-23. Available from your ARRL dealer or from the ARRL Store, ARRL order no. 9876. Telephone toll-free in the US 888-277-5289, or 860-594-0355, fax 860-594-0303; **www.arrl.org/shop/**; **pubsales@arrl.org**.

[3]M. Eiselman, NC4L, "One Ham's Power Connector Preference," *QST*, Sep 2010, pp 36-37.

CE9 DXpedition to the Tip of South America

Cezar Trifu, VE3LYC

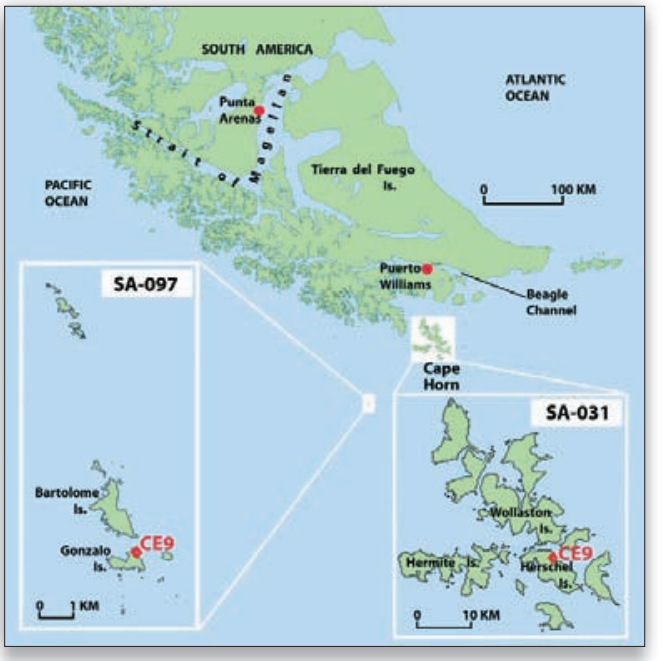

Figure 1 — CE9 camps on Herschel and Gonzalo Islands.

Dream big and dare to fail!

A memorable expedition is as much about *the destination* as it is of *the journey*. Traveling to a remote region of our planet is not only adventurous and challenging, it allows us to discover the nature and wildlife in their primordial splendor and to develop a strong interaction with many others along the way. In the process, we become intensely aware of the diversity and fragility of our world, as well as of our resilience and social nature.

RSGB's Islands On The Air (IOTA) program has organized world open-sea islands into 1200 groups, with about 100 still waiting their first activation. In the spring of 2010 I embarked on a project to put on the air the Wollaston and Hermite (SA-031) and Diego Ramírez (SA-097) Islands at the tip of South America. Located near Cape Horn, 75 miles south of Puerto Williams, the former group was activated only once, 24 years ago. In demand by 98% of island chasers, it ranks #6 on the Most Wanted IOTA World Wide List and #1 in South America. Lying 70 miles to the southwest of the Cape, in the Drake Passage, the Diego Ramírez group had never been on the air.

Down there the wind is king. It averages 20 mph, with gusts over 60 mph occurring in all seasons. Beagle Channel and passages between Wollaston and Hermite are notorious for treacherous winds, which can strike a vessel with little or no warning. The prevailing winds below 40°S can blow from west to east around the world almost uninterrupted by land, except at the edge of South America. These winds are further increased by the funneling effect of the Andes and the Antarctic Peninsula, which channel them into the Drake Passage. Also, the presence of a shallow ocean floor in the region contributes to the generation of rogue waves of nearly 100 feet high. What an adventure!

Oasis in the Arctic

Searching for a teammate, I learned that Johan, PA3EXX, was independently looking into a similar project. He enthusiastically accepted that we join forces. Meanwhile, the skipper I retained earlier for the trip took the wind off our sails by announcing that he would be unable to assist us. Luckily, our frantic search for a substitute was short, as he found a replacement in Thomas, an experienced sailor, with his 40 foot steel yacht *Nunatak* ("Oasis in the Arctic" in Inuktitut).

Logistics favored landing sites on Herschel Island and Gonzalo Islands, respectively. Aside from needing radio licenses from the Subsecretaria de Telecomunicaciones, approvals for navigation, landing and camping were also required from the Chilean Navy, Corporacion Nacional Forestal, Ministerio de Bienes Nacionales and Direccion Nacional de Fronteras y Limites del Estato. It was a daunting task, accomplished due to the resilient assistance of Dino Besomi, CE3PG, president of the Radio Club de Chile, and Jorge Garcia Briones, CE8PTK, president of the Radio Club de Punta Arenas.

As Thomas traveled to Ushuaia, Argentina and Puerto Williams, Chile in late November for the southern summer season, final preparations were under way. Contingencies included wetsuits, additional camping gear, spare rigs, antennas and generators. Also, we

Figure 2 — Sara, Thomas, Johan and Cezar at Micalvi.

Figure 3 — Cezar and Johan in the operating tent.

Figure 4 — CE9 camp on Herschel Island.

Figure 5 — Equipment is brought ashore at Gonzalo Island.

retained Sara as additional crew, thus reinforcing the ability to navigate the yacht and land the operating team.

We arrived in Punta Arenas on January 6, 2011, welcomed by Jorge, CE8PTK, and Jose, CE8GWZ. Our hosts took us on a tour of the city lying on the shores of the Strait of Magellan and overlooking the big island of Tierra del Fuego before accepting our invitation to dinner. A huge monument in Plaza de Armas reminds that Magellan arrived here in 1520. To his left sits the giant statue of a native Indian. Following the tradition, we kissed his toe for good luck.

The next morning we flew into Puerto Williams, located on the southern shore of the Beagle Channel, on Navarino Island. Established in 1953 and serving primarily as a naval base, the picturesque city of 2000 people offers an alternative experience to the visitor compared to more opulent Ushuaia, located 25 miles to the west. The entire region has a subpolar oceanic climate with 118 inches per year of rain, short and cool summers, and long but moderate winters. Less exposed to the southern cold winds than its western neighbor, Puerto Williams offers an excellent shelter for yachts off season.

Thomas and Sara met us upon arrival and we noticed the good chemistry instantly. After renting the camping gear and purchasing some food provisions, we all went to the harbor administration to seek the "zarpe," the Navy's formal approval of our itinerary. With all permits in hand it still took us several hours to obtain it. Yachters and tourists cruising southern waters gather after dark at the Micalvi Yacht Club, tucked in a sheltered bay overlooking the rocky but delicate Dientes de Navarino Mountains. The club runs the southernmost bar in the world, where we were becoming famous since tourists on Diego Ramírez were unheard of.

At 9 AM January 8 we lifted the anchor and headed east on the Beagle, on engine power alone. Three hours later the wind picked up and we put the sails, cruising at 7 knots. After a small detour to photograph the Magellanic penguin colony on Martillo Island, we passed Puerto Toro. A little later the cliffs of the Wollaston Islands appeared in the horizon, at the end of Bahia Nassau, and we headed for them under a continuous drizzle. The wind and rain increased in strength just as we entered the narrow Passo Bravo, so the sails came down and the engine went back on. Crossing the Franklin Channel to the Hermite Islands, we anchored the boat in Caleta Martial, just off Herschel Island. It was getting dark and the waters were too choppy, so landing was postponed.

Setting Up on Herschel

On the morning of January 9 we made several trips to shore, where we set camp. The radio tent was only 4 feet by 5 feet inside, and 4 feet high. For resting, a smaller tent was located 60 feet away, up the hill, in case the ocean would sweep the beach. Johan installed a Force 12 vertical, later used on 17 and 20 meters, while I put up a wire vertical, employed on 20, 30 and 40. To maximize the number of stations worked, we used one call sign per band and mode (CE9/VE3LYC and CE9/PA3EXX). During the day we took some shifts, but it would be mostly Johan operating, while I took my turn at night and early morning. There was no propagation between about 12 and 16 UTC, which gave us time to work around the camp. We slept on the boat and took turns for dinner, always masterfully prepared in French tradition.

Next day the wind intensified, with gusts of 75 mph. The sounds of the tent pummeled by the wind and the ocean's waves splashing on the beach were so strong that it was very difficult to copy the stations calling us in the pileup! Each night I had to battle with the tide. Higher waters would dig the antenna radials out, thus flipping the mast. Since the beach was narrow, at least one of the radials had to

Figure 6 — Panoramic view of the CE9 camp on Gonzalo Island.

Figure 7 — Everyone enjoys in the success.

be moved deep into the bush.

During the breaks I took long strolls deep into the island. Climbing the hills around offered some great views of the neighboring islands. The highly humid and moderately cold climate, typical of tundra, limits the growth of trees. Vegetation was lush, however, from large and solidly grounded bushes to hard leaf grass and various types of moss. Albatrosses, blackish oystercatchers, kelp and Magellanic geese could often be seen on and around the beach.

On the morning of January 13, as the weather improved steadily, we shut down, preparing for the second stage of our expedition. From SA-031 we logged 4044 QSOs with 2818 stations in 85 DXCC entities on 6 continents. About 61% of the contacts were on CW and 39% on SSB, operating on 17 (31%), 20 (32%), 30 (25%) and 40 m (12%).

On to Diego Ramírez

After a good night's sleep we felt recharged and, based on a promising weather forecast, headed overnight to Diego Ramírez, leaving Cape Horn in the distance. A quasi-continuous drizzle accompanied us for a while. We sailed on automatic pilot, but Thomas and Sara took shifts to keep an eye on it. Once in the open, the ocean swells became stronger, rolling the yacht and throwing me from one side of the bunk to another. As if I needed anything else to stay awake, my Pelican case holding the ICOM IC-7000 and components was thrown forcefully and landed with an incredible noise on the wooden floor. Would the rig work the next day?

By 6 AM we were all up on deck, checking out the foggy gray silhouettes of the Diego Ramírez Islands. The group was first sighted on February 12, 1619 by Bartolomé and Gonzalo Nodal, exploring on behalf of the Spanish crown, three years after the discovery of Cape Horn. It was named after the expedition's pilot, Diego Ramírez de Arellano, while the largest of the southern islands bear the names of the brothers.

The housing compound on Gonzalo was clearly visible atop of Caleta Condell, but attempts to contact the lighthouse personnel using the VHF radio were unsuccessful. Although the weather was calm, given the ocean swell and the presence of many rocks just under its surface, we wore wetsuits. First, Thomas and I would go to check the landing site, taking some gear with us, after which Thomas was to bring Johan with the heavy equipment.

It was partly sunny, with a light breeze when I stepped on the beach. In front of us was a landmark rock, while penguins, albatrosses, seabirds and a leopard seal were all around. A young navy staff member came to say hello and invite us to their office uphill. It wasn't easy to climb the very steep, 80 step steel ladder in wetsuit socks. It had taken the guys a couple of months to replace the old wooden stairs, heavily damaged by the elements. They had just finished the job and partied long the previous night. A few minutes later Thomas and I, leaving water marks on the parquet, must have offered a funny memorable moment explaining calmly to the sleepy lighthouse keeper (Jorge) and crew (the two Franciscos, plus Rodrigo and Patricio) what we were doing there dressed like Agent 007!

Once things were clarified, Jorge and his crew didn't spare any effort to help us out. They brought everything up using a poly, after which Johan and I began working on the antennas and setting up the station. Ready to get on the air, we realized that an S9+20 dB noise made any attempt to operate futile. With permission from our hosts we searched for its source by switching off their generator, then each of several refrigerators, the TV set and computers. Nothing helped. Since shutting down the satellite communication wasn't possible, we gave up. Our hosts picked up the generator, batteries, gas and water, while we took the radio and camp gear, walking everything down those steep stairs to the beach.

Diego Ramírez is QRV

We worked fast to set up the camp and at 2:30 PM (1730 UTC) the Diego Ramírez group was on the air. Over the next 48 hours we operated virtually non-stop. During the day time we took turns, while I kept operating overnight. The propagation conditions were amazing, as we were able to copy stations from up to 5 continents at times, with fierce pileups. We were always invited for meals at the lighthouse quarters and took turns. Only once we both broke for a short time in response to the chief's invitation to a fine BBQ.

The weather changed frequently, from overcast and rain to sunshine and blue sky and back, from 56°F at noon to 34°F at night, when it was cold, wet and windy. From Cristian and Jaime, on a scientific mission there, we learned that islands were home to 55,000 pairs of black-browed and 17,000 pairs of gray-headed albatrosses, almost half and all of their respective populations in Chile. Magellanic and rockhopper penguins, giant petrels, other sub-Antarctic seabirds, as well as seals were a common presence on the beach. At night, however, leopard seals had to be carefully avoided, while the sky belonged to countless blue petrels, representing 90% of its world population.

A pathway led to the lighthouse, located on top of the hill, several hundred yards away from the staff quarters. Albatross nests in which cute chicks with puffy feathers waited for food dotted the grounds between green and blue high grass fields. The view from above was breathtaking. The rocky cliffs of the nearby Bartolomeo Island, green on top, rose high from the blue waters, while white albatrosses flew over their dense colonies under the partly dark blue sky as far as one could see.

Back at the CE9 camp, we only installed the wire vertical antenna, since it was so easy to change bands on it. During the day, a couple of striated caracara, a type of Austral falcon, figured out that by picking the tip of one of our radials the mast would fall on the surrounding rocks and break, making us angry. They seemed to enjoy it very much, as they would repeat it time and time again. Without wood, we spliced the broken pieces using bird bones, remains of animal feasts. At nightfall the caracara would go away, but the tide would set in, pushing the water from east and north. What a nuisance!

We logged a total of 3058 QSOs from SA-097 with 2378 stations in 78 DXCC entities from 6 continents. 70% of the contacts were on SSB and 30% on CW, operating on 17 (31%), 20 (39%) and 30 (30%) meters.

Back to Puerto Williams

On January 17 the wind changed direction and our request to enter the Beagle Channel through Bahia Cook was approved by the Navy. Saying goodbye to our wonderful hosts, we left the island late in the afternoon. As we passed by the northern group isles, hundreds of elephant seals jumped off

Figure 8 — The *Nunatak* at anchor off Gonzalo Island.

the rocks and swam toward us, while large groups of penguins came very close, and numerous dolphins followed us for a long distance, executing synchronized jumps in the air in front of the yacht. We were in awe!

Next morning we reached the continent and entered the southwest arm of the Beagle. Sailing by Cloué Peninsula, we dropped anchor near the majestic Coloane glacier. Before dinner Thomas and Sara surprised us with a bottle of Champagne for a successful project! We took it easy, walking around the glacier, taking photos, sailing farther past Delta Island through Barros-Merinos Channel toward the northwest arm of the Beagle, and from there to Beaulieu. Passing by some of the most impressive southern glaciers, such as Espagna, Romanche and Italia, we stopped at the Yendegaia ranch, a short distance from Ushuaia. The return to Puerto Williams signaled the end of an epic journey in sub-Antarctic waters.

Acknowledgments

This project was made possible due to the skill and dedication of Thomas and Sara. Our team is thankful to Dino, CE3PG; Jorge, CE8PTK; Navy Commander Marco Arellano; Alejandro, CE3JWF; Jose, CE8GWZ, and Pedro Giannini for their fantastic logistical support. We are truly grateful to our group sponsors: IREF, GDXF, ICOM Canada, MFJ, SDXF, Clipperton DX Club and IT9EJW QSL Printing. Gratitude is expressed to Lighthouse Chief Jorge Figueroa and the Navy crew on Gonzalo Island for their amazing hospitality. Thanks to Cristian and Jaime for sharing some of their work with us. George, VE3GHK, is specially appreciated for his exceptional technical assistance. We remain obliged to our families for their understanding and support.

We are also indebted to W5BXX, JM1PXG, VE7DP and W8OU for their trust and exceptional support. Top donors included DK8UH, I1SNW, I2YDX, JE1DXC, K9AJ, OE3WWB, PT7WA, SM6CVX, VE7IG, VE7QCR and W5BOS. Substantial support was provided by 9A2AA, DL1BDD, DL2MSA, EA8AKN, F6BFH, G4SOZ, HB9BZA, 7K3EOP, JA1EY, JF4VZT, JA8MS, JA9IFF, JRØDLU, OE3RPB, OE3SGA, ON4IZ, ON4XL, SM3NXS, SM5LNE, UAØYAY, VE1VOX, VE3JV, VYØPW, VK3HJ, KD1CT, WB2YQH, W3AWU, K3FN, N3QQ, W4DKS, AD5A, WB5JID, K5MT, W5PF, W5VFO, N6AWD, N6DT, W6RLL, N6VR, N7RO, K7SO and WB9EEE. We thank them very much, as well as all those who were able to offer some support (see full list at **ce9iota.weebly.com**).

Photos by the author.

A passionate DXer, Cezar, VE3LYC/YO3YC, is credited with the DXCC Honor Roll, 2400+ DXCC Challenge, 5BWAZ and 1000 IOTA entities. He has activated several rare and new IOTA groups in the Canadian Arctic. You can reach the author at **ve3lyc@hotmail.com**.

IN THE SEPTEMBER/OCTOBER 2011 ISSUE:

■ John Hansen, W2FS, describes "VSC-X: A Virtual Serial Cable" that uses a pair of X-Bee Pro modules, which transmit with an output power of about 60 mW on the 2.5 GHz band. These modules use the Zigbee IEEE 802.15.4 protocol to provide data transceivers. John adds the necessary hardware to create a USB interface and a serial interface. Use a pair of these modules to remotely program your mobile transceiver, no wires required! How many other applications can you find for a virtual serial cable?

■ Arch Doty, W7ACD, explains some results from his experiments with "The Effect of Soil Properties on the Performance of Antenna Radials." When earlier research was interrupted by some heavy rains that changed the ground conductivity of his antenna test range, Arch turned his attention to the temporary effects caused by that change.

■ Fred Franke, WB2FNO, introduces an electronic "component" many have never heard of in "Playing with the Lambda Diode." The lambda diode, built from two transistors, exhibits a negative resistance response that proves useful for a variety of circuits, including a signal generator, dip meter and crystal oscillator for checking crystal operation.

■ Jukka Vermasvuori, OH2GF, describes a test circuit that he built for "Measuring Coils in Tuned Circuits." Jukka explains the importance of measuring coil *Q* at the frequency at which the coil will be used.

■ Maynard Wright, W6PAP, presents the next in his series of articles about the *Octave* programming platform in "*Octave* for Curve Fitting." Maynard uses *Octave* for some antenna modeling calculations, and shows us how to use some of the program's features to accomplish a least squares fit of the data.

■ ARRL Lab Test Engineer Bob Allison, WB1GCM, gives us his impressions of *Receiver Design and Technology*, a new book by *QEX* author Cornell Drentea, KW7CD. Bob explains why RF engineering students and those more casually interested in receiver design topics would benefit from a copy of this new book.

■ Ray Mack, W5IFS, returns to our pages as an author, with a long-awaited addition to his "SDR: Simplified" series. In this installment, Ray introduces us to cascaded integrator comb (CIC) filters, and explains their operation in the signal processing chain.

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Surfing 2696 km over the Atlantic

How French and Swiss operators set a new world record on 10 GHz.

Pierre-André Probst, HB9AZN

On July 10, 2010, a group of French and Swiss operators established a new world distance record on 10 GHz. The contact was made between the island of Sal, Cape Verde and Vila Nova de Milfontes, Portugal, a path of 2696 km or 1675 miles. This article describes the project from the perspective of the Swiss team, which operated from Sal.

Trans-Horizon Propagation: Evaporation Ducts

Traditional microwave links on the Earth's surface can only work when the sending and receiving sites see each other. Trans-horizon propagation mechanisms, such as reflections (EME, for example), tropospheric scatter, rain scatter, elevated ducts and surface ducts, also exist.

The refractive index (or more accurately the modified refractive index[1]) usually increases with altitude. On the surface of the ocean, however, the air is saturated with water vapor, resulting in a decrease of the refractive index up to the so-called evaporation duct height. When such ducts are present over the entire link path, distances of several thousand kilometers on the ocean are possible. According to the reference in Note 1, this propagation mechanism affects frequencies over 3 GHz, and the world average height of the evaporation duct is 13 meters.

This phenomenon is well-known within the microwave ham community and has led to several activities like the so-called "Grande Bleue" in Europe. For almost 20 years, Amateur Radio stations met together around the Mediterranean Sea in June to contact each other on ATV/DATV.[2]

Motivated by the success of this activity, a group of Swiss and French amateurs took the initiative to set up a project with the objective of breaking the existing world SSB distance record of 2079 km on 10 GHz, established in June 2000 by DL4AM and DJ3KM between Israel and Lampedusa, Italy.[3]

Preparation

We took the first step in our preparation in 2007 by researching the location, timing, equipment, propagation, logistical and regulatory requirements (licenses and related authorizations).

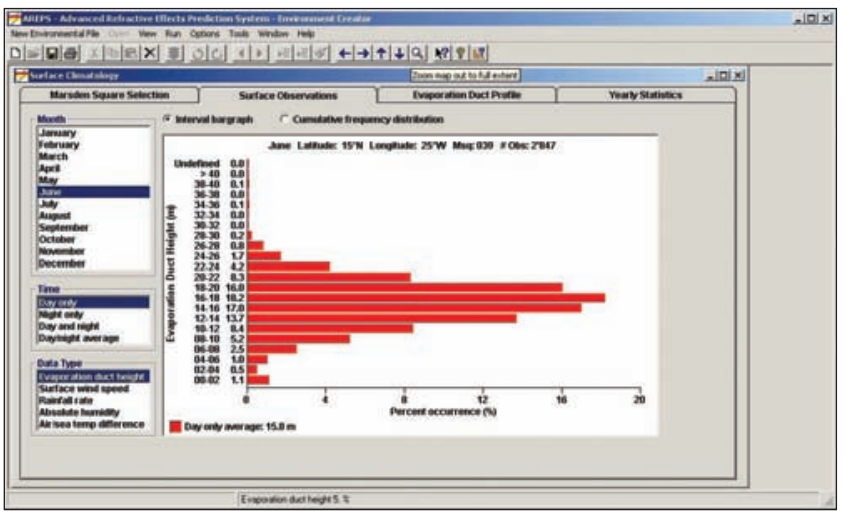


Figure 1 — Evaporation duct height (vertical: duct height; horizontal: probability of occurrence).

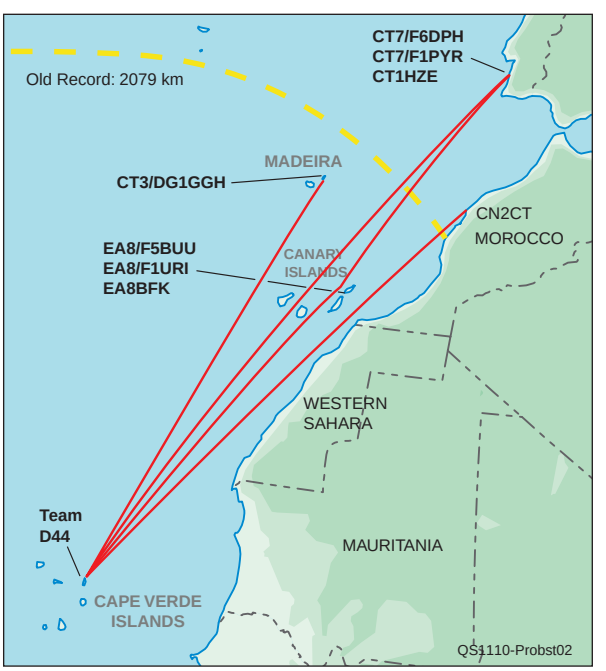


Figure 2 — The Hyperatlantica 2010 network.

Location

The key issue was to find the right location for the two stations with a link of more than 2079 km. The path needed to be completely over water and free of any obstacles like islands. Furthermore, as explained above, the equipment had to be operated close to sea level to benefit from the evaporation duct propagation mechanism. Figure 1 represents an example of the probability prediction of the evaporation duct height (Cape Verde, June 2009), using the Engineer's Refractive Effects Prediction System software (EREPS).[4]

Our dream was to find two holiday resorts with nice beaches!

We started to plan to operate between Egypt and Spain (about 2500 km), mainly for two reasons: travel facilities (from Switzerland and France) and the fact that the probability of getting high temperatures over the water in summer over the entire path is greater for an East-West path than a North-South link. Unfortunately, after more than seven months of effort, beginning in 2008, we received a negative answer from the Egyptian authorities.

Finally, we decided to try between southern Portugal and the island of Sal on Cape Verde, 2696 km.

[1]Notes appear on page 70.

Timing

From observations of the propagation data,[5] it was obvious that our expedition would have to take place in summer. To avoid the holiday season (July-August), we chose end of June/beginning of July.

Equipment

Based on our experiences in Europe, we decided to use existing 10 GHz equipment with transverters, power amplifiers of about 20 W and offset dish antennas. Some of the modules were "tropicalized" to protect them against humidity, salt and dust. For the service channels, we planned to operate 144 MHz and SW stations.

Figure 3 — Team D44.

Logistics

The critical issue was the amount of material we could take with us from Switzerland to Sal at reasonable costs. The idea was to get everything within the limit imposed by the airlines: 30 kg of registered luggage and 6 kg of personal items for each team member. With six operators, this would allow us to take 180 kg of technical material without having to pay a supplement.

Since the planned location, Ponte Fiura in the north part of the island of Sal, 15 km away from the nearest city, Espargos (the island's capital city), looks similar to the Nevada desert, we planned to install a camp, including a power generator and a minimum of facilities for a team of three operators to stay overnight. For the basic infrastructure, material was supplied by our local support, Xara, D44TD.

Regulatory Aspects

Thanks to the support of the ITU, we contacted the national regulation authority (ANAC) in Praia on Cape Verde. During a preparatory stay on Sal and Praia in January 2009, we had the pleasure to meet the Director of ANAC. Our project was very well received and supported. We got guest call signs D44T… for our first visit in June 2009 and our second stay in Sal in July 2010.

2009 — Preparing for a Record

The new record was the result of long preparation and of a lot of effort. An important step was a 2 week trip in January 2009 to investigate possible locations and to check the logistical facilities on the island of Sal. This was also an excellent opportunity to meet Xara, D44TD, and to pay a visit to the Director of ANAC in Praia. Without this step, our project would have faced serious problems regarding logistics, licenses and the customs procedures.

In June 2009 a first attempt took place by a team of four operators: D44TOI/HB9BOI, D44TUG/HB9DUG, D44TZN/HB9AZN and D44TXV/HB9RXV.

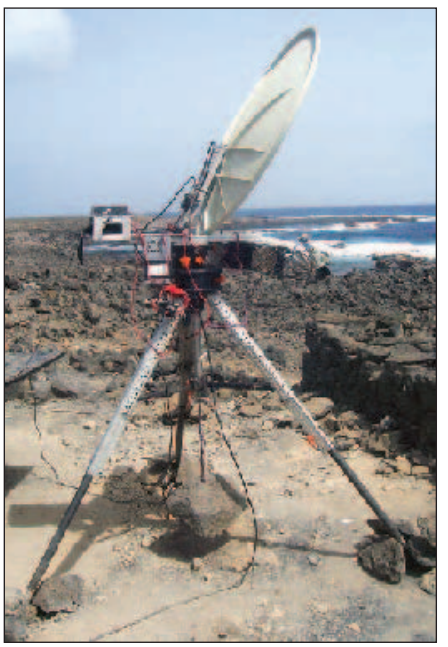


Figure 4 — 10 GHz equipment.

From June 20 to June 27 we tried to reach our partners, F1AAM, F1URI, F5BUU, F6DPH and CT1HZE, in Portugal, south of Lisbon (IM57NH). Unfortunately, we did not succeed in reaching them on 10 GHz due to unfavorable meteorological conditions south of Portugal during that period. This first expedition was very promising, as we made several 10 GHz contacts with EA8BFK, located in Fuerteventura, Canary Islands (1560 km).

Shortly after our return to Switzerland, the decision was made to organize a second attempt in summer 2010, under the project name "Hyperatlantica 2010."[6] Based on the experience of 2009, a number of improvements were made regarding equipment, organization, propagation forecasts, traffic management, and so on.

July 10, 2010, 1046 UTC: We Got It!

We arrived on Sal on Thursday, July 1, 2010 and on the evening of July 2 everything was in place at Ponte Fiura. We began to operate the station during the weekend. After 7 days of uncertainties, at the end of the afternoon of July 9 we started to hear weak signals from CN2CT in Morocco. We had to wait until the next day at 0855 UTC to conclude the two-way contact, breaking for the first time the world record of 2079 km with 2200 km.

Finally on July 10, 2010 at 1046, reports and locations were exchanged between the team D44 in HK86NU and the two French operators, CT7/F6DPH and CT7/F1PYR, in IM57or.

Unbelievably, our signal had traveled 2696 km over the ocean! All six HB operators of the D44 team had the opportunity to contact CT7 until 1110 UTC before performing tests on other frequencies.

Hyperatlantica Network: 5 Teams Involved

In addition to the station in Portugal, a number of other partners were involved in the project (Figure 2). They have all contributed to the success of the expedition. For example, contacts with Fuerteventura (Canary Islands) and Madeira have been very useful in helping us to follow the evolution of the propagation.

The following teams were involved:

- D44 (Cape Verde, Sal / HK86nu) (Figure 3):
  D44TD
  D44TAX/HB9AYX, D44TEF/HB9EOF, D44TOI/HB9BOI, D44TRD/HB9RHD, D44TXV/HB9RXV, D44TZN/HB9AZN
- CT (Portugal, Vila Nova de Milfontes / IM57or): CT7/F1PYR, CT7/F6DPH, CT1HZE
- CN (Morocco, Safi / IM52jh): CN2CT (F2CT)
- EA8 (Fuerteventura, Canary Islands / IL28xq): EA8/F5BUU, EA8/F1URI, EA8BFK
- CT3 (Madeira / IM12np): CT3/DG1GGH, CT3HF

Home station in Switzerland: HB9ACA
Technical support in Switzerland: HB9DUG

Traffic

Although the priority was on 10 GHz, we also took the opportunity to contact our partners on 144 MHz, 1296 MHz and 5.7 GHz. For 1296 MHz and 5.7 GHz, we made the

first contacts on these bands from Cape Verde. On 5.7 GHz, the distance also represents a new record between Africa and Europe.

In addition to the 10 GHz record, the traffic from Sal can be summarized as follows:

- D44-CT7 (2696 km): several contacts on 144 MHz, first contact between D44 and CT7 on 5.7 GHz and first contact D44-CT7 on 23 cm with CT1HZE.
- D44-EA8 (1591 km): almost permanent link on 144 MHz (service channel).
- D44-CT3 (1852 km): first two-way D44-CT3 contact on 10 GHz.
- D44-CN2 (2200 km): almost permanent contact on 144 MHz (service channel) and world record on 10 GHz SSB with CN2CT (July 10).

All these contacts were achieved in SSB with signal reports up to S9-plus! We were particularly surprised by the signal strength S7 to S9 on 5.7 GHz between D44 and CT7 on July 10.

Figure 5 — Our improvised shack at Ponte Fiura.

Equipment

For 10 GHz and 5.7 GHz we used a single configuration with tripod and parabolic dish antenna (offset, 90×105 cm see Figure 4). Within a few minutes, it was possible to switch between the two bands, connecting the corresponding transverter and feed horns.

Apart from the FT-817 commercial transceivers, the rigs for 10 GHz, 5.7 GHz and 1296 MHz were homemade with modules available on the market.

The 10 GHz transceiver was based on a transverter module from DB6NT with 432 MHz IF. The horn antenna was directly mounted on the waveguide switch. In the receiving section, to improve the sensitivity a low noise preamplifier was also mounted directly on the waveguide switch. In the sending path, a 25 W power amplifier with adequate cooling was used. A logic unit including a sequencer delivered the PTT control and command signals.

The 5.7 GHz station was built with the same structure (15 W PA).

On 1296 MHz, the transceiver was also based on a transverter but with an IF of 144 MHz, followed by an LDMOS-PA (50 W) and a Yagi antenna (26 elements) with preamplifier.

The VHF/144 MHz station, composed of an FT-857 (50 W) and an 11 element Yagi antenna also with preamplifier, was operated mainly as a service channel.

For HF, an ICOM IC-756MKII with ground plane (7-14 MHz) and Slim Jim (18-21-24-28-50 MHz) antennas were installed in priority as a service channel. In addition, about 2500 contacts were made on the HF bands.

Ponte Fiura: Improvised Shack in the Desert

The choice (dictated by technical requirements) to stay at the northern part of the island of Sal for more than 1 week was a real challenge. The microwave station was installed close to the sea. The remaining equipment was located about 15 meters away, behind the rest of a stone structure that probably provided housing for the lighthouse keeper (a long time ago!). There is nothing else in Ponte Fiura other than volcanic stones, dust, wind, humidity and sand! It was therefore important to protect the shack and equipment from dust and humidity. Based on our experience from June 2009, we were successful this time in using a spray to limit the corrosion between the aluminum boom and stainless clips of the Yagi antennas.

The station was operated 24 hours per day with a break during the night. The changing of the two teams (three operators each) took place in the morning between 0900 and 1000 local time.

Figure 5 is a general view of the installation and of the campus.

Conclusions

For all participants, the record will remain as an unforgettable experience, especially the technical and logistical challenges, which were very exciting.

Thanks to the information gained during the first attempt in June 2009 and the good preparation in all areas (technique, logistics, propagation, traffic management, and so on) we managed to let our microwave signal surf 2696 km over the ocean. Despite the fact that evaporation ducts are well-known among the ham radio community, there is still room to better understand this propagation mode and perhaps push the limit further!

Acknowledgments

The author expresses his sincere thanks to the other members of the D44 team for their help in preparing this article and to all other participants for their contribution to the project. He especially acknowledges the regulatory authority ANAC in Praia, Cape Verde for authorizing our operation, and the following sponsors: TAP/Portugal, Imbiex SA/Switzerland, ID Electronik GmbH/Germany and FlexaYagi/Germany.

Notes

[1]Engineer's Refractive Effects Prediction System (EREPS), Naval Command, Control and Ocean Surveillance Center, RDT and E Div, San Diego, California.
[2]**www.swissatv.ch**
[3]See Note 1.
[4]**dj3km.de/html/deutsch.html** and "The World Above 50 MHz," *QST*, Nov 2000, p 83.
[5]**www.dxinfocentre.com/tropo_eur.html**
[6]**www.hyperatlantica.ch**

Pierre-André received his Swiss license, HB9AZN, in 1973 and has been from the beginning interested in special traffic modes like RTTY and Amateur Television. His present areas of interest are digital amateur TV, microwaves and software defined radio. He has been a member of the board of the Swiss ATV Association for many years and is one of the initiators of a network of ATV/DATV relay stations in Switzerland.

In 1969 Pierre-André graduated in electrical engineering from the Federal High School of Technology in Zurich. He worked for more than 30 years for a major telecom operator in Switzerland before becoming a consultant in multimedia technologies and applications. You can reach the author at Impasse En Vernettaz 13, CH-1586 Vallamard, Switzerland; **probst-pa@bluewin.ch**.

CW — the Old Twitter

In a code contact, concise is key.

Rick Lindquist, WW3DE

RICK LINDQUIST, WW3DE

Figure 1 — Texting, Twitter and CW all demand that you be as concise as possible in sending messages.

I have to chuckle whenever I see the abbreviations texters use. Morse code — CW — is the *old* Twitter. Many of texting's short forms are identical, or nearly so, to the ones CW operators have used for decades. Okay, Amateur Radio (or earlier) telegraphers did not invent the now ubiquitous LOL ("laughing out loud"), but C for see and U for you are veritable antiques. *The ARRL Operating Manual* provides a comprehensive list of common CW abbreviations; at least a few will look familiar to Twitter aficionados trying to stay within 140 characters.[1] Hams also employ Q signals (often inappropriately on phone) that abbreviate commonplace questions and answers. Today's CW operators could take some lessons from Twitter users.

Why Morse Code?

Some may ask, "Why CW?" I like to quote MFJ Founder and President Martin Jue, K5FLU. He once told me that he enjoys CW because "it's different from any other way we communicate." Come to think of it, this may be why texting and Twitter are so popular.

Let's face it, though, hams are talkative. They love to sit and gab on the air, even on CW. But too many operators, even those spawned before Morse code disappeared as a licensing requirement for HF privileges, have not mastered the art of brevity, although the means to be brief are right at hand. Merely being proficient at sending and receiving at lightning speed does not, in and of itself, make you a great CW operator. Most of us can speak with reasonable skill, but few of us are renowned orators.

Deconstructing the Typical CW Contact

Far too many CW operators, oldsters and newbies alike, hew to the tried-and-true CW contact formula (report, location, name — *booorrrring!*), and, yes, *The ARRL Operating Manual* reinforces this approach. This format is not engraved in stone. Nor is it written that you have to send everything more than once on CW. This habit seems to be a holdover from the Novice days of yore, when the other station was far more likely than not to have poor CW skills or limited readability (how well could you *really* hear on that S-38C receiver?) — or both.

As it is with texting and Twitter, brevity is a virtue on CW, even if you stick to basics. You may speak 150 WPM but send only 30 WPM on CW. *Tick-tock, tick-tock!* In my mobile CW days, I'd often reach my destination by the time the other operator had transmitted my report, his location and his name three times apiece (despite the fact that I'd sent a 599 report).

On the first go-around, do not send *anything* more than once! I say, *do not send anything more than once!* The other operator can ask for any repeats. Avoid unnecessary verbiage and pretty much all punctuation. For example, send QTH SEAFORD DE or UR 599 IN SEAFORD DE. There's no need for IS after QTH or even a comma between city and state. In like fashion, quickies such as UR 599 NAME [or OP] RICK BTU (back to you) BK (break) help to maintain the momentum.

The FCC does not require a full-blown recitation of call signs after each transmission, so avoid cluttering up the ether with it (or causing the other operator to nod off). With full-break-in (QSK) keying now common, a CW contact now can be much more like an SSB contact using VOX — in short, more like a *real* conversation instead of a cryptic military communiqué. One of my pet peeves is the tendency of keyboard CW operators to (1) spell out everything and (2) insert *every* comma, period and question mark. These are immediate cues that the other station is using a CW keyboard — not that there's anything wrong with that. If you're a keyboard operator, resist the temptation.

For many years I took part in a morning roundtable of veteran CW operators on 40 meters and it was most influential in augmenting my code skills and knowledge of abbreviations. It was there that I first heard — and learned — the Morse prosign for the quotation mark (AF), for example, although you need not get *that* complicated. A few of the short forms you might want to get into the habit of using include TMW for tomorrow, YDA for yesterday, GG for going, TK for take, GV for give, THOT for thought, TT for that, WNT for want, DE or FM for from (depending upon the context) and MITE for might. Some common CW abbreviations have the same number of letters as the full word, but fewer character elements, such as FER instead of for (texters use 4, which is shorter still). You may hear *real* OTs send EEK — OK in *American* Morse code, but I haven't heard any younger operators use GR8 for great — yet. Some Twitter and texting abbreviations may in time gravitate to CW, and that's fine too.

Think about what you want to say and consider ways to send that information more concisely. With a little practice, you'll find yourself getting a lot more out of each CW contact and add to your enjoyment of this vintage mode.

Rick Lindquist, WW3DE, has been a ham for 53 years (Amateur Extra, despite the Group B call sign), enjoys CW, digital modes, contesting and DXing. Rick is a veteran mobile CW operator (although no longer active). He retired from the position of senior news editor at ARRL Headquarters in 2007 but continues as 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. Rick can be reached at 25483 Jamie Ct, Seaford, DE 19973-8310,* **ww3de@arrl.net**.

[1] M. Wilson, K1RO, Ed, *The ARRL Operating Manual*, 9th edition (Newington: 2009), p 1-29.

Amateur Radio Down Under

A radio amateur's guide to Australia — what to do, what to see — and how to celebrate Field Day.

Barry Keating, WD4MSM

So you've planned a trip to Australia and you're wondering whether there is something for you to look forward to other than the Sydney Opera House, the Harbour Bridge and Ayers Rock (now called Uluru). The short answer: *Yes!* Just beneath the surface of "Australia for Tourists" lies an exciting wealth of experiences, organizations and people for radio amateurs to enjoy. You won't find any of these listed in Fodor's, the Lonely Planet guides or any commercial publication. Those guides are for the general interest visitor, but you have a special interest. What you need is a "Travel Guide for Radio Amateurs," and that is exactly what this article is about.

Barry, WD4MSM/VK6, operating Field Day in Australia with Christie, VK6XCJ, standing.

First, let's think about a practical matter: Consider taking a dual-band handheld with you. It will place you in immediate and direct contact with Australian amateurs (who seem to speak a language that is somewhat related to our own). I had no trouble taking the handheld in my carry-on luggage; security did not bat an eye at my handheld and small "go bag," and I was not asked to show my license at any security station.

For my stay in Australia I chose a Yaesu VX-8DR because it is a triband radio and because it included APRS capability. In addition, this radio has a general coverage receiver and that proved to be especially enjoyable. Australia is covered under the CEPT reciprocal licensing program, so there is no need to apply for a separate Australian amateur license (see sidebar).

Repeaters and Tones

Australian repeaters are run remarkably like ours in the US. The offsets are the same and some use CTCSS tones. The Australian band plan is much like ours (see sidebar). In addition, many of the features you are used to on American repeaters are there in Australia: courtesy tones are common, the etiquette we observe on repeaters seems universal and IRLP/*EchoLink* are available on many.

The sister organization to our American Radio Relay League in Australia is the Wireless Institute of Australia (WIA). A handy list of repeaters throughout Australia, their offsets, call signs, frequencies and features is available on the WIA website (see sidebar). Radio, and telegraphy before the advent of wireless, played a significant role in Australia. With large distances and few people, communication was important and wireless replaced telegraphy very early and very rapidly in Australia. You will be able to see the clear evidence of the importance of radio as you note the substantial antennas on vehicles throughout current day Australia.

Commonly used was the Codan brand antenna on a "Ute" (SUV). The cost of a Codan antenna and its mount (which is usually welded to the "roo bar" on the front of the vehicle) would not be too far from the cost of the mobile radio itself. Why do Australians use such an expensive antenna? Big antennas and giant mounts are a necessity for reliable communications capability if you drive anywhere but in the city. The other mobile antenna that seemed to be in common use was the Perth Outbacker. Yes, they're actually made in Perth on the far western side of Australia.

APRS, AIS and Wideband

The radio I took Down Under had APRS built in; both the Yaesu VX-8 series and the Kenwood D72 radios have built-in GPS and APRS capability. Note that the APRS 2 meter frequency is different for Australia than in the US (145.175 MHz in Australia, 144.390 stateside). The APRS protocols, however, are the same in Australia as in the states (see sidebar). Having APRS capability proved to be a great deal of fun. On arriving in Sydney I turned on the APRS receiver and programmed the radio to beacon my position at intervals. That meant my position was reported to the Internet and I could later see my "track" on Google APRS anytime I connected my computer to the Internet.

I was accessing the VK2US digipeater while traveling around Sydney (either from a public bus with the radio in the backpack or simply walking). Your APRS handheld will work nicely on the water as well. The Sydney Ferry system provides you with "mini cruises" and lots of local flavor.

One APRS feature surprised me in Sydney: The ferries in the harbor showed up in the received signals list on my handheld. By "drilling down" on the handheld menu I was able to access information about these ships (name, type, speed, distance, compass direction, and so on). The commercial marine transponders are repeated on the Sydney APRS digipeaters. Most ocean-going vessels carry this commercial APRS-like system called AIS (Automatic Identification System).

As an Amateur Radio operator you have access to some real time information when you are near a port (and in Australia you are almost always near a port). You have the ability to listen in on the marine frequencies; note that scanning is legal in Australia. I found this

Web Resources

International Radio Operation and CEPT (using your amateur license in Australia) **www.arrl.org/international-operating**

Wireless Institute of Australia (the IARU member society in Australia) **www.wia.org.au/**

Codan (Australian "heavy duty" screwdriver antennas and other HF equipment) **codan.com.au/**

Terlin Outbacker (Australian mobile antennas made in Perth) **www.outbacker.biz/index.php**

The Official Australian APRS website (includes lists of active digipeaters by region) **www.aprs.net.au/**

AIS (Automatic Identification System) Marine Transponders **www.marinetraffic.com/ais/**

Radio Scanning in Australia (it's legal!) **www.scanneraustralia.com.au/; www.qsl.net/vk1zmc/information.html; warsug.info/**

Marine VHF Radio (Harbour Operations) **en.wikipedia.org/wiki/Marine_VHF_radio**

VK6RFM Repeater — Fremantle, Western Australia **www.vk6uu.id.au/vk6rfm-fremantle.html**

Hills Amateur Radio Group, Western Australia **www.harg.org.au/**

Northern Corridor Radio Group, Western Australia **www.ncrg.org.au/**

Whiteman Park (The NCARG station is located in Whiteman Park) **www.whitemanpark.com.au/**

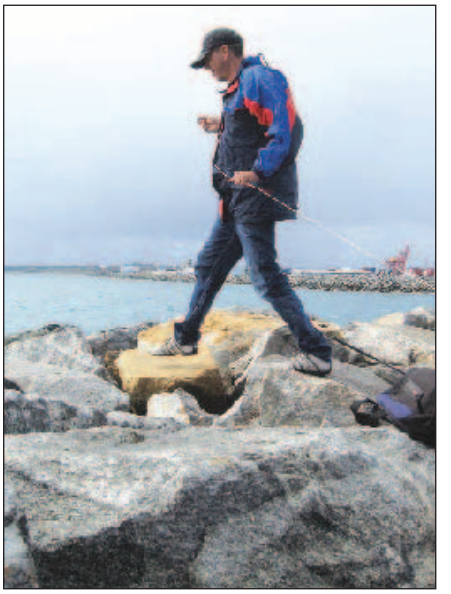
Field Day Australia — Hills Amateur Radio Group **www.flickr.com/photos/hillsarg/sets/72157625151208353/**

Wireless Hill Telegraphic Museum (near Perth) **coastradio.intco.biz/australia/wireless-hill-telecommunications-museum.htm**

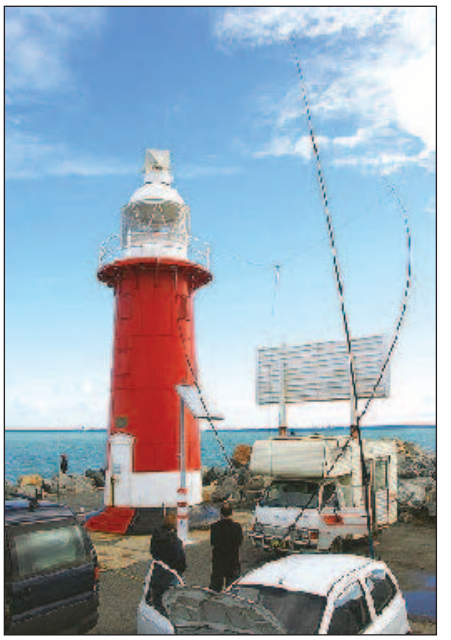
youtu.be/Z3CwjWW9Si4 (VK1ØØWIA "Super Springtime" Event at Wireless Hill) **youtu.be/yeMol0BRtmY** (VK1ØØWIA "Super Springtime" Event at Wireless Hill) **youtu.be/FVIC-OrxwQ8** (VK1ØØWIA — Heath, VK6TWO, explains the VK1ØØWIA site)

Western Australia Maritime Museum (US submarine base during WW II) **www.museum.wa.gov.au/museums/maritime/#maritime/**

Japanese Kana Code (Japanese language sent using Morse code) **www.quadibloc.com/crypto/pp1323.htm** **www.lonesentry.com/articles/ttt07/katakana.html**



Martin, VK6FDX, operating from the North Mole, Fremantle, Western Australia is tossing the saltwater counterpoise into the Indian Ocean.



Two "Squidpoles" were used to support a dipole on the North Mole attached to the recreational vehicle. Also note the rather tall Squidpole attached to the bumper of Martin's auto; this supported a vertical wire with the counterpoise thrown in the salt water of the Indian Ocean.

ability opened up another whole world. By listening in to the communications between the harbormaster and a ship's captain I could hear the directions given to large container ships, hear harbor pilots and learn how tugs maneuver gigantic vessels into their assigned berths. Marine frequencies are standard the world over.

Local Clubs

When I arrived in Western Australia (WA), I wanted to make contact with local clubs. On my first evening in Fremantle I stepped outside with the handheld and noticed that there was an APRS "object" showing up every few minutes. The object had a lighthouse icon and included a message indicating the object was maintained by the Hills Amateur Radio Group (HARG) and the club would be operating from the lighthouse on Lighthouse/Lightship Weekend. Contact information was included. The lighthouse was located at the harbor entrance to the Port of Fremantle. From where I was standing I could actually see the flashing beacon atop the North Mole Lighthouse!

I contacted VK6FDX (Martin) and VK6ZMS (Marty) to ask if I could join the group of club members that would operate from the North Mole Lighthouse. I received a reply with an invitation for the event. Lighthouse/Lightship Weekend is observed in Australia on the same weekend as in the US. The previous year I had operated with the Michiana Amateur Radio Club from the only lighthouse in Indiana in Michigan City. The prospect of operating from the other side of the world while overlooking the Indian Ocean seemed unique. When the day arrived I made my way to the North Mole to find an energetic and colorful group of amateurs intent on having a fun weekend of Amateur Radio operating — and eating.

Martin had extended a Squidpole to its maximum length and attached it to a ready-made holder affixed to the bumper of his automobile; this allowed the attachment of a vertical wire to the top of the Squidpole with a counterpoise thrown in the salt water next to the Mole. Having an Indian Ocean counterpoise proved to be a winner; we contacted lighthouses around Australia from Sydney to Brisbane with ease on SSB. Later in the day, international stations all across Southeast Asia came online and made for interesting contacts.

No outdoor Amateur Radio event would be complete without some form of outdoor cookery; in Australia the favorite is a "sau-

Sister Julie O'Sullivan, a Morse code expert and WWII Codebreaker, examines WD4MSM's handheld transceiver.

Christie, VK6XCJ; Marty, VK6FDX, and Heath, VK6TWO, at the Hills Amateur Radio Group Field Day.

sage sizzle" and the Hills Amateur Radio Group proved that they had mastered the technique of preparing food in the field.

Another WA Amateur Radio club has its shack in the bush just north of the city of Perth. The Northern Corridor Radio Group (VK6NC) operates from the Neil Penfold State Amateur Radio Centre in Whiteman Park. It's called a "state" Amateur Radio Centre because the Australian government provides some funding for the club.

The Northern Corridor shack is in the middle of what might be similar to a county park in the US. You really have the feel of operating in the bush. The group told me not to walk out in the grass to inspect the tower bases because the king brown snakes were out (king browns are venomous and the second largest snake in Australia). The VK6NC building includes many operating positions, which makes it ideal for the contesting that seems to be a club staple. In addition there are two bedrooms in a second floor loft for weary contesters who need 40 winks.

VK1ØØWIA — 100 Years of Amateur Radio in Australia

2010 marked the 100th anniversary of the founding of the WIA; the Australian national Amateur Radio organization is older than ours! WIA affiliated clubs shared the centenary call VK1ØØWIA throughout 2010, and only a single club used the call on any given day. When an individual club had the call it was one of the major Amateur Radio events of the year for that club. VK1ØØWIA was held by the Hills Amateur Radio Group for their "Super Springtime Event" organized by Heath, VK6TWO. Held at historic Wireless Hill in Melville, this event was a once in a lifetime opportunity.

Wireless Hill is just a short bus ride from downtown Perth. It houses a telegraphic/radio museum because it was the site of one of the first Western Australian communications centers. When radio came to Australia, it changed the way business was done. Australia was a long way from the mother country but radio changed all that and Wireless Hill played a significant role in the process. Wireless Hill is viewed by Australians much like the Wellfleet, Massachusetts Marconi site is viewed in the US. It's a unique piece of radio history.

Step Back in Time…

To see how radio developed in Australia, let's go back to late 1941. You are a radio amateur in Australia. You could be a man or a woman, old or young. No matter, you possess a skill that your country needs. General Hideki Tojo, the man who engineered the attack on Pearl Harbor, is in power in Japan and your country is at war with the Empire of Japan. What can you as an Australian do?

And there begins the story of the American effort in Australia. Fremantle became the second largest American naval base in the world (Pearl Harbor was larger). 123 Gato class American submarines operated out of the Port of Fremantle. But how would they find the Japanese ships? That's where your special skill comes into play.

In Perth one day I was able to meet with Sister Julie O'Sullivan, an 88 year old Sister of St Joseph of the Sacred Heart. 2009 was a big year for the Sisters of St Joseph, as one of their own was canonized as the first Australian saint. As it happens, before Sister Julie became a nun and spent her religious life teaching Australian children, she engaged in a clandestine activity. Her fellow sisters would know nothing about what she did during the war for more than 60 years. It turns out that Sister Julie was a codebreaker. It was only recently that she, and others like her, were allowed to tell their story.

When recruiters found out that she knew Morse code she was whisked off to a secret training center to learn the Kana code. There are 75 characters in the Kana code, Sister Julie told me; the Japanese characters are made up of standard Morse characters and symbols run together as amateur CW operators do today (BK, for example). Of course the Japanese messages were in ciphertext and could not be read directly.

The process worked. Sister Julie spent the war intercepting Japanese messages that were deciphered and passed to the naval authorities. The relevant information in those messages was often transmitted directly to the American submarines from Wireless Hill just a few miles from where Sister Julie now lives in the Perth convent of the Sisters of St Joseph of the Sacred Heart.

Field Day Aussie Style

The WIA National Field Day takes place in October. My Field Day Australia experience was with the Hills Amateur Radio Group who chose Wireless Hill for their location.

Once again the Squidpoles were deployed to provide an easy support for vertical wire antennas. With no saltwater counterpoise possible at Wireless Hill, a ground radial system was employed. Power is rarely a problem in Australia; the sun is intense and solar panels work at peak efficiency. Since Wireless Hill is so easily accessible to anyone near Perth, there was a constant stream of visitors to the solar powered station.

Have a Great Time!

Radio amateurs in Australia are a delightful group from every walk of life. You'll miss the real flavor of Sydney, Perth, Melbourne and the rest of OZ if you don't take the time and effort to meet a few of these terrific individuals. The contact information you need is in the sidebar. Plan your trip well in advance and have a great time in a very accommodating country.

Photos courtesy of Barry Keating, WD4MSM.

Barry Keating, WD4MSM is an ARRL member and a member of an ARRL Special Service Club (the Michiana Amateur Radio Club). Barry is the Jesse H. Jones Professor of Business Economics in the Mendoza College of Business, University of Notre Dame. You can contact Barry at **wd4msm@arrl.net**.

Ham Radio "Pops" on the Big Screen

In the summer blockbuster Mr Popper's Penguins, *Amateur Radio gets the star treatment*

S. Khrystyne Keane, K1SFA

The scene: Night. Mid-1970s. A boy's bedroom in New York City. A young Tommy Popper lies in bed, anxiously waiting to hear his father's voice come over the ham radio. A crackle of static, then "Bald Eagle to Tippy Toe. Are you there?" comes through the ether. Tommy runs from his bed, stands up on his tiptoes to reach the mic, picks it up and begins a conversation with his father in Marrakesh. And cut.

Although not an accurate display of Amateur Radio — as radio amateurs, we use call signs, not handles — many proper elements were present in the scene, but the filmmakers got a few other details wrong. Young Tommy's radio was tuned to 21.246. While this portion of the 15 meter band is available to US amateurs today, it was not in the mid-1970s. And even with a great number of sunspots, it is virtually impossible that a QSO between Morocco and New York City could happen at that time of day on 15 meters.

But even so, young Tommy had quite a nice setup in his room: a Kenwood TS-120S HF transceiver, a Drake SPR-4 HF receiver (to go with the Drake MS-4 speaker), a Heathkit HM-15 VSWR meter and an Astatic JT-30 chrome microphone. So just how did the moviemakers get their hands on this equipment?

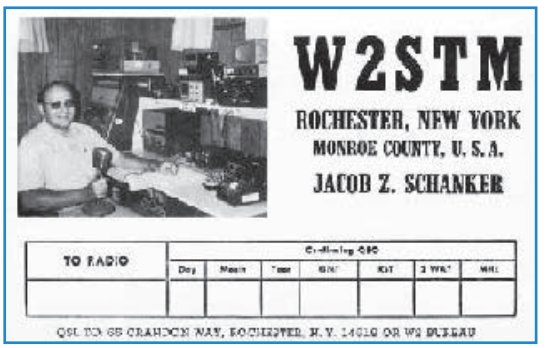
Family Ties

It helps when the Assistant Propmaster's father is a ham. When David Schanker read the script and found out he would need to procure some radios, he turned to his dad Jack, W2STM, of Rochester, New York. "David called me up and told me that he needed some radios from the 1970s for a movie he was working on," Jack told the ARRL. "So I told him I had just the radios he was looking for." All the radios and peripherals featured in the film came from Jack's shack.

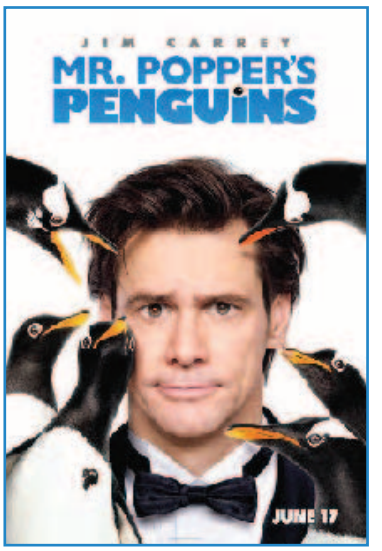
"I took photos of my radios and sent them to David, who in turn showed them to the production designer and the to the director," Jack explained. "David told me that she was very excited about the radios, so I boxed them up and sent them to the Brooklyn studios where they were filming. It was such a thrill to see my radios on the big screen!"

David said they had to employ a few tricks to make the radios appear to actually transmit and receive. "We're on a soundstage and it's a shielded room, so nothing's getting in or out," he told the ARRL. "This meant that everything had to be direct wired. My biggest challenge was making the needles on the S9, SWR and power out meters work. Since no one was actually transmitting, the meters didn't react, but we had to make sure that they moved in time with the voices. That meant I had to lie down on the floor, just out of camera range, and blow into or tap onto another mic to make the needles move. We weren't too sure what the dialogue would be, especially on Mr Popper's end — that was added later — so a lot of times, it was just a guess."

Mr Popper's Penguins was not the first film where David found he needed his father's help. When David was the Assistant Property Master on 2010's *The Sorcerer's Apprentice* starring Nicolas Cage, he needed a Tesla coil for a pivotal scene. "David called me and I put him in touch with a place where he could get one. That coil was featured in a few scenes in the movie." David has worked on other films, such as *The Smurfs* (released July 2011), *The Other Guys* (starring Will Ferrell and Mark Wahlberg) and *The Taking of Pelham 1 2 3* (starring Denzel Washington and John Travolta), as well as episodes of *Law and Order: Special Victims Unit*.



A '70s-era Jack Schanker, W2STM, in his '70s-era station. Schanker provided the radios that appeared in the opening scenes of *Mr Popper's Penguins*.



Jack, an Electrical Engineering Technology professor at Rochester Institute of Technology, first became interested in Amateur Radio as a boy growing up in Brooklyn. "A friend of the family had a radio and television repair service," he said. "Each day after school, I would go over there and watch and learn. I was interested, as most boys of that time were, in electronics. So of course, becoming an Amateur Radio operator was a natural step. I attended Brooklyn Technical High School, so many of my friends were hams."

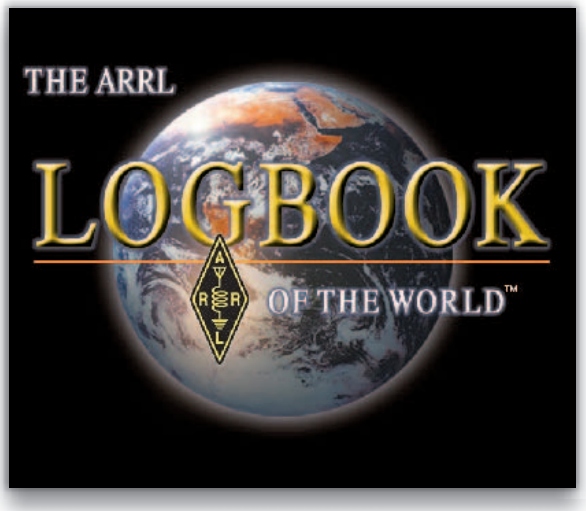
Jack is still active on the air today. "I mainly operate SSB, but I still do a little CW now and then," he said. "I'm playing around with some of the digital modes, too. I missed getting on the air while my radios were at the studios. But now that they're back, I try and get on a little bit every day. As a boy, Amateur Radio fascinated me. Even today, I still enjoy getting on the air, whether it be to talk to a friend in the next town or make a new friend across the country — or even across the ocean."

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

LoTW: Like Taking Your QSLs to the Bank

The author has a Eureka! moment and begins to appreciate the power of Logbook of The World, the ARRL's digital QSLing tool.

Sean Patrick Doran, W8OKN



Something really big has happened to me as a ham radio operator. It's so big, it has completely changed the way I track my ARRL awards. Since being licensed in June 1977, using my hand warming Heathkit HW-16 CW rig back then, I've played in nearly all of the Field Days and, from time to time, ARRL-sponsored contests. Even today, these operating events have a significant impact toward collecting states and countries for my awards. I've logged thousands of contacts all over the world, from Detroit to Mauritius and as far away as Antarctica.

Unfortunately, I have over the years done a poor job in tracking my progress in both casual operating and my loose contest participation. But now something much bigger has happened to help me attain these awards, and it has leapfrogged all of the other means for achieving success. It's all good and it's all getting much better.

The best thing to happen to me regarding my ham radio awards has been the use of Logbook of The World (LoTW).[1] At first, this old guy found it a pain to use. Having been active in computers since the early 1980s, I remember the huge 40 pound, bulging green-on-black monitors and off-color white laptops (carried with very small gray handles). So I know the difference between *DOS*, *Windows* and *Linux*. Because of my long history with computers, I thought LoTW would be a breeze.

No Pain, No Gain

Although I overcame it, it was tough at first. The LoTW process seemed cumbersome and without any logical reason for being the way it was. All my relatives call me when their computers crash, so it was embarrassing to have to ask the local hams how to set up Logbook. I was missing something easy — but what was it?

If this old timer can figure it out, then you can figure it out.

Now I get it — the tubes have warmed up again in my head. LoTW wasn't difficult because I didn't know computers. All it took was learning the needed steps to follow. Once I understood those steps, the rest came easy. I now realize that it's a well thought out process, one that was established for a very good reason. The setup I now use has been streamlined even more over the last few months by the use of the N3FJP *Amateur Contact Log* (**www.n3fjp.com**). Once I got the steps down, it was easy and it was repeatable — without having to get a PhD in computer science.

I now not only understand how to use LoTW, but I also understand the reason for the perceived difficulty in getting it set up. And now that I understand that reason, I've come to greatly appreciate it all. It's like looking at the lock on the front door of my bank and wondering why it's so difficult to get to my money. The inherent protection from the LoTW process isn't designed to keep me out; it's for keeping the integrity high so that the outcomes are never questioned.

Integrity Isn't Easy

Let's be honest with ourselves. If it were easy, and even the possibility of cheating could be argued, the entire awards process would come into question. It falls like a house of QSL cards. Folks, I've worked too hard for these awards to ever be questioned about the legitimacy of the work and my years of effort (1977 was a long time ago). I never want to have anyone question whether I really deserve my awards. I want the process to be a little bit of an effort, with built-in safeguards.

When the young lady at the counter of my local grocery store asks to see my signature on my credit card it makes me feel much better that she's checking. Too many clerks miss this and too many customers take it to be an insult, as if they were the one being accused of cheating. Some of us don't realize that she's protecting us and the entire credit card process.

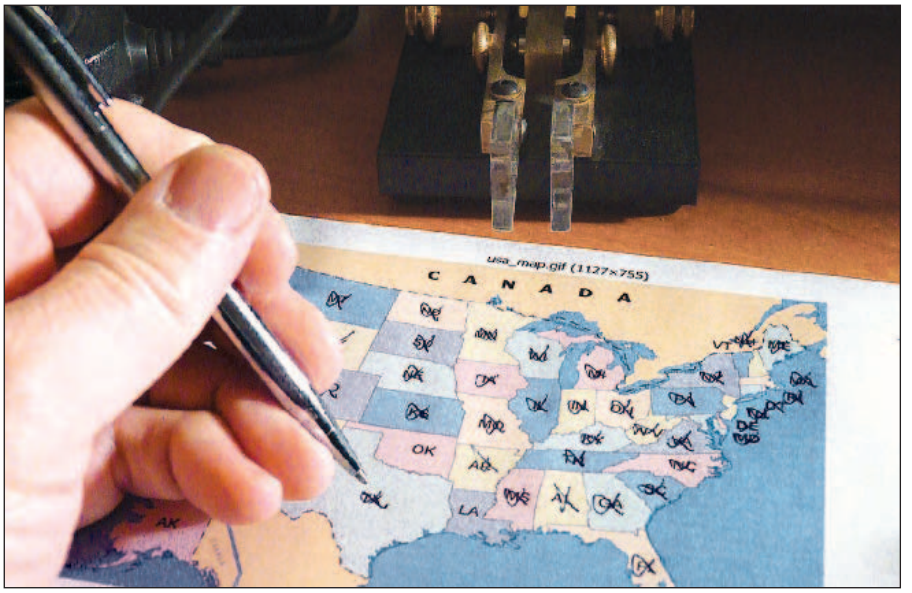
The same holds true for LoTW. There are clear safeguards in place to help protect your award and the entire awards system. In addition, it not only protects your award and all future awards, but it also protects all of the previous award winners. Can you imagine how angry you'd be if all of your DXCC and Worked All States[2] efforts were destroyed, or at least diminished greatly, because the awards now lacked integrity?

Would you trust a bank that never locked its doors?

The ARRL just didn't say one day, "Let's make this thing difficult for our users." I can't even imagine how much time and effort went into deciding where to draw the line between ease-of-use and providing the

[1]Notes appear on page 77.

SEAN DORAN, W8OKN



The author tracks his 80 meter WAS status.

proper and necessary safeguards. I have to believe that there were many hours of debate and discussion regarding how to safeguard this system from error and possible attacks on its integrity.

Now that the safeguards are in place, and we can trust them from experience, I can reap the benefits of this award system without ever doubting its integrity. I am now a recipient of all of that effort. I am assured that the LoTW process is whole and that all the awards handed out are legitimate. That makes me feel good — no, it makes me feel great!

What's In It for You

With all of that said, I now have some work to do. Now that I've discovered the awesome benefits of LoTW, it's time to educate. If I want people to come to my party, I have to give them directions to my home. The LoTW party is taking place and I'm eager to give you directions. You're invited.

From 1977 until about 4 years ago, I was another one of those hams collecting QSL cards. Books and books of cards collected and to be honest, I wasn't sure what to do with them. From time to time friends would ask me about my hobby and I'd show them my binders with QSL cards from around the globe, dating back to my first card from Norway in 1977. Every once in a solar cycle, I'd count my states to see if by chance I had collected every one. But even if I had, I still didn't know what to do with them. That process was unclear to me. Someone once told me that I needed to send them in. "But to whom?" I would ask.

Suddenly the 6146 tubes in the back of my head started to really overheat to a fine warm glow. It hit me like a jolt of RF coming from the back of my improperly grounded old Transmatch. I needed to follow a process then and I needed to learn the process of LoTW now. And so I did. The difference now is that I have automation and the immediate satisfaction of being credited for the contact as soon as my logbook is uploaded. The process today, compared to that of the '70s, is faster, easier and more rewarding. I now have immediate access to my progress and I no longer have to keep track after uploading my logbook. The system does it for me. How cool is that?

Let's Get Started

Whether you're making contacts daily, weekly or monthly, you can track your progress toward several ARRL awards via Logbook of The World. The Logbook website, **www.arrl.org/logbook-of-the-world**, includes a slide show of step-by-step directions — see "LoTW Tutorial."

The author uses *Amateur Contact Log* from N3FJP. Other useful software is listed on the website under "Resources/Third Party Software."

If you're having difficulty, click on LoTW HELP on the left side of the Logbook page.

And now, after using LoTW successfully for nearly 4 years, the benefits have greatly outweighed any difficulties I may have had from having to follow the LoTW process. The confirmed contacts are now adding up, exponentially, and in the last 4 years I achieved my WAS and my CW WAS, and I am well on my way to my DXCC. I've accomplished more in 4 years than in the previous 30. I'm now a firm LoTW believer and loving it. I now get it.

The More Hams, the More Confirmations

If there's anything missing, it's participation from other hams. If more of us begin using LoTW, not only will I see more confirmed contacts, but they too will reap the benefits of LoTW. The more we use LoTW and get past the misconceptions, the better off we will all be.

No doubt, through time and with some helpful, positive feedback, the ARRL will continue to make improvements to the process. In fact, since I started using LoTW I've seen some nice changes. The best thing we can do to help that process is to use the system. Just like learning the steps of sending in your QSL cards back in the '70s, we need to learn the steps of the LoTW process today. And when you do, you will find that the benefits of the system are very rewarding — literally. And if this old timer can figure it out, then you can figure it out. I'm just a casual operator learning about ham radio, just like I did back in the '70s when I first stepped into this wonderful hobby.

Something really big has happened to me, and it's bringing a lot of fun and additional passion into my hobby again. Logbook of the World is a winner.

Notes
[1]**www.arrl.org/logbook-of-the-world**
[2]**www.arrl.org/awards**

Sean Doran, W8OKN, has been a ham radio operator since 1977, originally licensed as WD8OKN. Employed as a sales and marketing manager, he's been active in global sales, having enjoyed travels to India, China, South and Central America, and many points in between. Sean is married to Mary, KA8NZK, and has three sons, his oldest being Timothy, KC8WMH. Sean spends much of his operating time on CW, while enjoying all modes of operation and an occasional contest. He can be reached at **w8okn@arrl.net**.

ARRL Board of Directors Looks Ahead to 2014 — and Beyond

With the ARRL's Centennial Celebration barely two years away, the Board focuses on how to set the stage for the League's second century.

S. Khrystyne Keane, K1SFA
ARRL News Editor

The ARRL Board of Directors held its Second Meeting of 2011 July 15-16 in Windsor, Connecticut, under the chairmanship of President Kay Craigie, N3KN. At the two-day meeting, the Board considered a number of reports and acted on several motions and recommendations — including proceeding with plans for a digital version of *QST* and planning for the League's Centennial Celebration in 2014.

ARRL Centennial Celebration: The year 2014 will mark the ARRL's centennial, with many activities to be planned to mark this momentous occasion. The Board voted to have President Craigie appoint a committee comprised of Board members and ARRL staff to plan the program of activities for the celebration. This committee will be chaired by the President, who will work in cooperation with the Chief Executive Officer. The committee shall develop a diverse program of activities and will solicit suggestions from the Board, Staff and ARRL members.

ARRL President Kay Craigie, N3KN, prepares to chair the 2011 Second Meeting of the ARRL Board of Directors.

Digital QST: The Board reviewed a plan to produce a digital version of *QST*; this benefit would be provided to ARRL members at no additional cost and would be in addition to the printed issues of *QST* that they receive each month. After reviewing the plan, the Board voted to authorize Headquarters staff to proceed with planning and negotiating a vendor agreement for a digital *QST* edition to be released in the mid-2012 time frame. Once finalized, the agreement would then be approved by the Chief Executive Officer, the ARRL General Counsel and the Administration and Finance Committee.

Ad Hoc Committee on Youth in the Second Century: Noting that it is essential to enhance the League's outreach to potential radio amateurs among America's youth, and taking into account that the ARRL's Centennial Celebration in 2014 will highlight not only the accomplishments of the past, but also its future, the Board voted to create the Ad Hoc Committee on Youth in the Second Century. This committee will be comprised of youth and young adults and will seek input from youth and also from adult radio amateurs who work with young people.

From left to right: Rocky Mountain Division Director Dwayne Allen, WY7FD, along with Southwestern Division Vice Director Marty Woll, N6VI, and West Gulf Division Vice Director John Robert Stratton, N5AUS, listen to a presentation about the digital version of *QST*. During Board meetings, Directors sit alphabetically by Division, with the Vice Directors sitting directly behind their Director.

Ad Hoc Committee to Address and Update ARRL Band Plans for the 902-3500 MHz Bands: The Board authorized President Craigie to appoint an ad hoc committee to study the ARRL Band Plan affecting the following bands: 33, 23, 13 and 9 cm. This committee will determine the current band usage in the US and internationally, seek input and comments from the amateur community and look toward emerging technology and projected future uses of this spectrum.

Larry Price, W4RA, Named ARRL President Emeritus: Dr Price served as ARRL President from 1984-1992 and served previously as a Vice Director, Director and Vice President of the ARRL Board of Directors. He also served for 10 years as Secretary of the International Amateur Radio Union (IARU) and another 10 years as that organization's President. Dr Price continues to serve the IARU as an expert consultant and has been recognized as President Emeritus by the IARU's Administrative Council. In celebration of Dr Price's service to the Amateur Radio Service, and in recognition of his 60th anniversary as a radio amateur, the Board named him President Emeritus of the ARRL.

Financial Matters: ARRL treasurer Jim McCobb, K1LU, told the Board that the ARRL stock portfolio remains solid, despite the current financial market. ARRL Chief Financial Officer Barry Shelley, N1VXY, reported that at this point

Summary of Board Actions

The *Minutes* of the 2011 Second Meeting of the ARRL Board of Directors are only published on the ARRL website at **www.arrl.org/board-meetings**. Members without Internet access may request a written copy of the *Minutes* by writing: ARRL Secretary, 225 Main St, Newington, CT 06111.

Minute	*Purpose*	*Action*
Organizational		
18	Approval of *Minutes* *The Board will now approve the* Minutes *of each Board meeting via e-mail, instead of waiting until the next Board meeting to do so.*	Approved
19	Formation of Centennial Celebration Committee *The Board authorized the President to appoint a committee of Board members and Staff to plan the program of activities for the celebration of the ARRL's centennial in 2014.*	Approved
20	Auditors' Statements *Formally accepted the financial statements, including the auditors' opinion letter, for the year ending December 31, 2010.*	Accepted
21	Recognition of Long-Standing Members *ARRL members celebrating their 70th and 80th year of membership will receive plaques celebrating this accomplishment at no charge through 2014.*	Approved
25	Digital *QST* *The Board authorized Headquarters staff to proceed to the next phase of implementing an electronic version of* QST.	Approved
29	Digital DXCC *The RTTY DXCC Award will now be known as the Digital DXCC Award.*	Approved
30	Ad Hoc Scouting Committee	Dissolved
31	Creation of Ad Hoc Committee on Youth in the Second Century *This committee — appointed by the President — will seek input from youth and adult amateurs who work with young people to develop meaningful plans to excite youth about Amateur Radio.*	Approved
32	ARRL Narrowband Committee	Dissolved
33	World Radiosport Team Championship 2014 *The Board welcomed the opportunity for involvement with WRTC during the League's centennial and allowed the WRTC 2014 committee to use the ARRL logo in its materials, subject to ARRL review and approval.*	Approved
37	Director and Vice Director Election Petitions *Would have required changes in the number of signatures needed for a recall petition.*	Defeated
38	Newsletters from Directors to Members and Section Managers *Would have eliminated review by ARRL Headquarters of e-mailed newsletters sent by Directors and Section Managers.*	Defeated
39	Creation of Ad Hoc Committee to Address and Update Portions of ARRL Band Plan *This committee — appointed by the President — address and update the ARRL Band Plans for 33, 23, 13 and 9 cm, and prepare a preliminary report to the Board for its consideration at the 2012 Second Meeting.*	Approved
40	Creation of Labor Cost Accounting System for Headquarters Staff *Would have required staff to implement a labor cost accounting system to determine the overall costs of activities.*	Defeated
41	Larry E. Price, PhD, W4RA Named ARRL President Emeritus *In recognition of his contributions to the ARRL and the Amateur Radio Service, former IARU and ARRL President Larry Price, W4RA, was named ARRL President Emeritus.*	Approved
Awards		
28	*2011 Philip J. McGan Memorial Silver Antenna Award* to Angel Santana, WP3GW	Conveyed

ARRL Roanoke Division Director Dennis Bodson, W4PWF, makes a comment at the meeting.

in the year, operations are ahead of the budget plan, mainly because of lower expenditures. Cash flow has been positive in the first half of the year and the balance sheet is strong. Upon recommendation of the Administration and Finance Committee, as presented by Chairman Cliff Ahrens, KØCA, the Board formally accepted the financial audit conducted by J.H. Cohn LLP for the year 2010. The report notes an unqualified audit of the financial statements of the ARRL for the year ending December 31, 2010.

ARRL Foundation: Foundation President Tom Frenaye, K1KI, highlighted the recent

ARRL Chief Development Officer Mary Hobart, K1MMH, apprises the Board of the progress of the Second Century Campaign Committee. ARRL Chief Operating Officer Harold Kramer, WJ1B, sits to Hobart's left; ARRL West Gulf Division Director Dr David Woolweaver, K5RAV, is at Hobart's right.

ARRL Rocky Mountain Division Director Brian Mileshosky, N5ZGT, checks his notes during the meeting.

activities of the ARRL Foundation, noting that it had awarded 84 scholarships totaling more than $180,000 to deserving amateurs attending undergraduate or graduate institutions.

Digital DXCC: Following the recommendation of the ARRL Programs and Services Committee, the Board voted to change the name of the RTTY DXCC Award to the Digital DXCC Award, taking into account that Amateur Radio technology has advanced to include many variations of digital communication.

Recognizing Long-Standing ARRL Members: The Board voted to provide ARRL membership plaques at no charge through 2014 to those members celebrating their 70th and 80th year of ARRL membership.

WRTC 2014: The Board welcomed the opportunity for the ARRL's involvement with the World Radiosport Team Championship (WRTC) in 2014, coinciding with the League's Centennial Celebration. This event will take place in New England. WRTC provides an exceptional opportunity to promote Amateur Radio as an international technology-based activity.

Approval of Board Minutes: The Board acted upon the Executive Committee's recommended procedure for Directors to approve minutes of Board meetings via e-mail.

Dissolution of Committees: The Board voted to dissolve the ad hoc Committee on Scouting, noting that the committee had met its charge of studying the interface between ARRL and scouting organizations, as well as presenting recommendations for improvement and surveying ARRL and scouting literature for effectiveness and adequacy. The Board also voted to dissolve the Narrowband Committee, formed in 2009, after accepting the committee's extensive report studying VHF and UHF narrowband technologies, practices, political, internal and external impacts.

Changes to Articles of Association and By-Laws: The Board voted to update the *ARRL Articles of Association* and the *ARRL By-Laws* to codify succession procedures in the event of a vacancy in the office of President or First Vice President, phased out the title "Executive Vice President" in favor of "Chief Executive Officer" and made other minor wording changes.

Philip J. McGan Silver Antenna Award: The Board selected Angel Santana-Diaz, WP3GW, of Trujillo Alto, Puerto Rico, as the winner of the 2011 Philip J. McGan Memorial Silver Antenna Award for actively promoting Amateur Radio at the local and regional level via print, audio, personal appearances, school presentations and volunteer services.

The complete *Minutes* of the 2011 Second Meeting of the ARRL Board of Directors are available on the ARRL website at **www.arrl.org/board-meetings**.

The next meeting of the ARRL Board of Directors is scheduled for January 20-21, 2012.

All photos by Steve Ford, WB8IMY.

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

ARRL Board Names Angel Santana, WP3GW, Winner of Silver Antenna Award

Angel Santana, WP3GW, has been named the winner of the 2011 Philip J. McGan Memorial Silver Antenna Award for his volunteer public relations work on behalf of Amateur Radio. Santana was recognized for his work and recommended for the award by the ARRL Public Relations Committee; the ARRL Board of Directors conveyed the award at its July meeting.

"It came as a surprise when ARRL Southeastern Division Director Greg Sarratt, W4OZK, sent me the notification about winning the 2011 Philip J. McGan Award," Santana said. "I had about two hours of shock before landing again to Earth!" ARRL Media and Public Relations Manager Allen Pitts, W1AGP, called Santana a "sparkplug for a major surge of good publicity" in Puerto Rico.

COURTESY WP3GW

Angel Santana, WP3GW, is the recipient of the 2011 Philip J. McGan Memorial Silver Antenna Award.

"In recognizing my work, you have acknowledged that Puerto Rico has many equal activities, just like our colleague hams around the US and the world," Santana said. "Before, you only learned of us when you saw an article on the Arecibo Observatory or in the results of contests. But in the past few years, Puerto Rican amateurs have participated in many special events. The Puerto Rico Amateur Radio Operator Day — celebrated the second Tuesday of May — has been promoted on the ARRL website. And now, with the ARRL Field Day rules in Spanish, it makes it easier here in Puerto Rico to develop and promote this annual event. We see at least five Field Day activations here on the island now, compared to only two 10 years ago. We have realized the public relations side of Field Day is more than the competitive side."

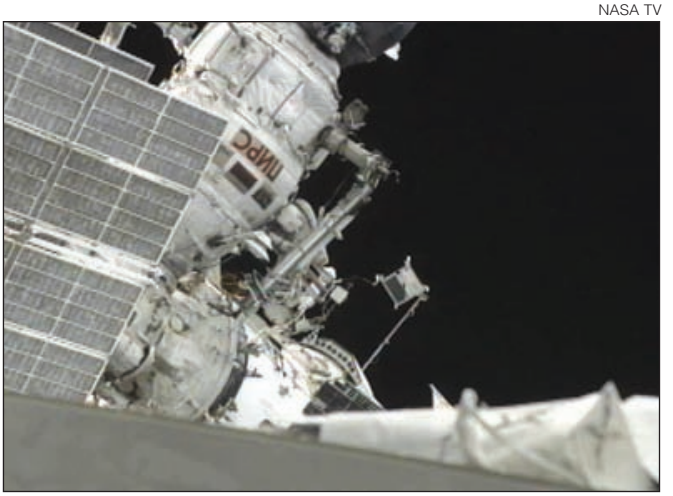
Santana said that with receiving the Silver Antenna Award, "I feel the responsibility and have more of a reason to let all amateurs learn more about this island in the Caribbean. We have more than 4000 active hams, and each month, no less than 10 new ones are made."

The McGan award is named for Philip J. McGan, WA2MBQ (SK), a journalist who served as the first chairman of the ARRL's Public Relations Committee. After his death, friends in the New Hampshire Amateur Radio Association joined with the ARRL Board of Directors to pay a lasting tribute to the important contributions McGan made on behalf of Amateur Radio. The Silver Antenna Award goes to that ham who has demonstrated success in Amateur Radio public relations and best exemplifies the volunteer spirit of Phil McGan. QST

HAPPENINGS

Cosmonauts Deploy ARISSat-1 from ISS

NASA TV



ARISSat-1 is seen floating in space — connected to the ISS only by a tether line — shortly before it is jettisoned off into space by Sergei Volkov, RU3DIS.

Radio amateurs around the world are receiving voice, CW and SSTV transmissions via the newest Amateur Radio satellite: ARISSat-1/KEDR. Some hams have reported success in making contacts, using the satellite's linear transponder mode. ARISSat-1, which was deployed from the International Space Station on August 3, almost didn't make it into orbit. According to US Mission Control in Houston, the satellite was supposed to have two antennas — one 70 cm antenna and one 2 meter antenna — but cosmonauts Sergei Volkov, RU3DIS, and Alexander Samokutyaev expressed concern when they saw only the 2 meter antenna.

Without a UHF antenna, AMSAT expressed concern that the 435 MHz/145 MHz linear transponder might not work. According to US Mission Control, there might be loss in the data that can be downloaded from ARISSat-1, as well as a loss of control capability from the ground. But despite these initial concerns, the linear transponder is working and radio amateurs are making contacts with it.

ARISSat-1 is expected to be operational through January 2012 on the following frequencies and modes:

- **145.950 MHz FM Downlink:** FM transmissions will cycle between a voice ID as RSØ1S, select telemetry values, 24 international greeting messages in 15 languages, as well as SSTV images. If you successfully receive the SSTV transmissions, you are invited to upload your picture to the ARISS SSTV Gallery at **www.amsat.org/amsat/ariss/SSTV**.
- **435 MHz/145 MHz Linear Transponder:** The linear transponder operates in Mode U/V (70 cm up, 2 meters down). It is a 16 kHz wide inverting passband, transmitting LSB on the 435 MHz uplink and receiving USB on the 145 MHz downlink.
- **145.919 MHz/145.939 MHz CW Beacons:** The CW transmissions will be call sign ID RSØ1S, select telemetry and call signs of people actively involved with the ARISS program.
- **145.920 MHz SSB BPSK-1000 Telemetry:** The BPSK transmissions will feature a new 1kBPSK protocol developed by Phil Karn, KA9Q. When the CW2 beacon on 145.919 MHz is active, this indicates that the BPSK-1000 format is being transmitted. If the CW1 beacon on 145.939 MHz is active, the backup of BPSK-400 format is being transmitted.

After a delay of nearly four hours, Volkov was given the go-ahead to deploy ARISSat-1 from the Pirs docking station on the ISS. Originally scheduled to be deployed at the beginning of the spacewalk, the satellite's deployment was delayed as the cosmonauts, along with the payload manager and the ground teams in Houston and Moscow discussed the antenna situation and debated what to do. "Instead of taking chances on the satellite not working properly once deployed, it has been decided to secure it for the time being," US Mission Control reported when the decision to delay was made. If ARISSat-1 had not been deployed during August's spacewalk, its next opportunity for deployment would have been February 2012.

On this spacewalk, Volkov and Samokutyaev also installed laser communications equipment, replaced experiments on the Zvezda service module and retrieved a rendezvous antenna. They were unable to perform the major job of the spacewalk — relocating a boom structure to aid future spacewalks — due to time constraints. This spacewalk was the third for Volkov, who performed two spacewalks as Expedition 17 commander in 2008, and the first for Samokutyaev.

TEACHERS GO "BACK TO SCHOOL" AT ARRL TEACHERS INSTITUTE

This summer, the ARRL offered five sessions of the Teachers Institute on Wireless Technology (TI). Veteran instructors Miguel Enriquez, KD7RPP, and Nathan McCray, K9CPO — along with newcomers Tommy Gober, N5DUX, and Matt Severin, N8MS — led the instruction. A total of 55 educators from 24 states, ranging from elementary teachers to university PhDs, took part in the 2011 TIs.

The first TI session of 2011 was held at Desert Ridge Middle School in Albuquerque, New Mexico, and was hosted by Diane Nihart, KE5UHB, a 2010 TI graduate. Other sessions took place at Parallax, Inc's corporate office in Rocklin, California (Parallax provides the robotics equipment for each TI session); at Mohawk Valley Community College in Utica, New York — hosted by Bob Decker, AA2CU, and at ARRL Headquarters. "Nihart and Decker proved themselves superb hosts, preparing their facilities for an unimpeded learning experience for participants," said ARRL Education Services Manager Debra Johnson, K1DMJ. "Their school principal and college president also showed up to check out the activities with great interest. As always, Parallax rolled out the red carpet and treated participants to a tour of their operation as well as some bonus 'toys' for their Boe-Bots, the rolling robot with a BASIC Stamp 2 microcontroller brain that each TI participant builds."

The Dayton Amateur Radio Association

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

COURTESY LARRY KENDALL, K6NDL

Larry Kendall, K6NDL, is poised to confirm a QSO via satellite during a TI session.

hosted the TI-2 seminar, *Space in the Classroom*. The TI-2 curriculum focuses on the nuts and bolts of setting up and operating a satellite ground station. While TI participants do not need to have an Amateur Radio license to attend a session, TI-2 participants must have at least a Technician class license and have already attended a TI session. Each TI-2 participant received equipment to configure a satellite communications station. DARA President Jim Simpson, WB8QZZ, took extra steps to facilitate activities this year by arranging for a cable access hole, allowing participants to run their station cables out to the parking lot. "This was most welcome, as temperatures rose to more than 90 degrees during the first two days," Johnson said. "The cable channel allowed the group to keep the door closed and the air conditioning running. DARA's financial support, along with generous assistance from HRO, made this advanced workshop on satellite communications possible."

In Utica, Decker installed a weather antenna on the roof the classroom building, enabling participants to download images and work with composite weather maps right in the classroom. "He also set up an HF radio in the classroom which provided the opportunity for a radio QSO with the Isle of Man," Johnson explained. "This group of participants included only a few licensed hams, so this was a fine introduction to Amateur Radio for the uninitiated."

At ARRL headquarters, ARRL Contest Branch Manager Sean Kutzko, KX9X, and ARRL Emergency Preparedness Manager Mike Corey, W5MPC, assisted with the satellite communications demo and thrilled everyone with 13 contacts in one pass. "Multiple contacts via satellite between the two simultaneous TIs in Utica and Dayton created lots of opportunity for practice," Johnson noted. "Each participant at the TI-2 made at least one complete QSO via an FM satellite, with most making multiple contacts. Everyone copied satellite telemetry from multiple satellites."

INVESTIGATION BY ARRL OOs, RESEARCHERS LEADS TO RESOLUTION OF INTERFERENCE ON 12 AND 60 METERS

Collaboration between ARRL Official Observers and researchers at Rutgers University has resulted in a change of operating frequency of coastal HF radars, eliminating interference on the 12 meter band, as well as two frequencies in the 60 meter band.

Recently, amateurs reported hearing Coastal Ocean Dynamics Applications Radar (CODAR) signals on 60 meters. CODAR is a form of HF radar used by a number of institutions to research and study ocean currents and waves. "After comparing reception reports of these signals that we had been hearing on the East Coast and reports he had received from amateurs on the West Coast, ARRL Orange Section Official Observer Coordinator Dan Welch, W6DFW, followed up on them and began doing some research," explained ARRL Field and Regulatory Correspondent Chuck Skolaut, KØBOG. "We alerted Official Observers — especially along the coast — to monitor and forward reports."

Welch enlisted the assistance of a number of these Official Observers and other stations to monitor the frequencies after he had received more observations. Through good cooperation with the FCC, he was able to ascertain that CODAR was being used by Rutgers University on channels 3 and 4 in the 60 meter amateur band.

According to Skolaut, much of the follow-up included good cooperation from the CODAR group at Rutgers, including Josh Kohut and Ethan Handel. Rutgers is part of a regional partnership working on ocean observing. Kohut told the ARRL that information they gather is used by the Coast Guard, fisheries, offshore energy facilities, storm forecasters and pollution studies. He explained that the transmitters are capable of 40 W and provide information from up to 100 miles.

Welch and Handel coordinated testing, and amateurs were contacted to help monitor the frequencies as Handel shut down the various transmitters in their network to determine which ones amateurs were hearing. "They conducted two tests a week apart and it was definitely determined that the pulses being heard on the two channels were being transmitted from one or more of their sites," Skolaut said.

John Terrell, N6LN, of Palos Verdes, California, reported hearing CODAR activity on the 12 meter band, from 24.93 to 25.058 MHz. Since it appeared likely it was originating on the West Coast, possibly near Welch, Skolaut contacted him for assistance.

With assistance from Richard Saunders, K6RBS — an Official Observer from Mission Viejo, California — Welch determined the CODAR transmissions were originating from an installation operated by the University of Southern California. "Dan contacted Burt Jones, a Professor of Research in the Marine Environmental Biology Department, and Lab Manager Matthew Ragan," Skolaut explained. Jones, a former radio amateur, told the ARRL that he was glad that he was notified of the problem and was happy that it could be resolved quickly. "In many ways, we are on the same team, in the sense of using the radio technology to address multiple kinds of issues," he said. "The ARRL and the Amateur Radio community provide a substantial benefit to society that I think the general public doesn't fully appreciate. Our HF radar network serves multiple issues,

FCC News

♦**Vanity Call Sign Fee Increased 90 Cents**: As of September 9, radio amateurs must pay $14.20 to receive or renew a vanity call sign, an increase of 90 cents. "The Commission tries to keep the regulatory fee for Vanity call signs as minimal as possible," the FCC explained. "Between FY 2007 and FY 2010, the regulatory fee for vanity call signs increased from $1.17 (per year) to $1.33 (per year), an increase of $0.16 per year or $1.60 over a 10 year license period. We do not believe this increase is inequitable, and the Commission will continue its efforts to keep this fee as minimal as possible. The fees that are collected from vanity call signs are used to offset the cost of monitoring and researching new call sign requests to prevent the issuance of duplicate call signs." The vanity call sign fee has fluctuated over the 14 years of the current. In FY 2011, the FCC expects to grant 14,600 vanity call signs, bringing in $207,320 from the vanity call sign program, and looks to recover a total of $336,599,048 in fees from all the Services that it regulates.

COURTESY CIMES, UNIVERSITY OF HAWAII

CODAR is used to measure the surface currents of the coastal ocean. A transmitter sends out a radio frequency that scatters off the ocean surface and back to a receive antenna. Using this information and the principles of the Doppler shift, CODAR is able to calculate the speed and direction of the surface current.

from understanding basic science to facilitating search and rescue operations, as well as managing responses to environmental disasters, such as last year's Deepwater Horizon oil spill in the Gulf of Mexico."

ARRL ASKS FCC TO KEEP 2300 MHz PROCEEDING OPEN

In June, the FCC released a *Public Notice* that sought comments on whether or not it should terminate approximately 800 docketed proceedings in the Wireless Telecommunications Bureau, the International Bureau, the Office of Engineering and Technology and the Enforcement Bureau. Some of the proceedings set for possible termination affect the Amateur Radio Service. On July 20, the ARRL filed comments with the FCC on this matter, explaining that it has no objection to the termination of the proceedings in the *Public Notice*, save for one item. "With respect to the Office of Engineering and Technology dockets slated for termination," the ARRL stated in its comments, "there is one Amateur Radio-related proceeding that, in the ARRL's view, should not be terminated, but retained in open status."

The ARRL notified the FCC that it does not consent to the termination of the proceeding initiated by the League's May 2001 rulemaking petition RM-10165, *Amendment of Parts 2 and 97 of the Commission's Rules Regarding the 2300-2305 MHz Band*. In this *Petition*, the ARRL requested that the FCC change the Amateur Radio Service's allocation in that band from Secondary to Primary. This *Petition* was filed May 7, 2001 and it was placed on *Public Notice* two months later.

SECTION MANAGER NOMINATION NOTICE

To all ARRL members in the Eastern New York, Eastern Pennsylvania, Louisiana, North Carolina, Pacific, San Diego, South Dakota and Virginia 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 and Volunteer Program 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 December 9, 2011. If more than one member is nominated in a single Section, ballots will be mailed from Headquarters on or before January 3, 2012, to full members of record as of December 9, 2011, which is the closing date for nominations. Returns will be counted February 22, 2012. Section Managers elected as a result of the above procedure will take office April 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 April 1, 2012. If no petitions are received from a section by the specified closing date, such Section will be resolicited in the April 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*

In Brief

- **ARRL Launches Forums on Website**: The ARRL has established three forums — Contesting, Awards and Technology — on the ARRL website. Visit **www.arrl.org/forums** to chat with fellow hams about these topics. Additional forums are in the planning stages. ARRL members, guest users and others can view the threads, but you must be logged in as an ARRL member in order to participate in the conversations or ask questions. All users should read the forum rules at **www.arrl.org/forum/home/rules** before participating.

- **2011 ARRL Field Day Logs Posted**: The first-pass data entry has been completed and the preliminary totals show a record 2654 submissions for the 2011 ARRL Field Day, Amateur Radio's most popular on-the-air operating event. The combined list of Logs Received for Field Day has been posted online at **www.arrl.org/logs-received** and includes all logs submitted online, via e-mail and by US Mail. The results from the 2011 ARRL Field Day will be posted online on or around November 1, and will appear in the December issue of *QST*. The 2012 Field Day is scheduled for June 23-24.

- **2011 ARRL June VHF QSO Party Sets Record for Logs Received**: The 2011 running of the ARRL June VHF QSO Party saw a record number of logs submitted. This year, 1243 logs were submitted, breaking the record set in 2010 of 1202 logs. "Six meters has been in excellent shape for the June VHF QSO Party for four of the past five years," explained ARRL Contest Branch Manager Sean Kutzko, KX9X. "It's clear that when the 'Magic Band' is in great shape at the start of the contest, we see more participation with more logs submitted."

Broxton Bridge Plantation Endurance Ride

Ann Beach, KJ4MWN
kj4mwn@arrl.net

"Step out of your comfort zone!" has become my motto since I turned 50. As a mom who has chosen to be a very active part of my kids' lives, I have been challenged to take up hobbies that interest my kids and that I have never thought about. This is how I got involved in ham radio. As my Elmers say, "Ham radio is a large tent. There is something for everyone." My son, Philip, KJ4MWM, has caught on very quickly to the equipment and the desire to make his own antennas. But for me, just give me something that works well and gets me on the air. My son enjoys DXing. I, on the other hand, have had to get over microphone fright. So where is my niche under the tent?

MIKE NEWLAND, NC8N

Philip Beach, KJ4MWM, is at the microphone keeping track of riders at the Broxton Bridge Plantation Endurance Ride.

MIKE NEWLAND, NC8N

Ann Beach, KJ4MWN, maintains the rider log used to track the entrants as they go through the "lollipop."

This past spring, Philip and I had the opportunity to participate in the Broxton Bridge Plantation Endurance Ride as ham radio operators. It was an awesome experience. One of our Elmers, Mike Newland, K4NOP, arrived early and set up the base station with a VHF radio and a J-pole antenna mounted on a mast. He spent the rest of the day instructing us on how to run the base station at this equestrian endurance ride in South Carolina. Thankfully, we were under an awning that kept us dry when the rain came and shaded when the sun shone. Kent Hufford, KQ4KK, and Jim Ellett, KJ4ZFZ, worked the northwest checkpoint while Bob Gagliardi, N4XML, worked the southeast checkpoint using their mobile VHF radios. They also experimented with their handheld transceivers to give them more portability.

On arrival, we were introduced to Joe and Tamra Schoech, the couple managing the Ride. Joe explained to me that people who participate in this type of event are driven by their love for horses. Sometimes there is no rhyme or reason. It is purely passion. People from all over the southeastern states arrived in their diesel pickup trucks with their living quarters and horse trailers in tow, filling the camp. Portable corrals for the horses were set up. Riders and horses need to have a place to rest after their 25 or 50 mile trips.

Under the awning at base camp, I noticed at least six veterinarians and their assistants. Initially and after each loop every horse must pass a "vet check" and rest for 40 minutes. There are two loops in the 25 mile ride and four loops in the 50. Each horse is identified by a number, which is painted on their rump. These are the numbers that we, the ham radio operators, become very familiar with. At this particular ride on Saturday, we had 44 riders in the 25 mile ride and 66 riders in the 50. There were slightly fewer riders on Friday.

At each checkpoint the field ham operators were stationed at the entrance and exit of a "lollipop" — so called because of the trail's shape. As a horse enters the lollipop, the rider shouts the assigned number to the ham who documents it and then reports it back to the base station. We acknowledge the number and repeat it back to the field ham and annotate our lists. This is repeated when the horses exit the lollipop. Those of us who are detail oriented love the challenge. Maybe I am finding my niche.

Double Trouble

As we were tracking the numbers, we noticed that three numbers that had been reported already were being reported again. It appeared that these riders were off the trail and had ridden the lollipop a second time. A concerned husband reported to us and asked if we had heard any news about his wife. He had expected to see her an hour ago. She was one of the riders who had gone off the trail. We reported the concern to Joe, who drove out on the trail to look for them. They were located a mile away from the base camp. I started to develop a concern for people I had never met and who I only knew as a number. I was relieved to hear they were safe.

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

The most exciting incident happened when a horse with his reins tied to a bucket came running at full speed through the base camp. The bucket and reins hit the horse's leg and banged on the ground, which frightened him. In his panic he had no intention of stopping.

The horse headed out on the trail he previously traversed with his rider. Fifteen minutes later, we received a call from KQ4KK. Kent reported a horse with no rider or |saddle running past the checkpoint. The horse had the reins trailing back but the bucket was no longer attached. Again, Joe was notified and he now knew to go out to the northwest lollipop where he found the horse at the water trough at the far end. Many times Joe had told us, "This ham radio communications really works. It has saved me time and ensures safety for our riders for this event."

My son and I came home tired but full of many adventures we can tell our family. We both really enjoyed ourselves and we felt like we made a contribution with our newly obtained skills as hams.

NEIGHBORHOOD HAMWATCH AT ROYAL HARBOR

John Luebbers, K1AYZ

On March 18, 2011, the Royal Harbor Amateur Radio Club (RHARC) officially announced the adoption of the Neighborhood HamWatch program in their Royal Harbor retirement community located in Tavares, Florida. RHARC held a 1 day Field Day type event to demonstrate its ability to contact the Lake County Emergency Operations Center. This ability is an essential element of the HamWatch program to keep Royal Harbor in touch with the outside following an emergency.

RHARC members come from a wide area of the county and joined together to share their ham radio experience in a way that would benefit their neighbors. We heard about Neighborhood HamWatch (**www.hamwatch.me**) at the HamCation (**www.hamcation.com**) in Orlando and offered this service to Royal Harbor. The Royal Harbor Homeowners Association has made it part of their overall disaster preparedness program.

JOHN LUEBBERS, K1AYZ

The Royal Harbor Lighthouse where the RHARC held their Field Day type event.

HART DISTINGUISHED SERVICE AWARD NOMINATIONS

Nominations are open for the 2012 George Hart Distinguished Service Award. This award is named in honor of George Hart, W1NJM, a long-time communications manager at ARRL Headquarters and chief developer of the National Traffic System.

Selection criteria include: Fifteen or more years of operating with the NTS; participation within ARES®, or station appointments and/or leadership positions held within the ARRL Field Organization. For more information, visit **www.arrl.org/arrl-award-nominations** and click on Distinguished Service Awards. Nominations are due at ARRL Headquarters by November 1, 2011 and should be submitted to Steve Ewald, WV1X, at **wv1x@arrl.org**.

The Royal Harbor ARC, WX4RH, made VHF, UHF and HF radio contacts throughout Lake County, Florida, as well as contacts across the US and some foreign countries. The modes of operation were SSB, FM, D-STAR, D-RATS, Packet and *EchoLink*. A GMRS link was used to maintain contact with the Royal Harbor management office. The site selected for this event was the Royal Harbor Lighthouse. This county has had its share of hurricanes and deadly tornadoes in the past, so it's necessary to take part in events such as this to ensure our readiness to provide radio communications when needed.

For more information about ham radio activities in Lake County, Florida, visit **www.n4fla.org** and **www.k4fc.org**.

JOHN LUEBBERS, K1AYZ

Ted Luebbers, K1AYZ (left) operates the ID-880H D-STAR radio at the lighthouse. Carl DePoy, K8BBT (center) works 2 meter packet while Garrett Collins, W2GGC, operates on 15 meters.

CORRECTIONS TO LAST MONTH'S COLUMN

A few glitches crept into "The Haiti Project — A Post-Catastrophe Personal Radio System," Public Service, Sep 2011, pp 78-80:

- "The many large ham antennas in the United States that were aimed at Haiti after the 2010 earthquake and that presumably would be aimed at any future disaster area might make QRP a feasible option."

This alone does not make QRP a feasible option for emergency communications. Factors such as propagation, available power and antennas also have to be taken into consideration. For initial emergency communications, it cannot be assumed that everyone is listening for you.

- "While these contests often allow all ham bands…"

Contests are not permitted on the 12, 17, 30 and 60 meter amateur bands.

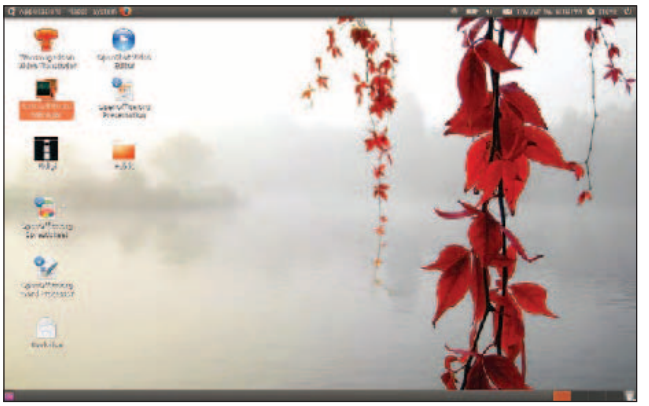
- "Also, the ARRL sets aside emergency frequencies on both these bands [20 and 40 meters]"

There are no designated emergency frequencies on any amateur band in the US. Further, the ARRL does not have the authority to designate frequencies for emergency use. Emergency communications that involve the immediate threat to life and property have priority on any frequency in the amateur bands.

WB8IMY

ECLECTIC TECHNOLOGY

You've Come a Long Way, *Ubuntu*



Like the vast majority of amateurs, I've been thoroughly indoctrinated in the Church of Microsoft *Windows*. I made peace with the idiosyncrasies of *Windows* many years ago and since then the operating system has become familiar and comfortable, like slipping into an old pair of jeans.

Curiosity drove me to dabble in *Linux* a few times, but on each occasion it was akin to learning a foreign language. The directory structure was different and strange. The simple act of installing a new application was an exercise in frustration. Worse still, the commands and terminology were unlike anything I had encountered before. It was easy to understand why so many people — myself included — chose to remain with *Windows*.

The visionaries of the *Linux* world understood that if they intended to compete with *Windows* in the consumer marketplace, something had to change. *Linux* needed a user interface that would behave more like *Windows*, with all the familiar friendliness and ease of use that consumers had come to expect.

The *Ubuntu* version of *Linux* has been marching toward that goal for several years. I had tried *Ubuntu* before, but found it to be rough around the edges. In each instance I wound up returning to *Windows*. A few months ago I decided to give the latest *Ubuntu* iteration another shot.

I downloaded the ISO image file from the *Ubuntu* Web page at **www.ubuntu.com** and burned it to a CD. (You have to use software with a specific image-burning function, such as the free *ISO Image Burner* at **www.isoimageburner.com**. You can't simply copy the ISO file to a CD.) Within a few minutes after popping the CD into a laptop and answering a couple of questions, I was greeted with an attractive screen that looked an awful lot like *Windows*.

Before I could touch the keys, a little window suddenly popped open to tell me that *Ubuntu* had automatically found my wireless network. It asked me if I wanted to connect. I braced for the worst. No doubt this would involve a painful series of obscure commands. I clicked YES and I was instantly connected. It was that simple.

So where would I put documents and applications? The answer was found by clicking the intuitively named PLACES link in the upper left corner. What appeared was a window with folders that carried the familiar names I learned to recognize in *Windows*.

What if I wanted to install a ham application for *Linux* such as *Fldigi*? *Ubuntu* has addressed this by creating a huge online repository of free programs that you can search. I entered "Amateur Radio" and was presented with a list that included *Fldigi*. I clicked on the INSTALL button and *Fldigi* downloaded and installed automatically — no more questions, no odd directories to navigate.

The more I played with *Ubuntu*, the more I enjoyed it. Not only was it friendly, it ran quite well on my underpowered laptop. As a bonus, I didn't need to worry about installing virus-protection software. There are too many different versions of *Linux* in use to make it a worthwhile target for criminals. They'd rather devote resources to easier prey such as computers running *Windows*.

With the latest version of *Ubuntu*, *Linux* stands its best chance yet of making a successful leap to consumer (and Amateur Radio) computers. In the ham community *Linux* users comprise only about 2% of the population. It will be interesting to see if *Ubuntu* is able to grow that number in the coming years.

More Solid State Dreams

In my June column I described the new Freescale MRFE6VP61K25HR5 broadband RF power transistor. To my surprise, I've already heard from a couple of amateurs who've successfully built amplifiers around the device.

Manfred Mornhinweg, XQ6FOD, weighed in with his thoughts on low-cost solid-state RF amps for HF use. "I think that a solid state legal-limit amp, developed by and for hams, should have some advantage over commercial units. Either this could be *much* lower cost, or it could be some other improvement, such as very high efficiency, with the resultant small size and weight." Manfred has created an excellent web page with a detailed discussion of the design concepts and challenges. You'll find it at **http://ludens.cl/Electron/mosfetamps/amps.html**.

About USB/Serial Adapters

With so many new computers doing away with serial ports, some amateurs find themselves in a bind when it comes to connecting these machines to their station equipment. The obvious answer is a USB/serial adapter, either a stand-alone module or a module built into a cable.

The two most popular chipsets for USB-to-serial communication are those made by Prolific Technology and Future Technology Devices International, better known as FTDI. I've used both, but in my experience the FTDI products tend to be more compatible across a wider range of applications. For instance, I initially used a Prolific adapter to allow my *Ham Radio Deluxe* software to control my Kenwood TS-2000 transceiver, which has a serial port on the back panel. It wasn't long before I grew weary of *Ham Radio Deluxe* randomly losing its connection to the radio. I swapped in an FTDI-based adapter and haven't had a problem since. I've heard similar comments from other amateurs.

Don't get me wrong — Prolific and FTDI both make fine products. But for whatever reason, at least for ham applications, the FTDI-based adapters appear to have the edge. QST

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

CONTEST CORRAL

in association with the *National Contest Journal*

OCTOBER 2011

Start and Finish	HF	VHF+	Contest Title	Phone	CW	Digital	Exchange	Sponsor's Website or Contact
Oct 1, 0000Z - Oct 1, 2400Z	1.8-28	50	PSK Rumble — The Fall Classic			✘	Name and call area (see website)	www.n2ty.org
Oct 1, 0400Z - Oct 2, 0359Z	1.8-28		EPC Russia DX Contest			✘	EPC member nr or serial and grid square	www.epc-ru.ru
Oct 1, 0800Z - Oct 2, 0800Z	1.8-28		Oceania DX Phone Contest	✘			RS and serial	www.oceaniadxcontest.com
Oct 1, 1200Z - Oct 2, 1200Z	14-28		Worked All Britain HF Contest	✘			RS, serial, DXCC entity or WAB area	www.worked-all-britain.co.uk
Oct 1, 1600Z - Oct 2, 2200Z	1.8-28	50,144	California QSO Party	✘	✘		Serial and state/prov/"DX" or CA county	www.cqp.org
Oct 1, 1600Z - Oct 1, 1959Z	3.5-14		EU Autumn Sprint	✘			Both call signs, serial, name	www.eu-sprint.com
Oct 2, 0700Z - Oct 2, 1900Z	21,28		RSGB 21/28 MHz Contest	✘	✘		Serial and UK district	www.rsgbcc.org/hf/rules/2011/r2128.shtml
Oct 4, 0200Z - Oct 4, 0400Z	3.5-28		ARS Spartan Sprint		✘		RST, S/P/C, and power	www.arsqrp.blogspot.com
Oct 5, 7 PM - Oct 5, 11 PM		432	Fall VHF Sprints	✘	✘	✘	4-character grid square	www.svhfs.org
Oct 7, 0200Z - Oct 7, 0300Z	1.8-14		SNS and NS Weekly Sprints		✘		Serial, name, and S/P/C	www.ncccsprint.com/rules.html
Oct 7, 1400Z - Oct 9, 0200Z	1.8-28		DX/NA YLRL Anniversary Party	✘	✘	✘	Serial, RST, and section/province/country	www.ylrl.org
Oct 8, 0000Z - Oct 9, 1600Z	3.5-28		Makrothen RTTY Contest			✘	4-character grid square	home.arcor.de/waldemar.kebsch
Oct 8, 0800Z - Oct 9, 0800Z	1.8-28		Oceania DX CW Contest		✘		RST and serial	www.oceaniadxcontest.com
Oct 8, 1200Z - Oct 9, 1200Z	3.5-28		Scandinavian Activity Contest	✘			RS and serial	www.sactest.net
Oct 8, 1600Z - See website	3.5-28	50,144	Arizona QSO Party	✘	✘	✘	RS(T) and AZ county or S/P/C	www.azqsoparty.org
Oct 8, 1600Z - Oct 8, 2000Z	3.5-14		EU Autumn Sprint		✘		Both call signs, serial, name	www.eu-sprint.com
Oct 8, 1600Z - See website	1.8-28	50,144	Pennsylvania QSO Party	✘	✘	✘	Serial and ARRL/RAC section	www.nittany-arc.net
Oct 8, 1700Z - Oct 8, 2100Z	3.5-28		FISTS Fall Sprint		✘		RST, S/P/C, name, FISTS number or pwr	www.fists.org
Oct 9, 0000Z - Oct 9, 0400Z	**3.5-14**		**North American RTTY Sprint**			✘	**Both call signs, serial, QTH, name**	www.ncjweb.com
Oct 9, 0000Z - Oct 9, 2359Z	1.8-28	50	SKCC Weekend Sprintathon		✘		RST, QTH, name, SKCC nr or "none"	www.skccgroup.com
Oct 10, 0001Z - Oct 10, 2359Z	28		10-10 Sprint	✘	✘	✘	Call, name, 10-10 number, S/P/C	www.ten-ten.org
Oct 12, 0030Z - Oct 12, 0230Z	3.5-14		NAQCC Monthly QRP Sprint		✘		RST, S/P/C, and NAQCC mbr nr or power	naqcc.info
Oct 12, 1300Z - See website	3.5-14		CWops Monthly Mini-CWT Test		✘		Name and member number or S/P/C	www.cwops.org/onair.html
Oct 15, 8 PM - Oct 16, 2 AM	1.8		Great Pumpkin Sprint			✘	RST and S/P/C	www.podxs070.com
Oct 15, 0000Z - Oct 16, 1600Z		50,144	Araucaria VHF Contest	✘	✘		RS(T) and 4-char grid square	www.avhfc.com
Oct 15, 0000Z - Oct 16, 2400Z	3.5-28		JARTS WW RTTY Contest			✘	RST and age (YL may send '00')	www.jarts.jp
Oct 15, 0001Z - Oct 16, 2359Z	28		10-10 Fall CW QSO Party		✘		Call, name, 10-10 number, S/P/C	www.ten-ten.org
Oct 15, 1200Z - Oct 16, 2400Z	1.8-28		QRP ARCI Fall QSO Party		✘		RS(T), S/P/C, QRP ARCI number or pwr	www.qrparci.org
Oct 15, 1400Z - Oct 15, 2300Z	1.8-28	50+	Iowa QSO Party	✘	✘	✘	RS(T) and IA county, state/prov, or "DX"	www.wa0dx.org
Oct 15, 1400Z - Oct 16, 0200Z	1.8-28	50+	New York QSO Party	✘	✘	✘	RS(T), NY county, state/prov, or "DX"	www.nyqp.org
Oct 15, 1500Z - Oct 16, 1459Z	3.5-28		Worked All Germany	✘	✘		RS(T) and serial or DOK code	www.darc.de/referate/dx/contest/wag
Oct 16, 0000Z - Oct 16, 0200Z	14-21		Asia-Pacific Sprint		✘		RST and serial	jsfc.org/apsprint/aprule.txt
Oct 16, 1700Z - Oct 17, 0100Z	1.8-28	50,144	Illinois QSO Party	✘	✘		RS(T) and IL county or S/P/C	www.w9awe.org
Oct 16, 2000Z - Oct 16, 2200Z	3.5-7,21-28		Spooky Feld-Hell Sprint			✘	RST, S/P/C, Feld-Hell member nr	www.feldhellclub.org
Oct 17, 0200Z - Oct 17, 0400Z	1.8-28		Run For the Bacon		✘		RST, S/P/C, Flying Pig nr or power	www.fpqrp.org
Oct 17, 1300Z - Oct 21, 2359Z	**1.8-28**	**50+**	**School Club Roundup**	✘	✘	✘	**RST, class and S/P/C**	www.arrl.org/school-club-roundup-scr
Oct 22, 7 AM - Oct 22, 1 PM		902+	Fall VHF Sprints	✘	✘	✘	6-character grid locator	www.svhfs.org
Oct 22, 0000Z - Oct 23, 2359Z		**50-1296**	**ARRL EME Contest**	✘	✘	✘	**Call signs, sig rpt, acknowledgment**	www.arrl.org/contests
Oct 22, 0000Z - Oct 22, 2359Z	1.8-28		FOC QSO Party		✘		RST, name, and FOC number if member	www.g4foc.org
Oct 22, 1000Z - Oct 23, 1000Z	3.5-28		Scandinavian YLRA Contest	✘	✘	✘	RS(T) + "88" (YLs) or "73" OMs	www.sylra.is
Oct 22, 1500Z - Oct 23, 1500Z	1.8		Stew Perry Warmup Contest		✘		4-char grid square	web.jzap.com/k7rat/stew.rules.txt
Oct 22, 1600Z - Oct 23, 2359Z	1.8-28	50	W/VE Islands QSO Party	✘	✘	✘	RS(T) and S/P/C or island designator	www.usislands.org
Oct 26, 0000Z - Oct 26, 0200Z	1.8-28	50	SKCC Weekday Sprint		✘		RST, S/P/C, name, SKCC number	www.skccgroup.com
Oct 29, 0000Z - Oct 30, 2359Z	1.8-28		CQ World Wide SSB Contest	✘			RS and CQ zone	cq-amateur-radio.com
Oct 29, 2300Z - Oct 30, 0300Z		50	Fall VHF Sprints	✘	✘	✘	4-character grid square	www.svhfs.org

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

Refer to the contest websites for full rules, scoring information, operating periods or time limits and log submission information.

No contest activity occurs on 60, 30, 17, 12 meters. Serial = Sequential number of the contact. S/P/C = State, Province, DXCC Entity. XE = Mexican state.

Publication deadline for Contest Corral listings is the first day of the second month prior to publication.

Check for updates and a downloadable PDF version online at www.arrl.org/contests

The 2011 ARRL November Sweepstakes

CQ SS CQ SS
Two New Categories for 2011!

■ The great on-air tradition of the November Sweepstakes returns for its 78th year in 2011. This year sees two entry categories split: Single Operator Unlimited and Multioperator are now divided into Low Power (150 W or less) and High Power (more than 150 W), for a total of eight entry categories. The same 6 precedence letters will be used, so be sure you list your power correctly if you enter one of the new categories.

■ As always, you can only work 24 of the 30 hour contest period. Working all 80 ARRL sections — The "Clean Sweep" — remains the great adventure of the event. Are you up to the challenge?

■ While paper logs are accepted, the preferred method of log submission is the electronic Cabrillo format. Logs are due *15 days* after the event: CW — 0300 UTC Tuesday, November 22. Phone — 0300 UTC Tuesday, December 6.

CHRIS PETERS, N4KIT

After eight years of trying, the Clean Sweep broom finally sits at the operating position of Chris Peters, N4KIT, of Windsor, Virginia. Chris earned his first Sweep in 2010.

CW: 2100 UTC Saturday, November 5 – 0300 UTC Monday, November 7

Phone: 2100 UTC Saturday, November 19 – 0300 UTC Monday, November 21

Complete rules and entry forms can be found at www.arrl.org/sweepstakes

W1AW Schedule

W1AW's schedule is at the same local time throughout the year. From the second Sunday in March to the first Sunday in November, UTC = Eastern US Time + 4 hours. For the rest of the year, UTC = Eastern US Time + 5 hours.

PAC	MTN	CENT	EAST	UTC	MON	TUE	WED	THU	FRI
6 AM	7 AM	8 AM	9 AM	1300		FAST CODE	SLOW CODE	FAST CODE	SLOW CODE
7 AM-1 PM	8 AM-2 PM	9 AM-3 PM	10 AM-4 PM	1400-1600 1700-1945	VISITING OPERATOR TIME (12 PM-1 PM CLOSED FOR LUNCH)				
1 PM	2 PM	3 PM	4 PM	2000	FAST CODE	SLOW CODE	FAST CODE	SLOW CODE	FAST CODE
2 PM	3 PM	4 PM	5 PM	2100	CODE BULLETIN				
3 PM	4 PM	5 PM	6 PM	2200	DIGITAL BULLETIN				
4 PM	5 PM	6 PM	7 PM	2300	SLOW CODE	FAST CODE	SLOW CODE	FAST CODE	SLOW CODE
5 PM	6 PM	7 PM	8 PM	0000	CODE BULLETIN				
6 PM	7 PM	8 PM	9 PM	0100	DIGITAL BULLETIN				
6:45 PM	7:45 PM	8:45 PM	9:45 PM	0145	VOICE BULLITEN				
7 PM	8 PM	9 PM	10 PM	0200	FAST CODE	SLOW CODE	FAST CODE	SLOW CODE	FAST CODE
8 PM	9 PM	10 PM	11 PM	0300	CODE BULLETIN				

♦ **Morse code transmissions:** Frequencies are 1.8025, 3.5815, 7.0475, 14.0475, 18.0975, 21.0675, 28.0675 and 147.555 MHz.
Slow Code = practice sent at 5, 7½, 10, 13 and 15 WPM.
Fast Code = practice sent at 35, 30, 25, 20, 15, 13 and 10 WPM.
Code bulletins are sent at 18 WPM.

♦ **W1AW Qualifying Runs** are sent on the same frequencies as the Morse code transmissions. West Coast qualifying runs are transmitted by K6YR and other West Coast stations on 3590 kHz and other frequencies. See "Contest Corral" in this issue. Underline one minute of the highest speed you copied, certify that your copy was made without aid, and send it to ARRL for grading. Please include your name, call sign (if any) and complete mailing address. Fees: $10 for a certificate, $7.50 for endorsements.

♦ **Digital transmissions:** Frequencies are 3.5975, 7.095, 14.095, 18.1025, 21.095, 28.095 and 147.555 MHz.

Bulletins are sent using 45.45-baud Baudot, PSK31 in BPSK mode and MFSK16 on a daily revolving schedule.

Keplerian elements for many amateur satellites will be sent on the regular digital frequencies on Tuesdays and Fridays at 6:30 PM Eastern Time using Baudot and PSK31.

♦ **Voice transmissions:** Frequencies are 1.855, 3.99, 7.29, 14.29, 18.16, 21.39, 28.59 and 147.555 MHz.

♦ **Notes:** On Fridays, UTC, a DX bulletin replaces the regular bulletins. W1AW is open to visitors 10 AM to noon and 1 PM to 3:45 PM Monday through Friday. FCC licensed amateurs may operate the station during that time. Be sure to bring your current FCC amateur license or a photocopy. In a communication emergency, monitor W1AW for special bulletins as follows: voice on the hour, teleprinter at 15 minutes past the hour and CW on the half hour.

W1AW code practice and CW/digital bulletin transmission audio is also available real-time via the *EchoLink Conference Server* **W1AWBDCT**. The conference server runs concurrently with the regularly scheduled station transmissions.

During 2011, Headquarters and W1AW are closed on New Year's Day (observed December 31, 2010), Presidents' Day (February 21), Good Friday (April 22), Memorial Day (May 30), Independence Day (July 4), Labor Day (September 5), Thanksgiving and the following day (November 24 and 25) and Christmas (observed December 26). For more information, visit us at **www.arrl.org/w1aw**.

W3UR

HOW'S DX?

Saba Island 6 Meter DXpedition

Dick Hanson, K5AND

It's not often one has a chance to put a "new one" on the air that is so close to home. So when the Netherlands Antilles made some independent status changes on 10/10/10, hams were presented with four "new" entity opportunities: Bonaire, Curacao, St Maarten and Saba/St Eustatius.

It didn't take long to make the decision to "put on a new one."

The first step involved getting the word out to the WW VHF DX community so as to head off redundant efforts. It did not take long before all four entities had groups lined up for DXpeditions.

Next we contacted the very successful PJ6A HF group that visited Saba on 10/10/10 and then again for the ARRL CW contest. Bob Allphin, K4UEE, was very helpful in providing guidance on shipping gear, island accommodations, etc, which saved a lot of discovery on our part.

The next step was to secure more folks to man the station. I was very fortunate to know George, K5TR, and Pat, W5OZI. They both have excellent operating skills and are just good guys to hang out with. We wanted to be sure we had the operator skills and equipment to give out as many contacts as possible to the WW VHF community and with three folks, we thought we could do it.

Plan Ahead

Because of the difficulties of getting ourselves and our gear to Saba, I immediately began to plan to ship our equipment well ahead of time. As it turned out, the least expensive/most reliable way to get our gear down there was via UPS or FedEx to Florida and then by ship to Saba. Customs requirements were handled by our freight company in Florida. Storage and delivery of 250 pounds of gear were handled by a company on Saba. When we arrived on Saba the afternoon of June 22, all our gear was safe and sound — and already at our cottage!

COURTESY DICK HANSON, K5AND

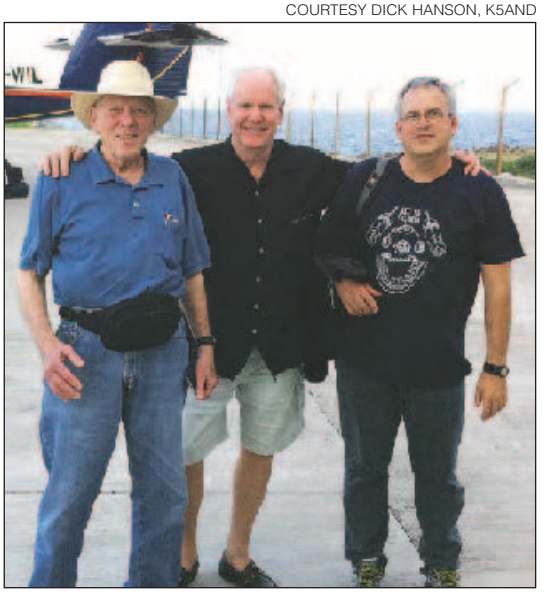
Dick, K5AND (foreground) and Pat, W5OZI, listening carefully for another 6 meter contact.

Because I had donated my travel antenna and Penninger mast (**www.penningerradio.com**) to the K5D Desecheo Island DXpedition, it was time for some replacements. The new Yagi is an Optimized Wideband Antenna (OWA) design and features a direct-feed driven element with no matching other than a current bead balun. The antenna has about 10.7 dBd gain with a 28 dB front-to-back ratio and a very wide VSWR curve. All this on 31 foot boom weighing in at 17 pounds.

My new Penninger mast is *so* slick and so quick to assemble. You can order the mast tubes in lengths up to 6 feet. I chose 5 foot lengths for ease of shipping. You also have a choice of wall thickness, either 0.058 or 0.125 inches; I chose 0.125. The mast tubes are 2 inch OD.

The thing that makes this mast so slick for DXpeditions, Field Day, etc, is the "joiner tubes." These are machined aluminum fittings that use "snap-lok" buttons to lock the

COURTESY DICK HANSON, K5AND



The tres amigos (from left) Pat Rose, W5OZI; Dick Hanson, K5AND, and George Fremin, K5TR, just after they landed on Saba Island.

COURTESY DICK HANSON, K5AND

What a beautiful picture of the 7 element OWA designed 6 meter Yagi some 450 feet above sea level, with the Saba International Airport runway down below.

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

tubes together. It takes 5 minutes, literally, to assemble my 25 foot mast. But how would the snap-loks hold up in high winds with a big Yagi on top? That question was answered in the extreme on Saba.

Thrashing the Mast

On June 27 we had a real *storm*, which was really intense for about 3-4 hours, with horizontal rain and sustained winds measured at 65 mph. Clearly, if we were going to lose our antenna/mast system, it would happen during this storm. We did turn the antenna into the wind with the Yaesu G450 rotator, but we had *no damage* of any sort! So sometimes, you can have your cake and eat it too. The Penninger masts are *easy* and *strong*.

The antenna performed very well. The tuning done at my home shack proved to be dead on, as the needle would not move off zero on reflected power. Also, the low-Q driven element design was unaffected by the daily downpours and, once you do the initial tuning, there's nothing to tune or adjust. I'm sold on low-Q driven element designs. The feed line was a 50 foot length of LMR400.

The stations consisted of two Elecraft K3s, an Elecraft P3 monitor scope, an Elecraft KPA500 amplifier, an M^2 M100 amplifier, *TR4W* logging software with WinKey interface to the computers. George put up a ladder line inverted V for HF and tuned it with an NYE antenna tuner. We also had Yamaha CM500 and Heil Proset headsets.

All the equipment functioned flawlessly — except the rotator. Its internal brake kept hanging up intermittently. So late one night, George took the thing completely apart (yes, this includes chasing runaway ball bearings across the floor), removed the brake altogether and we had no further problems. For power, we ran the amplifiers on 220 V ac and the rest of the gear on 110 V ac.

Location, Location, Propagation

Our biggest day for EU DX was June 27; the band opened at 0930 local and stayed open until 2200 local. Six hundred and fifty EU stations went into the log — the strongest signals and longest duration I've ever experienced in an E opening.

Our location at 450 feet ASL proved to have outstanding propagation from about 315° all the way around (through North) to 150°. We enjoyed a very low take-off angle in all directions because of the slope of the ground down toward the ocean. Our computer beacon generated just over 20,000 CQs during our 13 day operation that ended on July 6. It ran daily from 0530 to 2200-2300 local.

Our cottage was small but workable, just barely, for three guys; we could have used another bed, as Pat can tell you. The island folk are very friendly and shopping for food and other necessities proved to be very easy. We wound up taking taxis in lieu of renting a car. The only road is narrow and pretty challenging. Liquor and beer were inexpensive, so Pat and I had our share of both.

In conclusion, we hope we worked you. It was not for lack of effort, that's for sure. We also hope you found benefit from our website (**dkhanson.com/pj6**) postings of news, pictures, our log and with our LoTW uploads. George did an excellent job with all of this. We had fun bringing Saba to the world on 6 meters. Best regards from the tres amigos, Pat, George and Dick.

DXCC CHALLENGE

Doing last month's article on John Dack, W7KH, Amateur Radio's Top DXer, was so much fun I thought why not do one on the top DXCC Challenge operator? The DXCC Challenge award is for the total number of countries worked per band on 160 through 6 meters, not including 60 meters (5 MHz). Now with 341 DXCC Entities and 10 bands that is a total of 3410 band points. Definitely this is a lifetime achievement award and I doubt anyone will ever work the total number possible as on 160 and 6 meters it might be impossible to manage all 341 countries.

The idea of the DXCC Challenge award came during the DXCC 2000 rule changes in the 1990s. The basic award is available to all who confirm 1000 band countries. Endorsements are available in 500 increments (1500, 2000, 2500 and 3000). Contacts count from November 15, 1948 and after. A cup, called the DeSoto Cup, is awarded once a year to the top DXCC Challenge operator. It is only awarded once in a lifetime. Once you have one, that's it. Second and third place medals are awarded each year also. Well over 2200 have reached the basic award of 1000. As of early August of this year just over 40 DXers have obtained or passed the 3000 level.

Top DXCC Challenge DXer

The first to receive the DeSoto Cup was Bob Eshleman, W4DR, who held on to the number one spot until late 2006 when Fausto Minardi, I4EAT, briefly passed Bob for a few days until W4DR made his final endorsement for the year. Determined and with propagation and the right DXpeditions on his side I4EAT received the second DeSoto Cup in 2007 and has been at the top of the heap ever since. In fact the top three DXCC Challenge operators are all from Europe (OZ1LO and SP5EWY are tied for second). The European operators are dominating the top 20 spots and this trend will probably continue for years to come.

COURTESY FAUSTO MINARDI, I4EAT

Here is Fausto Minardi, I4EAT, with his DeSoto Cup and medallions for the DXCC Challenge Award.

Fausto, I4EAT, was first interested in Amateur Radio in 1965 at the age of 15 as he listened to a broadcast on 40 meters on the family radio. Later he learned that some of the strange signals he heard were Amateur Radio operators. He began shortwave listening as I1-12548. In 1968 he received his first Amateur Radio license, I1EAT. At this time all Italian operators were issued I1 calls, as the Italian call areas were not assigned until 1971, which is when he became I4EAT as he lived in the Emilia-Romagna region.

During most of the '60s and '70s he was mostly active on VHF. With a full license he could operate on both HF and VHF and very few contacts were on HF during this time period. His first HF DX contacts were made on October 29, 1968 with VK4TY followed by 5Z4KL on 20 meters, using a Geloso G. 4/216 receiver and G. 4/228 transmitter with a simple dipole. After many years of VHF activity on EME and meteor scatter he got back on HF in 1979 obtaining his DXCC about a year later.

Fausto is now using an ICOM IC-775 transceiver and Kenwood TL922 amplifier driving a TH-7DX Yagi on HF and an IC-736 transceiver and homebrew 3CX800 amplifier into a 10 element Yagi for 6 meters. This is his station in the city. He also has a second station about 35 kilometers outside of the city, where he has four phased verticals on 80 meters and a vertical on Topband.

It was 2001 when he first became serious about the ARRL DXCC Challenge as this is when he got on 6 meters initially with just 5 W. "You can imagine what I missed at that time" remembers Fausto. That was an amazing year of F2 propagation and he managed to work 100 countries.

In Italy the most difficult area to work is in CQ Zone 31 (mid Pacific) on all bands. One of his exciting days on 6 meters was March 29, 2002 as he worked four KH6 stations. Fausto does not operate on 6 meter EME. As of this writing I4EAT is at the top of the DXCC Challenge with the following band totals: 160 meters — 299; 80 meters — 336; 40 meters — 339; 30 meters — 336; 20 meters — 339; 17 meters — 338; 15 meters — 340; 12 meters — 331; 10 meters — 333, and 6 meters — 194 countries for a grand total of an amazing 3185 band points!

For more information on the ARRL DXCC Challenge, see **www.arrl.org/dxcc-challenge**, and for a complete listing of all award recipients and their numbers, see **www.arrl.org/system/dxcc/view/DXCC-CHAL-20110731-USLetter.pdf**.

NØJK

THE WORLD ABOVE 50 MHz

The Five PJ Summer 2011 VHF DXpeditions

With the addition of four new DXCC countries following changes in the administration of the Netherland Antilles, interest was high among 6 meter DXers to work these new ones. Five different operations took place from these new countries, which helped make the summer E_s season of 2011 memorable for many.

PJ2/K8LEE

Wayne, K8LEE, operated from Curaçao during the first 2 weeks of June. He caught the big opening June 10 to much of the United States, working as far west as Arizona and Washington State (W7FI, CN87). He worked Portugal, Madeira Island and Brazil. He had less luck to Europe, with no openings to mid or eastern Europe.

PJ4E

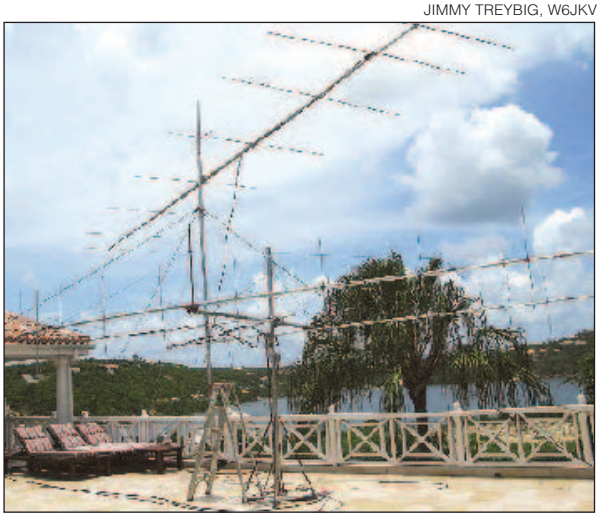
WØSD and WØOE operated from Bonaire with the assistance of Peter, PJ4NX. They reported working 999 unique stations in 56 countries on 6 meters. Of these, 974 were in North America, 212 Europeans, 10 South Americans and four Africans. No Asia or Oceania. Their best days were June 10 with 232 contacts and June 16 with 224. Their equipment consisted of the Yaesu FT DX 5000 transceiver, SPE Expert 1K-FA amplifier and an LFA 6 element Yagi on a mast. They operated 6 meters for 17 days. One advantage to a longer DXpedition is it increases the chances of catching a good opening. Out of 15 days PJ4E had only two good openings. They note PJ4NX will continue to be active on 6 meters. For QSLs, they request USA stations send an SASE, DX an SAE and $2 or IRCs. No LoTW upload is planned.

PJ6D

Dick Hanson, K5AND; Pat Rose, W5OZI, and George Fremin, K5TR, put Saba Island on in a big way. As Dick notes, it is difficult to get there, particularly shipping in a good station and antennas. This was likely the best opportunity to log Saba Island on 6 meters for many years.

PJ6D made 3528 contacts on 6 meters with 2695 unique call signs in 76 countries. Their best DX was almost 10,000 km to Israel. I was able to work PJ6D from both Kansas and Bermuda. They were quite loud and in for many hours to Hamilton. Ed, VP9GE, was also able to log them using just a vertical antenna. They had good openings to Europe on a couple of days when I heard nothing. Bernie, W3UR, has a detailed account of the PJ6D activity in his "How's DX" column this month.

JIMMY TREYBIG, W6JKV



The 6 and 2 meter antennas that Jimmy, W6JKV, and Mike, K6MYC, used on St Martin.

This Month

October 6	432 MHz Fall Sprint
October 16	Microwave Fall Sprint
October 30-31	50 MHz Fall Sprint
October 30-31	ARRL EME Contest
*October 22-23	Excellent EME conditions

*Moon data from EA6VQ

PJ76

Jimmy Treybig, W6JKV, and Mike Staal, K6MYC, operated from St Maarten. They used the call PJ76 on 6 meters and from June 24-July 3 operated EME as PJ7EME. They were plagued by a major storm and also had problems with high local RF noise at times.

Jimmy and Mike operated from the Villa Marrakesh, Cupecoy, Dutch Lowlands, St Maarten, grid FK88. Villa Marrakesh is at an altitude of 60 feet with ocean water to Europe and the west coast of the USA.

Jimmy hit the airwaves June 24 with strong E_s to the eastern and midwestern states. Good openings were noted to Europe on June 27-30 and July 2-3. On July 1 from 1300-2100 UTC he had a long duration opening to the Midwest. In all, the PJ76 6 meter operation made 1670 contacts covering 72 countries with 43% from EU, AF and AS. This was basically a one-man DXpedition on 6 meters and Jimmy did an outstanding job handing out a new "rare one."

On the 2 meter EME side Mike, K6MYC, operated as PJ7EME. His station consisted of a Yaesu FT-857 transceiver, 2 × 2MXP20 antennas with an Az-El mount; M^2 2M-HCP preamp; M^2 HPR-1 relays and M^2 S2 Sequencer. The EME operation made 260 contacts in 45 countries.

PJ2/DJ9ON

DJ6NK, DJ9ON and DJ9KX operated June 26-July 7 from Curaçao. They had good 6 meter openings to Europe June 27-30. Best openings to the USA were noted on July 1, 4 and 5. WØFY reported they had a "huge signal" in St Louis, Missouri on the 5th. Overall, the German group had better success to Europe than the earlier PJ2 DXpeditions. The end of June/first week of July is often a peak period for 6 meter E_s from the Caribbean and northern South America to Europe. They also did well to the states.

They operated split, at times listening

Jon Jones, NØJK ♦ 9356 E Wilson Estates Ct, Wichita, KS 67206-4417 ♦ n0jk@arrl.net (316-425-5326)

down 2-4 kHz. Some VHF operators seem to be unaware of "operating split" and often called the PJ2 simplex. Europeans and HF DXers are familiar with this operating technique. It helps to spread out callers and to hear the DX. Often with E_s strong one-hop-away domestic stations will cover the DX, making it difficult to tell who they are answering. Listen carefully to and follow the instructions of the DX station; it will help you work that "new one."

Other 50 MHz DXpeditions

J68HS

Howard Sine, WB4WXE, operated from St Lucia June 30-July 14. He worked into Europe June 30 and had nice openings to the states July 1, 5 and 12. Of note, Bob, K6QXY, worked J68HS on July 1 for his country #166 on 6 meters. W5XX worked Howard the same day for his #100.

VP9/NØJK

I operated from Bermuda July 3-7. This was a short trip with two of my children. I operated "Holiday" style from Ed's, VP9GE, station. Nevertheless, I made around 500 contacts on 6 meters. The station consisted of Ed's Yaesu FT-2000 and two Yagis. My 6M5X was aimed northeast for Europe and a smaller 5 element Yagi on a 10 foot mast was aimed at the states. I operated primarily on CW to give smaller stations a chance to work Bermuda on multihop.

We arrived in Bermuda the afternoon of the 3rd and after getting the kids settled in, I was on the radio at 1900 UTC. The first contact in the log on 6 meters was PJ6D at 1920 UTC, followed by N3LL (EL86) Florida. The band was pretty slow with only single-hop E_s to Florida and I took a break to fix the Bencher CW paddle and eat dinner.

Back on at 2200 UTC, I tuned around and heard a few weak beacons out of Florida and Georgia. I tossed out a random CQ on 50.125 MHz SSB. I had a nice 3 hour run that turned out to be my best opening to the states of the trip.

July 4 dawned bright and sunny. I was up early calling Europe. At 1742 UTC I had success contacting CU2JT. But Gary ended up being the only European I worked this trip on 6 meters. I heard a loud station up from my frequency and it was PJ6D sending CQ on SSB. I turned the antenna south toward them and they pinned the S meter, Saba being one E_s hop away. Later, I met up with the kids at the Royal Naval Dockyard and toured the old fort. We took the ferry across the harbor and had a nice dinner in Hamilton, then drinks at an oceanside bar. We ended the evening watching a great fireworks display over Elbow Beach. Though the 4th of July is not an official holiday in Bermuda, there are many celebrations for the numerous US tourists who visit each year.

On July 5 I worked several KP4s then PV8ABC (FJ92) on SSB. This may be the first VP9-to-Brazil contact (on checking PY5CC's list of Brazil 6 meter firsts at **www.50mhz.com**). The band switched stateside and some California stations called, including N6RV, N6CA and N6KK. I shut down at 1900 UTC to get in some time on the beach. We left July 7; my last contact was FP/VA2WA.

I had a great time with my kids this trip and made quite a few contacts. Some interesting DX that I logged included PJ6D, K7KV (CN87), VE4EAR, HR9/WQ7R, FP/VA2WA and PV8ABC Brazil. It was frustrating to see PJ6D and Florida stations working Europe, when none were heard in Bermuda. Perhaps bad timing? The day before I arrived (July 2), Ed reported loud stations from England and the southeast USA had a strong opening to central Europe.

ON THE BANDS

6 meters. On July 2, Pedro, CT1EKY, reported hearing Fred, KH7Y. He passed along this confirming e-mail: "Hi Fred, I hope every-thing ok with you. I just copy your sigs into IM58jp 519 today at 20:04utc on 50.105 wow! nice surprise. Best 73's Pedro CT1EKY." The ODX is 12,800 km.

Bob Yates, W4GCB, reported a strong opening all afternoon to Europe from Georgia. His friend KD4HJD just got on 6 meters and worked Italy. Bob explains: "July 1, a local friend, Tom, KD4HJD, decided to convert his 10 meter rotatable dipole to 6 meters, after much prodding from me. It's up about 30 feet and he is running 100 W. This afternoon (July 2), about 6 PM local time, I called Tom on 2 meters to tell him that IK5MEJ was on 50.130 and very strong. A couple of minutes later, I heard Tom's XYL, Brenda, KK4AXD, calling him, and she made contact on the first call! That was impressive, but it got better. Later in the afternoon, Tom managed to get his hands on the transceiver, and he called Steve — who answered the first call and gave Tom an honest 59 signal report! Tom had told him he was 'only running a dipole' and the Italian station commented on how strong his signal was being received."

July 8 was probably the best opening this season to Europe from the Midwest. From Kansas (EM28) I worked CT1HZE (both CW and SSB), CT1EWQ and EA7KW between 1450-1550 UTC. Joe, CT1HZE, peaked 59 at times on SSB on my 2 element Yagi. Rick Tucker, WØRT (EM27) worked DL5MAE, PF7M and CT1HZE and a "near miss" with CU2JT on SSB. Rick finds that CQing can bring results. It is easy to just tune for the DX but they are also tuning around looking for *you*. KØHA (EN10) reported contacts with Portugal, Spain, 5C12M and ISØGQX. Pat, W5OZI, worked 4X4DK.

Conditions were better for stations farther east. Tim, NWØW (EM47) ran a nice pileup of Europeans working HA, SP, EA, 9A, S5, SP, DL, YT, PE, ZB, G8, ISØ, IK, CT and CU. He heard but *wasn't able* to work SV5BYR.

Tim notes that it can be difficult for operators in the heartland to work Europe through a "wall" of W1-W3 stations. Being one E_s hop closer to the DX means the East Coast will usually be louder. Tim suggests that the key to working the DX is to stay *out* of the typical areas where most hams are looking and working. Outside the prime areas it is quieter and easier for the DX to pick you out.

I tend to go down around 50.050 MHz but that blocks the DLs and probably a few others from "legal" contacts (although some still call). I'll probably try going *higher* next time, perhaps around 50.190+ both CW/SSB. I find it really helps if the DX will ask their pileup to standby for W6, W7 and WØ. CT1HZE does this.

Farther east, stations in the mid-Atlantic region had much of Europe coming in with huge signals. Robert, W3HHK, in Ohio worked CT, ISØGQX, F8DBF, ON5HJS, 9H1BT and EA7KW using 100 W and a 5 element Yagi on a 10 foot mast by his patio. Ami, 4X4DK, was coming in to the mid-Atlantic region for over 90 minutes.

A45XR in Muscat, Oman answered Dave's, N3DB, CQ. Dave notes "I had gotten partials with A45XR but didn't have a clue who it was '...45X...' but no complete call because of my huge pileup. I asked the pile to standby twice and despite an HB9 calling over him we finally made it, 429 to him and 559 for me, a distance of 11,626 km!" Dave had a banner day making 144 contacts to 28 European and Mideast countries. He also worked SV5BYR for a new one, SV9CVY and 4X4DK. Dave, A92IO, worked into New England and was heard farther west.

Algeria was worked in the mid-Atlantic region July 11. And on July 15 a "really rare one" made an appearance on 50 MHz. Monk Apollo, SV2ASP/A, was worked by KP4EIT, CT1EEB and others around 1950 UTC. Great to see him on the band and hope he enjoyed the magic of 6 meters.

Dan, K3ZXL (EL87) Florida reported contacts on July 17 to PZ5RA, 8P9NX and CN8KD. His antenna is a 4 element Yagi at 30 feet. Nice to see Ramon, PZ5RA, on the band. The FY7 beacon is heard often, with not much live activity from that region.

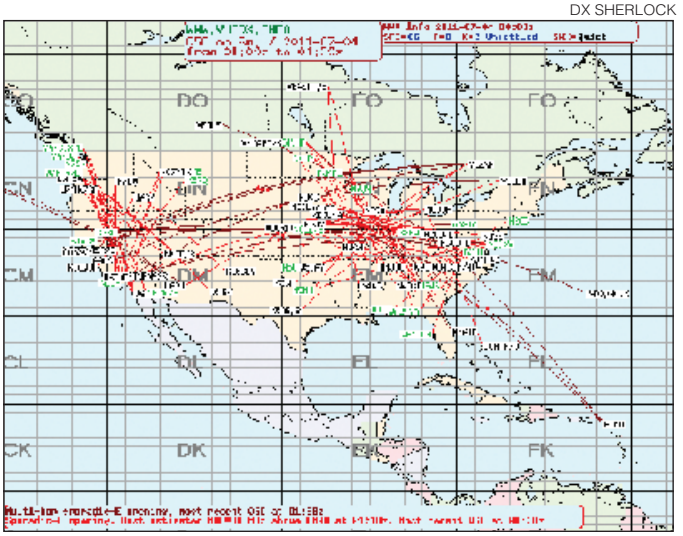
On July 19 C37NL worked into W1, W2 and W3 after 1615 UTC, and T77C was on as well. That evening YS1AG, El Salvador, was active and worked the Gulf Coast as well as the Midwest on double hop E_s. I heard Andy on 50.105 MHz and dropped in my call on CW as I know he is a good CW operator. He heard me but the band dropped before we completed. He sent me a nice e-mail about himself. He is a plastic surgeon who trained in England. He is busy setting up a microsurgery center to treat cancer patients in El Salvador. As for radio, he finds "YS in much demand in every band I poke my nose."

While the big news on the East Coast were contacts with Monk Apollo, rare European countries and the Middle East, the West Coast and the Midwest worked China. On July 22 at 0000 UTC, BA4SI reported contacts with N5DG (EM20), followed by KE7V (CN88), W7FI (CN87) and N3SL (EN12) in Iowa. Steve, N3SL, said he had his Yagi pointed toward Japan when he saw N5DG's spot for BA4SI pop up that afternoon. He tuned to the frequency and "was shocked" to actually hear BA4SI.

Steve anxiously called BA4SI several times before getting a definite reply. He said it "was over in a flash" and BA4SI was gone. Less than 24 hours later Steve's contact was confirmed by BA4SI via LoTW, which "was a real treat." N3SL's station for this contact was a 5 element Yagi at 50 feet with a kW amplifier. A good station, but not one of the stacked Yagi arrays. Jay, KØGU (DN70) also was pleased to work BA4SI.

2 meter E_s. Bruce, KI7JA (CN85) relates "an interesting evening" on July 20. "I was listening on 6 meters with the 2 meter rig on in the background

DX SHERLOCK



The DX Sherlock map for the 50 MHz opening of 0130 UTC July 4, 2011.

and heard some CW on 2 meter. I turned up the volume and hear N5JEH (DM65) in New Mexico calling. After working Ed, I went to 144.210 MHz to call CQ and was called by W5LMM (DN65), then WAØSIK (DM79) in Colorado, then later worked WDØBQM (DN81) in Nebraska all on SSB with great signals."

N5JEH (DM65) New Mexico reports: "I worked 3 stations in OR, 5 in WA and 3 in BC (VE7). Grids worked were CN85, CN88, CN87, CN89, CO70. Stations worked: KI7JA, KB7ME, KØVIZ, N7DB, VE7SL, W7YOZ, VE7XF, VE7DAY, W7BA, W7FI and KD7UO. At the same time we were working KL7s on 6 meters. NL7Z @ 02:39 UTC and KL8DX @ 03:01 UTC. Grids were BP51 and BP53."

I wonder if it would have been possible for New Mexico to work Alaska via 2 meter E_s that evening? Or double hop from the Pacific Northwest to Florida, as hinted by this report.

From Oklahoma, John, AA5JG, had 2 meter E_s to Florida just before the 5s worked northwest. From 0133–0144 UTC he worked EM70, EL88, EL95, EL86, EL87 and EM60. John has a modest station running 65 W to a 9 element Yagi up 25 feet.

An E_s or possible field-aligned irregularities (FAI) were reported by Gedas, W8BYA (EN70) on July 22. He worked NØKE (DM69) at 2245 UTC on 2 meters and noted he was in for over an hour, about S5. No other stations noted. Unusual to have 2 meter E_s last that long to one location.

Tropospheric ducting. Gedas, W8BYA, reported tropo to EN21, EN22 and EN35 on 2 meters July 17 and even a contact with WBØHHM (EN13) South Dakota.

HERE AND THERE

Pete, WA7JTM, worked EA8CQS June 28 at 2340 with 57 SSB signals on 6 meters. It was a new country for him (#124). EA8CQS was also worked by AA7A and K7JE. EA8 is common on the East Coast and not rare in the Midwest but west of the Rocky Mountains it is a rare one.

Dennis, K7BV, ran a one-man "grid DXpedition" in July in the western states. I worked Dennis while he was in DN42 on July 13. July 28 found Dennis along the Texas-Mexico border in DL79. He had a good E_s opening that evening and handed out this extremely rare grid to stations from W1 throughout the Midwest. Not only is DL79 difficult to drive to, the border area has become dangerous due to the drug cartels. On July 30 Larry, NØLL, completed a contact with Dennis in DM66. Larry needs only three more grids to complete his Fred Fish Memorial Award.

144 MHz Standings

Published 144 MHz Standings include call area leaders as of August 1, 2011. For a complete listing, check the Standings Boxes on the "World Above 50 MHz" web pages at **www.arrl.org/qst/worldabove**. There are two requirements for inclusion in this list: US operators located east of the Mississippi River must have worked at least eight states. All operators must have submitted information within the previous 2 years. (You need not work additional stations to remain in the standings, but please confirm your continued interest.) Submit data by e-mail to **standings@arrl.org** or mail paper submissions to Standings, ARRL, 225 Main St, Newington, CT 06111. Listed by states worked.

Call Sign	State	States Worked	DXCC Entities Worked	Grids Worked	DX (km)
1					
K1MS*	MA	50	32	—	2,166
W1AIM*	VT	50	18	231	2,340
K1SIX*	NH	43	14	201	2,501
W3TWX*	VT	38	42	161	1,984
W3EP/1	CT	37	3	199	2,450
W1ZC	NH	35	2	189	2,490
WA1FVJ	CT	27	2	55	2,200
K1WVX	CT	18	2	53	1,093
K1VU	MA	13	2	29	762
2					
K1JT*	NJ	47	73	466	2,369
W2UAD	NY	39	3	143	2,323
K1NY	NY	38	4	151	2,576
WB2CUT	NJ	37	2	164	—
NY2NY*	NY	36	6	172	2,812
3					
W3CMP*	PA	50	64	407	2,455
WA2FGK*	PA	49	49	367	—
AE3T*	PA	47	46	—	15,993
AK3E	MD	36	4	178	—
N3JNX	PA	15	3	51	949
N3TEE	DE	12	1	18	817
4					
W8WN*	KY	50	76	535	15,560
N9HF*	FL	48	44	85	2,510
W4WA	GA	42	7	167	7,922
K4RF	GA	40	4	212	2,147
N4QWZ	TN	40	3	207	2,295
K2BLA*	FL	39	77	373	—
K4RWP	TN	39	3	174	2,323
K4QI	NC	38	6	231	—
K4ZOO	VA	38	4	198	2,162
AA4H	TN	38	3	169	2,007
N4HN	NC	37	3	182	2,414
K4RTS	VA	37	3	175	2,023
N4MM	VA	35	5	153	—
K4MM	FL	34	8	163	2,347
K4MSG	VA	31	2	107	1,656
K4YMQ	AL	30	2	120	1,754
KØVXM	FL	26	6	139	1,974
KE4WBO	FL	22	5	64	2,264
W4SW	VA	16	2	40	838
5					
K5QE*	TX	50	80	327	14,156
W5UWB*	TX	50	71	299	2,332
WD5AGO*	OK	50	32	220	2,050
K5YY*	AR	50	31	498	2,510
WA5VJB*	TX	50	19	—	—
W5LUA*	TX	50	—	—	—
K5UR	AR	48	5	517	—
N5LJL	OK	48	3	219	2,472
K5SW	OK	47	5	298	2,378
K5YPV	MS	42	3	202	2,902
K5LLL	TX	39	3	208	2,089
AA5JG	OK	39	3	151	2,171
W5HNK	TX	37	3	—	2,442
AA5AM	TX	31	3	125	2,271
KØXXX	AR	26	3	85	1,971
W5OZI	TX	24	2	138	2,268
6					
K6AAW*	CA	50	58	411	3,831
K6PF*	CA	47	41	223	4,013
KC6ZWT*	CA	40	44	320	3,934
KR7O*	CA	26	29	223	2,134
K6QXY*	CA	24	8	—	3,794
N6ZE*	CA	22	16	115	2,600
KF6A*	CA	19	25	122	3,766
7					
W7GJ*	MT	50	110	—	—
W7MEM*	ID	50	102	566	16,654
W7EME	MT	50	78	—	—
W7RV*	AZ	50	35	275	2,937
WA7GSK	ID	30	2	215	3,635
K7CW*	WA	17	3	127	2,518
8					
K8BHZ*	MI	50	45	362	2,278
WA8RJF*	OH	44	27	227	2,131
K8ROX	OH	40	2	151	1,915
K2YAZ	MI	38	2	165	2,167
K8DIO	OH	38	—	—	1,871
N8IEZ	MI	32	2	171	2,379
N8PUM	MI	23	2	108	2,188
WA8WV	WV	20	2	39	1,055
9					
AA9MY*	IL	50	82	467	2,045
N9LR*	IL	50	50	511	2,274
W9RPM	WI	43	21	205	2,670
KA9UVY	IL	43	2	164	2,373
W9RM	IL	42	8	177	2,121
WA9PWP	WI	32	2	144	1,940
Ø					
KØAWU*	MN	50	53	421	2,343
KØFF*	MO	50	35	267	2,185
WØLD*	CO	50	26	167	2,373
WØRT*	KS	50	17	206	2,357
NØPB	MO	48	5	315	2,474
NØLL	KS	48	3	389	2,378
WAØKBZ*	MO	45	16	209	8,507
KWØA	MO	45	2	245	2,501
AEØG	NE	45	1	214	2,245
KØKP*	MN	43	53	324	15,207
KØAZ*	MO	43	9	215	2,384
KØGU*	CO	42	40	350	2,400
WBØULX	SD	38	2	130	—
KBØPE	MO	29	1	111	1,702
KØRZ*	CO	26	2	107	2,173
KØCS	CO	26	2	83	2,177
NWØW	MO	17	3	—	1,688
W6HCC	CO	4	2	—	3,950
Canada					
VE3KH*	ON	50	65	330	1,985
VE2PIJ*	PQ	14	2	52	1,781
DX					
XE2AT*	XE	44	77	356	2,191
DL8EBW*	DL	39	99	826	18,588
PA3CEE*	PA	33	118	751	18,346
NP3CW	KP4	2	1	20	6,390

*Includes EME contacts
— Not given

SPECIAL EVENTS

Contact these stations and help commemorate history. Many provide a special QSL card or certificate!

Sep 10-Sep 18, 0001Z-2359Z, W6A-W6Q & W6T, San Bernardino, CA. Citrus Belt Amateur Radio Club. Route 66 On The Air Special Event. 21.366 14.266 7.266 3.866. Certificate. Citrus Belt Amateur Radio Club, PO Box 3788, San Bernardino, CA 92413. *12th Annual Route 66 On The Air Special Event; rules and other info see* **www.w6jbt.org**

Sep 16-Sep 18, 2100Z-2100Z, K5B, Allen, TX. Plano Amateur Radio Club. Plano Balloon Festival. 14.070. QSL. Plano Amateur Radio Club, 815 Wind Elm Dr, Allen, TX 75002. **www.k5prk.net/K5B.html**

Sep 16-Sep 18, 0000Z-2359Z, K6P, Santa Ana, CA. W6APD. POW-MIA Remembrance Day. 14.253 18.150 7.250. QSL. Mark McMullen, KM6HB, PO Box 27271, Santa Ana, CA 92799.

Sep 17, 1400Z-2000Z, VE3MIS, Mississauga, ON. Mississauga Amateur Radio Club. Halton County Radial Railway Museum. 14.250 7.210. Certificate. Michael Brickell, 2801 Bucklepost Cres, Mississauga, ON L5N 1X6, Canada. *For certificate send QSL request and $2 US with a return envelope; cannot use US postage stamps in Canada.* **www.marc.on.ca**

Sep 17, 1400Z-2359Z, W3M, McKean, PA. Area Amateurs. 150th Anniversary of McKean, PA. 14.240 7.240 3.740 14.040. Certificate & QSL. Don Weaver, W3WDK, 8353 Pondview Dr, Mc Kean, PA 16426. *QSL/QSO info & SASE for QSL; QSL/QSO info & $2 (we will supply envelope & postage) for certificate.* **w3wdkx@gmail.com**

Sep 17, 1500Z-1900Z, W9JOZ, Radioville, IN. Starke County Amateur Radio Club. Radioville — The Town That Never Was. Gen portions 10 15 20 40 80 m. QSL. SCARC, 7495 S 500 W, North Judson, IN 46366. **www.w9joz.org**

Sep 19-Sep 25, 0000Z-2359Z, KØT, Boone, IA. Tall Corn Amateur Radio Club. Day Out with Thomas the Tank Engine. 21.310 14.260 7.250 3.980. QSL. Jim Moreland, 109 S Underhill St, Boone, IA 50036. **www.qsl.net/kd0med**

Sep 24, 1400Z-1800Z, W8ORS, Martinsburg, WV. Opequon Radio Society. 50 Year Anniversary and Repeater Coverage Mapping. 145.150 (PL 179.9). QSL. ORS, PO Box 499, Kearneysville, WV 25430. **www.qsl.net/wa8fse**

Sep 24-Sep 25, 1400Z-2000Z, KA5B, Clovis, NM. Eastern New Mexico Amateur Radio Club. The Train Runs Through Clovis! 14.285 7.180. QSL. ENMARC/KA5B, 208 Merrill Dr, Clovis, NM 88101. *From telegraph station of the original Clovis railroad station; manned by club members and Boy Scouts working on merit badges.* **www.ka5b.org**

Sep 24-Sep 25, 1500Z-2200Z, WE7GV, Sahuarita, AZ. Green Valley Amateur Radio Club. Fiesta Sahuarita. 14.244. Certificate & QSL. Green Valley Amateur Radio Club, 601 North La Canada, Green Valley, AZ 85614. *17th anniversary of the town of Sahuarita, AZ.* **tlang1080@gmail.com**

Oct 1, 1400Z-2200Z, W5HUM, Mena, AR. Ouachita Amateur Radio Association. Lum and Abner Radio Program 80th Anniversary. Gen portion 20 40 80 m. Certificate. Don Thomas, 117 Dallas Ln, Mena, AR 71953. *CD of Lum and Abner to first 25 contacts.*

Oct 1, 1400Z-2359Z, WD4WDW, Orlando, FL. Disney Emergency Amateur Radio Service. Walt Disney World's 40th Anniversary. 28.360 14.260 7.260. QSL. DEARS, PO Box 22346, Lake Buena Vista, FL 32830. **www.wd4wdw.org**

Oct 1, 1500Z-1900Z, KJ4SZD, Brandon, FL. Computer Acquisition and Placement. Family Abilities Information Rally. 14.325 146.52. QSL. CAPP, 201 Paka Ct, Brandon, FL 33510. **www.cappinc.org**

Oct 1-Oct 2, 1200Z-2000Z, W4O, Harlem, GA. Columbia County Amateur Radio Club. 23rd Annual Oliver Hardy Festival 28.360 21.290 14.260 7.260. QSL. CCARC W4O Special Event, PO Box 800, Evans, GA 30809. **ccarc@hamradioman.com**

Oct 1-Oct 9, 1400Z-1400Z, W5B, Albuquerque, NM. High Desert Amateur Radio Club. Albuquerque International Balloon Fiesta. 21.300 14.260 7.225. QSL. Via Bureau or direct to Theodore Zipes, 6833 Augusta Hills Dr NE, Rio Rancho, NM 87144. *Operating times will vary (local) 0800 to 1200 and evenings 1700 to 2100 due to weather and fiesta schedule.* **w4rcn@q.com or www.nm5hd.com**

Oct 5-Oct 9, 2300Z-0400Z, K4L, Eastpoint, FL. Kennehoochee Amateur Radio Club. St George Island Lighthouse, IOTA and US Island. 160 m - 6 m (conditions permitting). QSL. Kennehoochee ARC, PO Box 1245, Marietta, GA 30060. *Grid: EL791n USA 140 IOTA: NA-085 US Island: FL075S.* **www.stgeorgelight.org/**, **www.w4bti.org** *or* **www.qrz.com/db/K4L**

Oct 8, 1300Z-2100Z, NA4CC, Kings Mountain National Military Park, SC. Cleveland County Amateur Radio Service. 229th Anniversary of the Battle of Kings Mountain. 14.270 7.270. Certificate. Cleveland County Amateur Radio Service, PO Box 864, Shelby, NC 28151. **www.nps.gov/kimo/index.htm**. *Questions email* **na4cc@ccarsnc.org** *or* **www.ccarsnc.org**

Oct 8, 1400Z-1800Z, WØUK, Nowhere, KS. Douglas County Amateur Radio Club. Transmitting from Nowhere, KS. 20 m 146.760 tone 88.5. Certificate. Ken Blair, 1329 Kasold Dr D2, Lawrence, KS 66049. *DCARC invites you to find us on 20 m. Transmitting from Nowhere, KS, a stop along Midland Rail Road.* **www.w0uk.net**

Oct 8, 1400Z-2100Z, K5EPH, Murchison, TX. Athens Amateur Radio Club. Blackeye Pea Jamboree at the East Texas Arboretum and Botanical Society. 14.240 7.240. QSL. Sherry Nusko, PO Box 1641, Murchison, TX 75778. **www.athensarc.org**

Oct 8, 1500Z-2200Z, K9P, Trempealeau, WI. Riverland Amateur Radio Club (WI) & Winona Amateur Radio Club (MN). Trempealeau National Wildlife Center. 28.750 21.325 14.265 7.225. Certificate. Bob Seaquist, KC9IWE, 202 Zephyr Cir, La Crosse, WI 54601. **www.nwrweek-radio.info**

Oct 8, 1700Z-2359Z, NI6IW, San Diego, CA. USS *Midway* (CV-41) Museum Radio Operations Room. US Navy Birthday Established 1775. SSB 14.320 7.250 PSK31 14.070 D-STAR 012C 2 m 70 cm SOCAL rptrs. QSL. USS *Midway* Museum Radio Room, 910 N Harbor Dr, San Diego, CA 92101-5811. **kk6fz@arrl.net**

Oct 8-Oct 10, 0800Z-1000Z, N1D, Lewiston, ME. Androscoggin Amateur Radio Club. Dempsey Challenge. 80 through 10 m. Certificate. Androscoggin ARC, PO Box 1, Auburn, ME 04212.

Oct 9, 1400Z-1959Z, W8H, Marion, OH. Marion County ARES. Scout Pilgrimage and Wreath Laying to Commemorate the Birthday of Warren G. Harding, 29th President of the United States of America. 14.070 146.460 PSK 31 20 m only SSB CW 20 40 80 as bands dictate. QSL. W8H/KD8LAV, 4945 St James Rd, Waldo, OH 43356. *We will be QRT during the ceremony.*

Oct 9-Oct 17, 0000Z-2359Z, N8W, Seney, MI. Lake Effect Amateur Radio Club. National Wildlife Refuge Week 2011. 14.070 PSK31 14.225 7.180. QSL. Lake Effect ARC / NWR Week, 36 Southfork St, Marquette, MI 49855. *Details/changes* **www.lakeeffectarc.info/Event-NWRWeek/index.htm**

Oct 10-Oct 16, 0000Z-1800Z, N3AQC, Kittanning, PA. North American QRP CW Club. NAQCC 7th Anniversary. 14.060 10.120 7.040 3.060. Certificate & QSL. Tom Mitchell, WY3H, 210 Garretts Run Rd, Kittanning, PA 16201. **www.naqcc.info**

Oct 10-Oct 17, 1320Z-1320Z, W8F, Warren, OH. Trumbull County ARES. Warren Township Fire Department 75th Anniversary. 14.310 7.280. Certificate. Gail Wells, 708 Delaware Ave SW, Warren, OH 44485.

Oct 15, 1300Z-2100Z, WB8BSA, Milford, MI. Clinton Valley Scout Radio Club. Boy Scouts of America Ottawa District 4th Annual Unity Camporee and Jamboree On The Air. 14.290 14.060 7.190 7.030. QSL. Frank Maynard, NF8M, 44683 Mansfield Dr, Novi, MI 48375.

Oct 15, 1330Z-1730Z, NC4AR, Trinity, NC. Tri-County Amateur Radio Club. Car Show & Chili Cook-Off. 7.210 145.29 & 53.010 linked system. Certificate. NC4AR, PO Box 747, Trinity, NC 27370. **www.nc4ar.net**

Oct 15, 1400Z-2000Z, W5QX, San Angelo, TX. San Angelo Amateur Radio Club. SAARC 87th Anniversary Celebration. 14.230 7.230 146.940 pl 103.5. Certificate. W5QX, PO Box 4002, San Angelo, TX 76902. **www.w5qx.org**

Oct 15, 1500Z-2300Z, W5I, Denison, TX. David Booth. 121st Birthday of Dwight D. Eisenhower in Denison, TX. 14.250. QSL. David Booth, 409 Umstead, Colbert, OK 74733. **k5ym@yahoo.com**

Oct 15-Oct 29, 1600Z-1800Z, K4FAU, Boca Raton, FL. Florida Atlantic University Amateur Radio Club. Grand Opening of FAU Football Stadium, 50 Year Anniversary of FAU. 14.340 14.240 146.820 (110.9 PL) 444.925 (110.9 PL). Certificate. Florida Atlantic University, Attn: Hank Van Sant, Bldg 96, Rm 205, Boca Raton, FL 33431. **www.k4fau.org**

Oct 17-Oct 23, 1200Z-2359Z, W4BUC, Johnson City, TN. University Amateur Radio Club. East Tennessee State University 100 Year Anniversary Celebration. 28.450 21.310 21.135 14.255. Certificate & QSL via bureau or direct to University Amateur Radio Club, Box 70552 East TN State Univ, Elizabethton, TN 37643. *Active during School Club Roundup and Oct portion of the EME contest. Phone, CW, digital modes; attempting first moonbounce contact. Many guest student operators.* **lmcraig_6115@yahoo.com**

Oct 19-Oct 24, 1700Z-0400Z, WB8PPH, Circleville, OH. Pickaway County ARES. 105th Annual Circleville Pumpkin Show Special Event Station. 28.425 14.235 7.183 3.850. Certificate. Roy Ulko, 132 W Main St, Circleville, OH 43113.

Maty Weinberg, KB1EIB ♦ Special Events ♦ events@arrl.org

Oct 21-Oct 22, 1400Z-2200Z, W4Z, Virginia Beach, VA. US Coast Guard Auxiliary D5-SR. US Coast Guard Auxiliary 72nd Anniversary. 21.310 14.310 7.210. QSL. Robert Dunnington, KI4VCT, 1200 Atlantic Ave, Virginia Beach, VA 23451. **qrz.com/db/W4Z**

Oct 21-Oct 23, 2200Z-2200Z, N4Q, Lexington, NC. KG4ZOI. 28th Annual Lexington NC Barbeque Festival. 14.275 7.200 3.875. QSL. KG4ZOI, 105 Azalea Ct, Mebane, NC 27302.

Oct 22, 1200Z-2100Z, W2K, New York, NY. CG Auxiliary Flotilla 014-05-11. Coast Guard Auxiliary Special Event. 28.400 14.260 7.260. QSL. John Kiernan, KE2UN, 110 Cabrini Blvd Apt A, New York, NY 10033.

Oct 22, 1400Z-2200Z, N1A, Fairhaven, MA. Auxiliary Flotilla 65. 72nd Anniversary of USCG Auxiliary. 21.340 18.140 14.240. QSL. Paul G. Sadeck, 90 Doctor Braley Rd, East Freetown, MA 02717.

Oct 22, 1400Z-2200Z, K8E, Jacksboro, TN. US Coast Guard Auxiliary District 8E. USCG Aux 72nd Anniversary. 14.340 7.250. QSL. KF4PDH, 393 Clover Cir, Jacksboro, TN 37757. *Conditions permitting, Cumberland Gap National Park at "Pinnacle," 100 W; Stamp only for QSL card.*

Oct 22, 1400Z-2200Z, K3G, Media, PA. US Coast Guard Auxiliary District 5 NR. US Coast Guard Auxiliary 72nd Anniversary. 28.485 21.400 14.320 7.270. QSL. Daniel F. Amoroso, 196 Dam View Dr, Media, PA 19063. **a0530407. uscgaux.info/2011SED.htm**

Oct 22, 1400Z-2200Z, K5G, Sanger (Lake Ray Roberts), TX. Flotilla 10-3. Commemorating USCG Auxiliary 72nd Anniversary 28.460 21.350 14.260 7.260. Certificate & QSL. NQ5X, 2524 Craig Ln, Denton, TX 76209.

Oct 22, 1400Z-2200Z, W4D, Virginia Beach, VA. US Coast Guard Auxiliary D5-SR. US Coast Guard Auxiliary 72nd Anniversary. 14.070 7.035. QSL. Richard D. Dunnington, W4RDD, 1200 Atlantic Ave, Virginia Beach, VA 23451. **www.qrz.com/db/W4D**

Oct 22, 1400Z-2300Z, K2G, Babylon, NY. USCG Aux District 1 SR. 72nd Anniversary USCG Auxiliary. 14.278 7.258. QSL. KA2HHO, PO Box 92, Babylon, NY 11702. *QRV from one of the US Coast Guard Stations on Long Island*. **ka2hho@arrl.net**

Oct 22, 1400Z-2300Z, N5O, Kenner, LA. USCG Auxiliary Flotilla 081-04-05. 72nd Anniversary of USCG Auxiliary. 14.240. QSL. Albert Dupont, 448 Hooper Dr, Kenner, LA 70065. *New Orleans, LA, US Coast Guard Auxiliary District 8-CR Division 4.* **flotilla45@gmail.com**

Oct 22-Oct 23, 1400Z-2100Z, NB9QV, Manitowoc, WI. USS *Cobia* Amateur Radio Club. Commemorating the 52 subs lost in WWII. 14.240 7.240. Certificate & QSL. QSL: Fred Neuenfeldt, W6BSF, 4932 S 10th St, Manitowoc, WI 54220, Certificate: Vernon T. McNulty, KØEFV, 4015 Independence Ave, Waterloo, IA 50703. *QSL: SASE W6BSF; Certificate: $1 to KØEFV.* **www.qrz.com/NB9QV**

Oct 29-Oct 30, 1530Z-1900Z, WW7RC, Seattle, WA. King & Kitsap County Chapters of the American Red Cross. Rededication of the King & Kitsap County American Red Cross Radio Room. 28.420 21.300 14.240 7.230. QSL. ARC Communications Team, Attn: Kevin Koop, PO Box 3097, Seattle, WA 98114. *Will be moving frequencies during the event as band conditions change or due to crowding. Send card and a SASE with $1 in the USA/Canada or one IRC.* **www.seattleredcross.org**

Oct 29, 1400Z-2200Z, W4TCH, Tampa, FL. Bay Area Emergency Amateur Radio Service. Breast Cancer Awareness Month. 14.260 14.240. QSL. Robert Rathbone, PO Box 290384, Tampa, FL 33687. *If breast cancer has touched your family or someone you know contact us to show support.* **www.w4tch.net**

Certificates and QSL cards: To obtain a certificate from any of the special-event stations offering them, send your QSO information along with a 9×12 inch self-addressed, stamped envelope to the address listed in the announcement. To receive a special event QSL card (when offered), be sure to include a self-addressed, stamped business envelope along with your QSL card and QSO information. *Note: Some clubs may ask for a nominal fee to cover the cost of the certificate or QSL. Request will be made on air during the event or on the club's Web site.

Special Events Announcements: For items to be listed in this column, use the ARRL Special Events Listing Form at **www.arrl.org/special-events-application**. A plain text version of the form is available at that site. You may also request a copy by mail or e-mail. Off-line completed forms can be mailed, faxed (Attn: Special Events) or e-mailed.

Submissions must be received by ARRL HQ no later than the 1st of the second month preceding the publication date; a special event listing for **Dec** *QST* would have to be received by **Oct 1**. In addition to being listed in *QST*, your event will be listed on the ARRL Web Special Event page. Note: All received events are acknowledged. If you do not receive an acknowledgement within a few days, please contact us.

Special Events listed in this issue include current events received through August 10. You can view all received Special Events at **www.arrl.org/special-event-stations**. QST

Sean's Picks

Contest Manager Sean Kutzko, KX9X

All dates/times are in UTC.

- **State QSO parties this month:** Arizona, California, Illinois, Iowa, New York, Pennsylvania
- **QRP Contests this month:** ARS Spartan Sprint (Oct 4), NAQCC Monthly QRP Sprint (Oct 12), QRP ARCI Fall QSO Party (Oct 15-16), Flying Pigs Run For The Bacon (Oct 17)
- **PSK Rumble — The Fall Classic (Oct 1):** 24 hours of PSK digital contesting, sponsored by the Troy Amateur Radio Association. Work 'em fast and use those macros! Single Op categories broken into 5 W, 20 W or 100 W.
- **Oceania DX Contest (Phone: Oct 1-2 CW: Oct 8-9):** Point the antenna west and listen for loud signals from VK, ZL and all points around the Pacific.
- **North American RTTY Sprint (Oct 9):** 4 hours of heavy-duty RTTY action. This one is growing fast in popularity, and there's a need for some of the rarer states to get on the air. Give this one a try; it's a blast and doesn't take up much time.
- **ARRL EME Contest, 50-1296 MHz (Round 1: Oct 22-23):** Think you can't work moon-bounce? Think again; stations with as little as 50 W and a decent Yagi can work off the moon! For a great "how-to," visit Gabriel, EA6VQ's page at **www.vhfdx.info/eme.html**.
- **W/VE Islands QSO Party (Oct 22-23):** Portable operations from hundreds of islands within the borders of the US and Canada is the name of the game. How many can you work? Can you activate one yourself? Visit **www.usislands.org** for a complete list.
- **CQ WW DX Contest — SSB (Oct 29-30):** The biggest competitive Amateur Radio event on the planet. Even if you're a casual operator, there will be more DX on the bands this weekend than any other. "WW" traditionally signals the beginning of the contest season. Do not miss it.

In the September/October "Contesting 101"

NCJ

"Basic Troubleshooting & Technical Skills." Kirk, K4RO, introduces ops to some things to do when things go wrong in the heat of battle. Contesting 101 can be found in the *National Contest Journal*, published six times per year. For subscription information, visit **www.arrl.org/ncj**.

October 2011 W1AW Qualifying Runs

W1AW Qualifying Runs are 10 PM EDT Monday, October 3 (0200Z October 4) and 4 PM EDT (2000Z) Wednesday, October 19. The West Coast Qualifying Run will be transmitted by station K9JM on 3590 and 7047.5 kHz at 9 PM PDT Wednesday, October 12 (0400 October 13)(40-10 WPM). Unless indicated otherwise, speeds are from 10-35 WPM.

Strays

W1ACB, IN HONOR OF WWII RADIO OPS

◊ For more about a station dedicated to the men and women radio operators of World War II, see **mysite.verizon.net/vzezpglp/**. We operate mostly on the 20, 40 and 80 meter bands. QRP stations can listen for us on 7045 and 14,045 kHz and down CW. — *Paul Wipperman, W1ACB*

I would like to get in touch with...

◊ someone who can repair my RACAL RA-17C12 receiver. — *Rick Sitz, 5210 14th St W, #57, Bradenton, FL 34207*

◊ anyone with a Motorola service manual for a VHF 136-174 MHz, 100 W Spectra mobile radio. — *Rich Ballieu, WBØTML, PO Box 630, Sioux Falls, SD 57101*

K2TQN

VINTAGE RADIO

The National NC-400 Receiver

"The NC-400 might well be described as 'the receiver for the man who wants everything.' As befits a new entry into the high-priced receiver market, it offers just about everything anyone could want in the way of communications receiver features, either as standard equipment or as extra-cost accessories. Here is a list of options open to anyone who can afford them: diversity modification kit, crystal-controlled fixed channels, plug-in crystal calibrator with 100-kc. and 1000-kc. crystals, plug-in mechanical filter (to replace the crystal filter that is standard equipment), and crystal-controlled b.f.o."

So started the "Recent Equipment" review by Edward Tilton, W1HDQ, in the February 1960 *QST*.[1]

This front view of the NC-400 was more familiar to FBI agents than 1960s hams who were put off by its $895 price tag. That's $6590 today.

I had been a ham for about 4 years around then, nearly out of high school and looking for my first real full-time job. This receiver, then listing at $895, was so far out of my league I didn't even consider it. I was saving up to buy a new Volkswagen anyway (about $1600 then), so I could commute to my job. But I do remember reading the ads and seeing them listed in the ham catalogs. I had a Hallicrafters SX-100 receiver and that was plenty good enough.

Tilton's review goes on, "Even without any of these things, the NC-400 is a deluxe model general coverage job for 540-kc. to 31-mc. There are seven positions on the bandswitch, and calibrated bandspread ranges for the 80-, 40-, 20-, 15-, and 10-meter bands. All the usual communications receiver features are provided, plus some not-so-usual ones."

Weighing 80 pounds in the cabinet, it is solidly built. The 18 tube complement consisted of two 6BZ6, four 6BE6, three 6BA6, two 6AL5 and one 6BZ7, 6U8, 12AT7, 6AQ5, 5U4GB rectifier and 4H4C and 0B2 regulators.

Over the ensuing years I never ran across anyone who had one of these and never saw one in person at any hamfests or vintage swap meets. This receiver had become a distant memory for me.

Then, as luck would have it, two friends responding to an ad for a storage locker sale telephoned me one afternoon. They told me there were a couple of National receivers for sale, which they thought were brand new because they were in the original boxes. If I was interested in them I would have to come right away and bring cash for the seller. They told me the model numbers and the "NC-400" jogged my memory. Since I never had one, I thought I should go and make the deal. About 2 hours later I was on my way home with the radios, a National NC-190 and the NC-400, both with matching speakers.

The story attached to the radios was discovered as I went through the papers that were in the boxes. They had belonged to the seller's bachelor brother who purchased them new when he was a short-wave listener, used them for a while, then put them back in the boxes where they were stored ever since. Later he had become a ham, but I assume he had newer radios by then and never used the Nationals again. He had become a Silent Key and the remnants of his ham shack had been disposed of earlier, his home sold, and these were what was left.

Upon opening the boxes containing the NC-400 and the matching speaker, I realized this was a quality radio, guessing that it was one of National's last attempts at manufacturing a high-end tube-based receiver.

During this general time frame Collins had competing high-end 75A4 and 51J4 receivers, and Hammarlund had the SP-600 and the Pro-310 series receivers. But at half the price of a new car, ham customers were few for the National NC-400.

It was November and cold weather was coming, so I stored them away, waiting for spring and warmer weather to decide what I would do with them. Meanwhile two magazines came out at the same time with excellent in-depth articles on the NC-400. One was by Ray Osterwald, NØDMS, in *Electric Radio* (**www.ermag.com**).[2] The

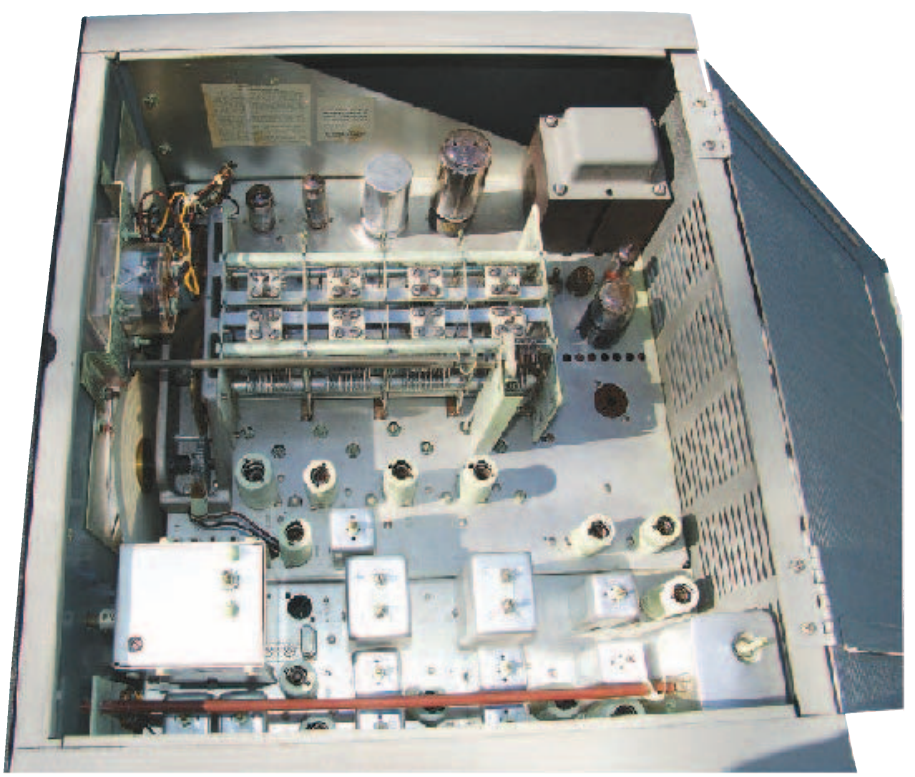
[1]E. Tilton, W1HDQ, "Recent Equipment," *QST*, Feb 1960, pp 44-46.

[2]R. Osterwald, NØDMS, "The National NC-400 Communications Receiver, Part 1 and 2," *Electric Radio*, Feb 2011, p 32 and Mar 2011, p 34.

John Dilks, K2TQN ♦ 125 Wharf Rd, Egg Harbor Township, NJ 08234-8501 ♦ k2tqn@arrl.org

Because this is a rare speaker I'm showing the interior to help you identify one if you need to.

Upon opening the boxes containing the NC-400 and the matching speaker, I realized this was a quality radio, guessing that it was one of National's last attempts at manufacturing a high-end tube-based receiver.



A peek inside at the spotless interior of this "like-new" '60s vintage receiver.

other was by Barry Williams, KD5VC, in the Antique Wireless Association's *AWA Journal* (**www.antiquewireless.org**).[3]

These hams are far more technical than I am and I would recommend to anyone wanting more detailed information to read these articles. In particular, Ray Osterwald makes some recommendations that may help someone restore their radio.

Overall what I learned was that National didn't make very many of these receivers, with several "guess" counts ranging from as few as 500 to perhaps a couple of thousand. The customers were a few well-to-do hams buying perhaps a couple of hundred and the rest went to government agencies, the FBI being mentioned as the major procurer for their field offices. Internet searches turned up a few results where hams picked up old FBI receivers through government surplus channels.

MARY DAY LEE

Last month I asked my friend James O'Neal, AG4DH, to write a story he had researched earlier on Mary Day Lee. He had done such an excellent job that I wanted to share it with you. It was a natural continuation of the July and August "Vintage Radio" columns about Lloyd Espenschied.[4,5] I regret not introducing him to you then, but his story needed that extra space. Mary Day Lee's boys went on to help found the Junior Wireless Club, which later became the (now 100 year old) Radio Club of America. She deserves the recognition.

A SUMMER TRAVELING

I spent June and July traveling and making presentations, first to the Ham-Com National Hamfest in Plano, Texas (**www.hamcom.org**), then a 19 day trip to the Michigan Antique Radio Club "Extravaganza," a 3 day collector meet in Lansing (**www.michiganantiqueradio.org**) and then on to the hamfest at Glacier National Park in Montana (**www.gwhamfest.org**). This was the second summer I had off from work since my first summer job on the Atlantic City Beach Patrol in 1958. I figured I better do it while I am still able.

I really enjoyed meeting so many of my readers who told me the Vintage Radio column is the first one they read when *QST* arrives. I am hoping to travel to a few distant hamfests again next summer and I am open to suggestions. — *K2TQN*

Photos by J. Dilks, K2TQN

[3]B. Williams, KD5VC, "The Communications Receiver," *AWA Journal*, April 2011, pp 38-41.
[4]J. Dilks, K2TQN, "Amateur Telegraph Stations," *QST*, Jul 2011, pp 93-94.
[5]J. Dilks, K2TQN, "Radio Amateur Days in Brooklyn," *QST*, Aug 2011, pp 90-91. QST

W1GHZ

MICROWAVELENGTHS

Circular Polarization

Circular polarization (CP) is one of those terms that most hams have heard but few really understand. I hope this discussion will clarify the concept rather than add further confusion.

Most antennas radiate linear polarization and most communication antennas use either horizontal or vertical linear polarization. Only a few types, like the helical antenna, have inherent circular polarization. Polarization is defined as the plane in which the electric field, the E-field, varies. For example, a vertically-polarized antenna, like a vertical dipole, has a vertical electric field that varies sinusoidally at the RF frequency. At one instant, it might be positive at the top and negative at the bottom; half a cycle later, it would reverse direction, to be positive at the bottom. In between, a quarter-cycle from the peaks, it would instantaneously pass through zero. The radiated wave created by this field is traveling at the speed of light, so that by the time the cycle is complete, the first peak has traveled 1 wavelength. If you could see the radiated wave, it would look like the vertically polarized RF in Figure 1.

Horizontal polarization is similar, but in the horizontal plane as shown by the horizontally polarized RF in Figure 1. For good communications, antennas at both ends must have similar polarization; if they are mismatched, a loss is incurred proportional to the sine of the angle between the polarizations. At 90°, they are cross-polarized and the loss is very high — infinite in theory, 20 dB or more with real antennas.

For circular polarization, the polarization is not stationary, but rather rotates at the same RF frequency. The polarization vector, indicating the direction of the electric field, rotates 360° for each cycle of RF frequency. In free space, traveling at the speed of light, it also propagates 1 wavelength in this amount of time. We might visualize the positive end of the vector as travelling along a corkscrew. Circular polarization is characterized by the direction of travel — right-hand (RHCP) or left-hand (LHCP), like the threads on a machine screw. See Figure 2.

To generate circular polarization with linearly polarized antennas, we must add a second radiator polarized at right angles to the first. For example, the horizontally polarized wave in Figure 1 is at a right angle (perpendicular) to the vertically polarized wave in Figure 1. If we simply combine the two, the result would be linear, at 45° polarization, halfway between the two. For circular polarization, we must excite one linear polarization radiator a quarter cycle (electrical 90°) later than the other, so that the electric field of the second radiator reaches a peak as the first passes through zero and vice versa. Thus, the positive end of the electric field travels in a circle rather than just reversing along a line.

Note that we use degrees for both polarization angle and electrical phase shift, which can add confusion. I'll try to keep the difference clear.

One way to excite the second radiator a quarter-cycle later is to add a delay, which produces a phase shift. Choosing which

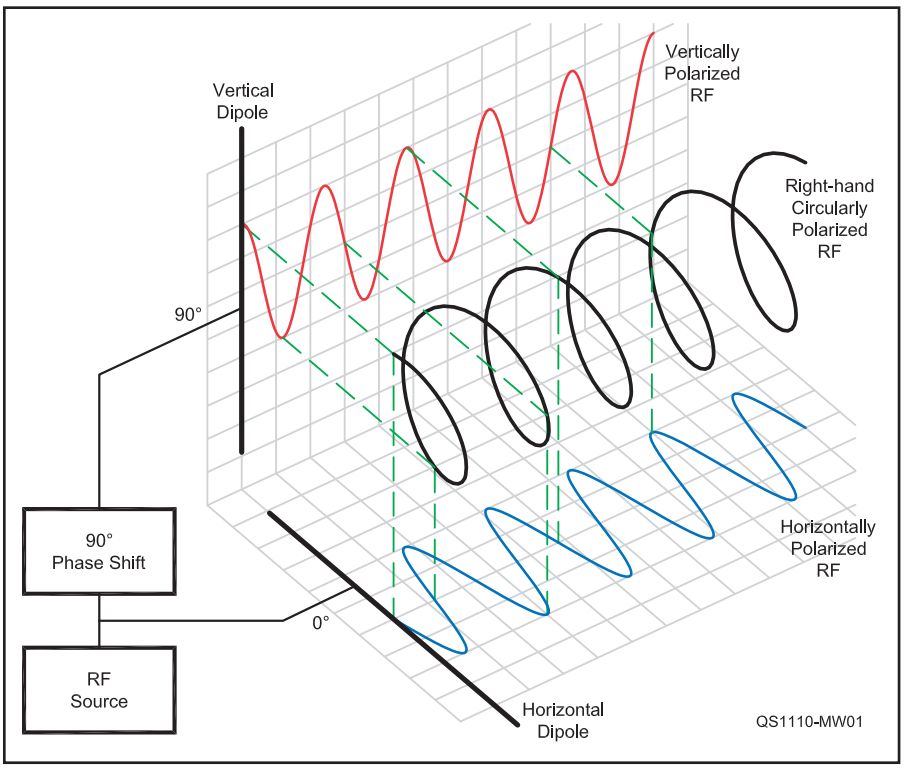


Figure 1 — When a horizontal and a vertical dipole are mounted at right angles and fed with two signals having a 90° phase difference, the vector sum of the two signals combines into one circularly polarized signal. The green lines represent how the horizontal and vertical signals sum together over the cycle to generate a circular signal.

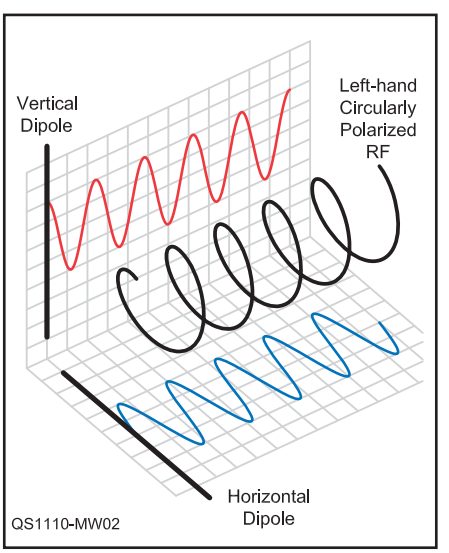


Figure 2 — Left-hand circular polarization — like a left-hand screw thread.

Paul Wade, W1GHZ ♦ 161 Center Rd, Shirley, MA 01464 ♦ w1ghz@arrl.org

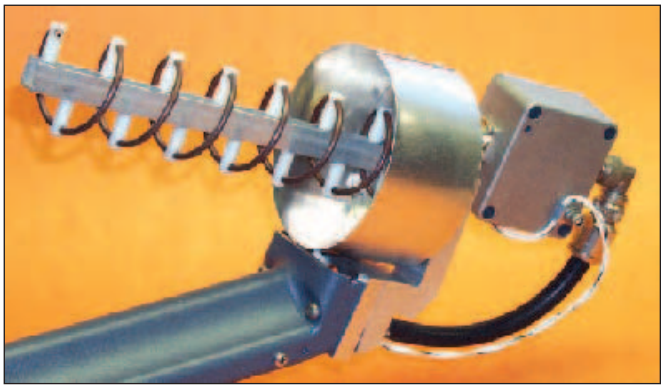


Figure 3 — Helical antenna

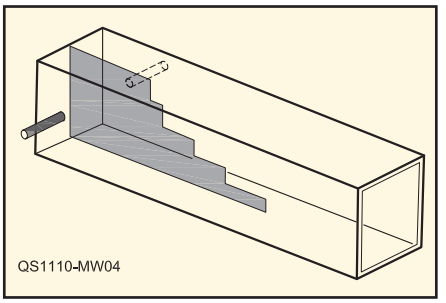


Figure 4 — Septum polarizer in square waveguide

linear polarization is delayed controls the direction of circular rotation. A quarter-wave of transmission line will produce the desired electrical 90° phase shift. Another common method for producing the delay is the use of a 90° hybrid coupler — a directional coupler — with two outputs of equal amplitude but 90° phase difference.[1]

In waveguide, a thin dielectric sheet or card will delay energy polarized parallel to the plane of the sheet, but not perpendicularly polarized energy; the length of the sheet may be chosen to provide a quarter-wavelength of delay. A circular waveguide linearly excited at a 45° angle to a dielectric card with ¼ λ delay will generate circular polarization. The 45° excitation is mathematically equivalent to two orthogonal polarization components, but only the component parallel to the dielectric is delayed. The dielectric may be a material, like Teflon, or an artificial dielectric, for instance, a row of screws in the waveguide, adjusted to provide the desired delay for circular polarization. A tapered septum in the center of a waveguide can also generate circular polarization.[2]

No matter how the circular polarization is generated, the essential concept is that the polarization vector, the direction of the electric field, rotates 360º for each cycle of RF frequency. In free space, traveling at the speed of light, it also propagates 1 wavelength in this amount of time.

The same antenna that generates circular polarization receives the same polarization, RHCP or LHCP. An antenna for the opposite sense would be cross-polarized and suffer the same loss as linear cross-polarized antennas. For example, a signal transmitted from a RHCP antenna will be highly attenuated at a receiver connected to a LHCP antenna.

Why Use Circular Polarization?

Circular polarization is more useful for space communications and for EME operation than for terrestrial communication. As a satellite orbits the earth, its orientation changes as seen by an observer, so it would be difficult to keep a linearly polarized antenna on the ground aligned with the satellite — misaligned polarization causes a severe loss of signal.

EME stations are often on different continents, viewing the moon at different angles, so aligning the antennas at the two ends to the same polarization becomes a problem in 3D geometry. With circular polarization, alignment doesn't matter, so signal strength is more constant. Even for geostationary satellites, circular polarization is used so installers don't have to consider polarization alignment. Some TV satellites also broadcast in both RHCP and LHCP, providing twice as many channels in the same bandwidth — the receiving antenna attenuates the undesired polarization enough that there is no interference.

Another feature of circular polarization is that the sense (RHCP or LHCP) of the polarization is reversed by reflection from a surface, so that RHCP becomes LHCP and vice versa. EME communication also takes advantage of this, with the reflection from the moon reversing the polarization, allowing transmission in one sense and reception in the other. Many dish feed horns have separate coaxial ports for the two senses, thus providing separate transmit and receive connections. As long as all stations transmit the same sense and receive the other, everything works.

Most terrestrial communications uses linear polarization; a station using circular polarization could receive both horizontal and vertical polarization, but would suffer a 3 dB penalty for either. Some broadcast stations use CP so that polarization at the receiver does not matter.

Practical CP Antennas

Only a few antennas, like the helix in Figure 3, naturally generate circular polarization. The polarization sense cannot be reversed for a helix — it is thus fixed by the winding direction. It is not useful for EME work, but is popular for satellite communications.[3]

Most CP antennas require two linear polarizations as described above. At VHF and UHF, crossed Yagis, with both horizontal and vertical elements, are often used for CP. The 90° phase shift can be provided by a quarter-wave long piece of coax, with relays to switch polarization or by a hybrid coupler providing RHCP and LHCP at separate ports.

At microwave frequencies, large dish antennas are used for EME. Circular polarization is generated by the feed antenna — perpendicular dipoles for the lower bands and waveguide feed horns for the higher bands. The waveguide may be excited by perpendicular probes and a 90° hybrid coupler or by a polarizer. The septum feed shown in Figure 4 was popularized by Zdenek Samek, OK1DFC, and provides excellent performance.

MICROWAVE UPDATE 2011

For the latest in microwaves, you should attend Microwave Update 2011 in Enfield, Connecticut, October 13-16. This is the premier amateur microwave conference, and this year it will be held in conjunction with the Eastern VHF/UHF Conference on October 15, so everything from VHF and up will be covered. Go to **www.microwaveupdate.org** for details.

[1]P. Wade, W1GHZ, "Microwavelengths," *QST*, Jan 2007, pp 87-88.

[2]Refer to **www.ok1dfc.com** and select the EME link for a description of the septum polarizer.

[3]For more information, see "Helical Antenna Basics," D. Straw, N6BV, Ed., *The ARRL Antenna Book* (Newington: 2007), pp 19-6 – 19-9. Available from your ARRL dealer or from the ARRL Store, ARRL order no. 9876. Telephone toll-free in the US 888-277-5289, or 860-594-0355, fax 860-594-0303; **www.arrl.org/shop/**; **pubsales@arrl.org**.

CONVENTION AND HAMFEST CALENDAR

Abbreviations
Spr = Sponsor
TI = Talk-in frequency
Adm = Admission

Alabama (Gadsden) — Sep 17 D F H R T V
8 AM. *Spr:* Gadsden ARC. Etowah County Fairgrounds, 71 Veterans Way (302 Griffin St for GPS use). *TI:* 147.16 (100 Hz). *Adm:* Free. Tables: Free. Travis Cox, W4TPU, Box 113, Walnut Grove, AL 35990; 256-490-3468; fax 205-589-6276; **travis@hopper.net**; **www.garc.org**.

Alabama (Helena) — Oct 15 D F H R S T V
9 AM-1 PM. *Spr:* Shelby County ARC. Helena Amphitheater, 4151 Helena Rd. *TI:* 146.98. *Adm:* $2. Tables: Bring your own. Jim Niven, KI4BRE, Box 572, Columbiana, AL 35051; 205-260-6477; **jwniven@aol.com**; **www.w4shl.com**.

Arizona (Tucson) — Oct 22 D F H R V
7 AM-noon. *Spr:* Old Pueblo RC. Kino Community Center, 2805 E Ajo Way. *TI:* 147.3 (110.9 Hz). *Adm:* public free; vendors $5. Ronald Kalish, N7SPW, 5402 E 8th St, Tucson, AZ 85711; 520-207-3852; **n7spw@arrl.net**; **www.oprc.org**.

PACIFIC DIVISION CONVENTION

October 14-16, Santa Clara, California
D F H R S V

The Pacific Division Convention (Pacificon 2011), sponsored by the Mount Diablo ARC, will be held at the Marriott Santa Clara Hotel, 2700 Mission College Blvd. Doors are open all day Friday and Saturday through Sunday mid-afternoon. Features include a full slate of outstanding forum presentations about a wide range of Amateur Radio related topics; large exhibit hall filled with exciting products and the latest ham radio equipment; Antenna Seminar (all day Friday, $15; must be purchased in advance); opening breakfast buffet with keynote speaker Gordon West, WB6NOA (Saturday, 6:45 AM; $18); series of Amateur Television demonstrations; Saturday evening banquet with special guest speaker Joe Taylor, K1JT ($45); VE sessions (Saturday and Sunday 9 AM-noon, $15); one day Technician class (Saturday, 8 AM-4 PM); great QRP and HF Pack activities; outdoor swapmeets (Saturday and Sunday mornings); the Boy Scout Jamboree-On-The-Air; fun and informative T-hunts; special Youth forums and activities; Wouff Hong ceremony; handicapped accessible. Talk-in on 147.06 (100 Hz). Admission is $20 in advance, $25 at the door (good all 3 days). For exhibitor tables and booths see web site. Contact John Ronan, K3ZJJ, c/o Pacificon 2011, Box 5514, Concord, CA 94524-0514; 925-288-1730 or 510-649-9045; **jtronan@aol.com** or **pacificoninfo@pacificon.org**; **www.pacificon.org**.

MICROWAVE UPDATE CONVENTION

October 13-16, Enfield, Connecticut
D F H R S T

The Microwave Update Convention, co-sponsored by the North East Weak Signal Group and the Eastern VHF/UHF Society, will be held at the Holiday Inn (formerly the Crowne Plaza), 1 Bright Meadow Blvd. Doors are open Thursday for observatory tour in the morning and ARRL tour in the afternoon, hospitality suite (6-11 PM); Friday and Saturday 8 AM-11 PM, Sunday 8 AM-noon (outdoor flea market in rear parking lot). Features include indoor swap, vendor displays, technical programs and presentations, speakers, auctions, Measurement Lab sponsored by Rohde and Schwarz, banquet (Saturday eve), handicapped accessible. Registration is $79 in advance (by Oct 5), $89 at the door. Tables are free for attendees and invited vendors. Contact Paul Wade, W1GHZ, Box 35, Cabot, VT 05647; 978-967-1607; **w1ghz@arrl.net**; **www.microwaveupdate.org**.

Connecticut (Gales Ferry) — Oct 29
8 AM-3 PM. *Spr:* Tri City ARC. Gales Ferry Fire Station, 1772 Rte 12. Auction. *TI:* 146.97 (156.7 Hz). *Adm:* $2. Darryl Del Grosso, WA1DD, 13 Linda Ave, Waterford, CT 06385; 860-443-7799; **ddelgrosso@sbcglobal.net**.

Florida (Delray Beach) — Nov 5
D F H Q R S T V
8 AM-1 PM. *Spr:* Boca Raton ARA. South County Civic Center, 16700 Jog Rd. *TI:* 145.29 (110.9 Hz). *Adm:* $3. Tables: advance $10, door $15. Walt Dreyfus, W4WCD, 21512 Woodchuck Ln, Boca Raton, FL 33428; 954-481-5327; **w4wcd@arrl.net**; **www.southfloridahamfest.org**.

Florida (Punta Gorda) — Sep 24 F H R T
8 AM-2 PM. *Spr:* Peace River Radio Assn. Tropical Gulf Acres Club House, 28245 Pasadena Dr. *TI:* 147.255 (136.5 Hz). *Adm:* $3. Tables: $5. Tom Lambie, N4XJQ, Box 510943, Punta Gorda, FL 33951; 941-661-2547; **n4xjq@comcast.net**; **www.w4dux.net**.

Georgia (Rome) — Oct 15 D F H R T V
8 AM-2 PM. *Spr:* Northwest Georgia ARC. Rome Senior Center, 406 Riverside Parkway NW. Al Brock Memorial Hamfest/Tailgate. *TI:* 146.94 (88.5 Hz). *Adm:* Free. Tables: Bring your own. Grover Keith, KA5QFI, 13 Fallow Dr NW, Rome, GA 30165; 706-766-1118; **gfkeith@comcast.net**; **w4vo.org**.

Hawaii (Kamuela/Waimea) — Oct 22
F H Q R T V
10 AM-3 PM. *Spr:* Big Island ARC. Waimea Community Center, 65-1260 Kawaihae Rd. *TI:* 147.16 (100 Hz). *Adm:* Free. Tables: Free. John Buck, KH7T, Box 489; Kamuela, HI 96743; 808-885-9718; **kh7t@arrl.net**; **www.arrl.org/sections/view/pacific-section**.

IOWA STATE CONVENTION

October 22, Sergeant Bluff
D F H Q R S V

The Iowa State Convention (Hamboree 2011, 34th Annual Event), co-sponsored by the 3900 Club and the Siouxland ARA, will be held at the Sergeant Bluff Community Center, 903 Topaz Dr. Doors are open for setup on Friday; public Saturday 8 AM-2 PM. Features include flea market; commercial and individual vendors; quality forums and seminars featuring special guest speakers, including Harold Kramer, WJ1B, ARRL COO; QSL card checking; VE sessions; fully handicapped facility; refreshments. Talk-in on 146.91. Admission is $5. Tables are $10. Contact Bob Molstad, WØPOD, Box 3746, Sioux City, IA 51102-3746; 712-490-2705; fax 712-255-6434; **bmolstad@cableone.net**; **www.3900club.com**.

IOWA SECTION CONVENTION

November 6, Davenport
D F H R S

The Iowa Section Convention (40th Annual Hamfest/Computer Show**)**, sponsored by the Davenport RAC, will be held at the Clarion Hotel (formerly the Davenport Holiday Inn), 5202 N Brady St. Doors are open for setup Saturday noon-5 PM, Sunday 6 AM; public 8 AM-2 PM. Features include commercial vendor displays; computer systems, hardware and software; fast scan Amateur TV demonstration; special guest from ARRL HQ Zack Lau, W1VT, Senior Laboratory Engineer. Talk-in on 146.88 (192.8 Hz), 146.94. Admission is $6

Coming ARRL Conventions

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*

October 13-16
Microwave Update, Enfield, CT

October 14-16
Pacific Division, Santa Clara, CA

October 21-22
West Gulf Division, Ardmore, OK

October 22
Iowa State, Sergeant Bluff

November 5-6
Georgia Section, Lawrenceville

November 6
Iowa Section, Davenport

November 19-20
Indiana State, Fort Wayne

December 3-4
West Central Florida Section, Palmetto

*See September *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

in advance, $7 at the door (under 12 free). Tables are $12. Contact John Hoenshell, NØBFJ, 2331 N Linwood Ave, Davenport, IA 52804; 563-326-4985; **n0bfj@arrl.net**; **www.arcsupport.com/drac/hamfest.html**.

Kansas (Olathe) — Oct 28-29 D F R S T V
Friday 5 PM-Saturday 1 PM. *Sprs:* Johnson County RAC and JOCO ARES. Ensor Museum and Farmsite, 18995 W 183rd St. Auction/Tailgate and Special Event. *TI:* 147.315 (88.5 Hz). *Adm:* Free. Tables: Free. Brian Short, KCØBS, 12170 S Prairie Creek Pkwy, Olathe, KS 66061; 913-638-7373; fax 913-712-8359; **kc0bs@arrl.net**; **www.w0erh.org**.

Kentucky (Hazard) — Oct 29 D F H R S V
8 AM-1 PM. *Spr:* Kentucky Mountains ARC. Hazard/Perry County Senior Center, 354 Perry Park Rd. *TI:* 146.67 (103.5 Hz). *Adm:* $5. Tables: $5. John Farler, K4AVX, 1264 Hall Mountain Rd, Viper, KY 41774; 606-476-9662; **k4avx@arrl.net**; **kmarc.net**.

Louisiana (Pineville) — Oct 8 D F H R S T V
8 AM-1 PM. *Spr:* ARC of Central Louisiana. Kees Park, 2450 Hwy 28 E. *TI:* 147.33 (173.8 Hz). *Adm:* Free. Tables: $10. Scott Wren, KD5DFL, 70 Rainbow Dr, Pineville, LA 71360; 318-484-6744; **kd5dfl@hotmail.com**; **www.arccla.us**.

Maryland (Westminster) — Oct 23
D F H R S T
8 AM-1 PM. *Spr:* Carroll County ARC. Carroll County Agriculture Center, 706 Agriculture Center Dr. 21st Annual Mason-Dixon Hamfest. *TI:* 145.41 (114.8 Hz). *Adm:* $5. Tables: $15. Steve Beckman, N3SB, 2145 Bethel Rd, Finksburg, MD 21048; 410-876-1482; **n3sb@qis.net**; **qis.net/~k3pzn**.

Massachusetts (Cambridge) — Oct 16.
Nick Altenbernd, KA1MQX, 617-253-3776; **w1gsl@mit.edu**; **www.swapfest.us**.

Michigan (Kalamazoo) — Oct 16
D F H Q R S T V
8 AM-noon. *Sprs:* Kalamazoo ARC and Southwest Michigan AR Team. Kalamazoo County Fairgrounds, 2900 Lake St. *TI:* 147.04 (94.8 Hz). *Adm:* advance $5, door $6. Tables: $12 (8-ft, without electricity); $20 (with electricity); trunk sales $5 per space. Murray Cooper, W8UNF, Box 33, Richland, MI 49083; 269-377-3867; **murraycooper3@earthlink.net**; **www.KalamazooHamFest.com**.

Michigan (Sterling Heights) — Oct 23
D F H R V
8 AM-1 PM. *Spr:* Utica Shelby Emergency Communication Assn. American Polish Century Club, 33204 Maple Ln. 26th Annual Hamfest. *TI:* 147.18 (100 Hz). *Adm:* $5. Tables: $12 (plus admission). Larry Boggs, WB8SJD, 24330 Valley Ave, Eastpointe, MI 48021; 586-873-9198; **wb8sjd@arrl.net**; **www.usecaarc.com**.

Missouri (Bismarck) — Oct 1 F R T V
7 AM-noon. *Spr:* Eastern Ozarks ARC. Iron Mountain Lake Ladies Auxiliary, 591 N Lakeshore. *TI:* 147.03 (100 Hz). *Adm:* $2. Tables: $10. Arthur Jones, KE5JLB, 1228 E Lakeshore, Bismarck, MO 63624; 573-915-4116; **ke5jlb@gmail.com**; **www.k0eor.org**.

Missouri (Kirkwood) — Oct 29 D F H R V
7:30 AM-1 PM. *Spr:* St Louis ARC. Kirkwood Community Center, 111 S Geyer Rd. 20th Annual Halloween Hamfest. Breakfast made to order. *TI:* 147.15. *Adm:* advance $3 each or 4 for $10; door $5 each or 3 for $10. Tables: $15 (electrical hookup $15). Steve Welton, WØSLW, 9847 Arv-Ellen Dr, Affton, MO 63123; 314-638-4959; **swelton@clear.net**; **www.halloweenhamfest.org**.

New Jersey (Mullica Hill) — Sep 18
D F H Q R T V
6 AM-2 PM. *Spr:* Gloucester County ARC. 4-H Fairgrounds, 240 Bridgeton Pike (Rte 77). 33rd Annual Hamfest. *TI:* 147.18 (131.8 Hz). *Adm:* $6. Tables: $10. Alan Arrison, KB2AYU, 208 Ewan Rd, Box 21, Ewan, NJ 08025; 856-478-6571; **kb2ayu@arrl.net**; **w2mmd.org**.

New Mexico (Socorro) — Oct 29
D F H R S T V
8 AM-2 PM. *Sprs:* Socorro ARA, Tech ARA, and the City of Socorro. NM Fire Fighters Academy, 800 Aspen Rd. *TI:* 146.68 (100 Hz). *Adm:* Free. Tables: $10. Al Braun, AC5BX, 722 N California St, Socorro, NM 87801; 575-835-3370; **ac5bx@juno.com**; **www.socorroara.org**.

New York (Queens) — Oct 2 D F H Q R S T V
Set up 7:30 AM; public 9 AM-2 PM. *Spr:* Hall of Science ARC. NY Hall of Science Parking Lot (Flushing Meadow Corona Park), 47-01 111th St. *TI:* 444.2 (136.5 Hz), 145.27 (136.5 Hz). *Adm:* buyers $5, sellers $10. Stephen Greenbaum, WB2KDG, 85-10 34th Ave, Apt 323, Jackson Heights, NY 11372; 718-898-5599; **wb2kdg@arrl.net**; **hosarc.org**.

Ohio (Massillon) — Oct 30 D F H R V
8 AM-2 PM. *Spr:* Massillon ARC. Massillon Boys and Girls Club, 730 Duncan St SW. 51st Annual Hamfest. *TI:* 147.18 (110.9 Hz). *Adm:* $5. Tables: $14. Terry Russ, N8ATZ, 3420 Briardale Dr NW, Massillon, OH 44646; 330-837-3091; **truss@sssnet.com**; **www.w8np.org**.

WEST GULF DIVISION CONVENTION

October 21-22, Ardmore, Oklahoma

D F H R S V

The West Gulf Division Convention, sponsored by the Texoma Hamarama Committee, will be held at the Ardmore Convention Center, 2401 N Rockford Rd. Doors are open for setup on Friday noon-5 PM, Saturday 7-8 AM; public Friday 5-8 PM; Saturday 8 AM-1 PM. Features include commercial dealer area; indoor flea market; forums and meetings; special guest from ARRL HQ Mike Corey, W5MPC, Emergency Preparedness and Response Manager; VE sessions (10 AM, walk-ins welcomed); limited RV parking. Talk-in on 146.97. Admission is $7 in advance, $8 at the door (under 14 free). Tables are $12 (flea market), $2.50 per linear foot (dealers; minimum 6-ft space). Contact Henry Allen, W5TYD, 2802 County Rd 2226, Caddo Mills, TX 75135; 214-673-7942; **w5tyd@arrl.net**; **www.texomahamarama.org**.

Oklahoma (Enid) — Nov 5 D H R S T V
8 AM-3 PM. *Spr:* Enid ARC. Garfield County Fairgrounds Hoover Bldg, 111 W Purdue. *TI:* 145.29. *Adm:* $2. Tables: $2. Mike Cofer, KD5OFF, Box 261, Enid, OK 73702; 580-554-2749, **w5htk@enidarc.org**; **www.enidarc.org/enidhamfest**.

Pennsylvania (Belle Vernon) — Oct 9
D H R T
8 AM-1:30 PM. *Spr:* Monessen ARC. Rostraver Central Fire Hall, 1100 Fells Church Rd. *TI:* 147.225. *Adm:* $5. Tables: $5. Chris Grilli, W3CDU, 133 Main St, Monongahela, PA 15063; 724-258-8419; **grilli@verizon.net**; **www.w3csl.org**.

Pennsylvania (Sellersville) — Oct 16
D F H R T V
Set up 6 AM; public 7 AM-1 PM. *Spr:* RF Hill ARC. Sellersville Firehouse, 50 N Main St (Bethlehem Pike). *TI:* 145.31 (131.8 Hz). *Adm:* $6, non-ham spouses and children free. Tables: $12 (indoor); $8 per outdoor space (bring your own table), plus admission. Jim Soete, WA3YLQ, c/o RF Hill ARC, Box 336, Perkasie, PA 18944; 215-723-7294; fax 215-257-0724; **wa3ylq@arrl.net**; **www.rfhill.ampr.org**.

Pennsylvania (Talmage/Brownstown) — Oct 1
D F H T V
Set up 6 AM; public 7 AM. *Spr:* Red Rose Repeater Assn. West Earl Community Park, Rte 772. *TI:* 147.015 (118.8 Hz). *Adm:* $2. Tables: $7 (includes 1 admission). Edward Albright, KB3OWF, 237 N Fulton St, Strasburg, PA 17579; 717-669-9559; **kb3owf@gmail.com**; **w3rrr.org**.

Pennsylvania (Washington) — Nov 6
D H Q R S T V
8 AM-3 PM. *Spr:* Washington Amateur Communications. Washington County Fairgrounds, 2151 N Main St. *TI:* 145.49. *Adm:* $5. Tables: $12 (5 or more tables are $10 each). Bud Plants, N3TIR, 236 Chambers Ridge Rd, West Alexander, PA 15376; 724-350-6745; fax 724-484-0998; **bud@n3tir.com**; **www.wacomarc.org**.

South Carolina (Anderson) — Oct 15
D F T V
9 AM. *Spr:* Anderson RC. Darwin Wright Park, Manse Jolly Rd. *TI:* 146.79 (123 Hz). *Adm:* Free. Tables: Free. James Hampton, WA4JWS, 129 Powell Rd, Anderson, SC 29625; 864-225-0567 (phone and fax); **brookele@brookelect.com**; **andersonradioclub.com**.

South Carolina (Sumter) — Oct 22 D F T
8 AM-4 PM. *Spr:* Sumter ARA. Sumter Jaycee Hut, 314 Pine St. Sumter "Open-Air" Hamfest. *TI:* 147.015 (156.7 Hz). *Adm:* Free. Tables: $5 ($5 per tailgate space). Thomas D'Anella, KC4ZTC, 109 Kells Dr, Hopkins, SC 29061; 803-661-9934; **tdanella@sc.rr.com**; **webspace.webring.com/people/pk/kt4jk_jim/sara.htm**.

Tennessee (East Ridge) — Oct 22
D F H S T V
8 AM-2 PM. *Spr:* Chattanooga ARC. East Ridge Community Center, 1517 Tombras Ave. *TI:* 146.79. *Adm:* Free to public. Tables: $5. Jim Bowman, W4DFS, Box 3681, Chattanooga, TN 37404; 423-394-7373; **w4dfs@arrl.net**; **www.w4am.org**.

Tennessee (Johnson City) — Oct 15
D F H R S T V
8 AM-4 PM. *Spr:* Gray Hamfest Assn. Appalachian Fairgrounds, 101 Lakeview St. *TI:* 145.29 (103.5 Hz), 146.52. *Adm:* $6. Tables: $10. Charles Stuchell, K4CWA, 222 River Rd, Bluff City, TN 37618; 423-538-4811; fax 423-538-3868; **k4cwa@arrl.net**; **grayhamfesttn.org**.

Tennessee (Oak Ridge) — Oct 8 D F H R T V
8 AM-2 PM. *Spr:* Oak Ridge ARC. Order of Eagles Bldg, 1650 Oak Ridge Tnpk. *TI:* 146.88, 146.97. *Adm:* $5. Tables: $10. Gwen Cole, KF4ROX, 193 Laurel Rd, Clinton, TN 37716; 865-457-1806; **jcole549@aol.com**.

Texas (Lufkin) — Oct 22 D H R S T V
8 AM-1 PM. *Sprs:* Deep East Texas and Nacogdoches ARCs. Lufkin First Church of the Nazarene, 1604 S Medford Dr. Skywarn Spotter training is scheduled. *TI:* 146.94 (141.3 Hz). *Adm:* Free. Tables: first table free; additional tables $5 each. Jerry Wilson, K5JLW, 144 Donna St, Huntington, TX 75949; 936-897-2716; **ac5zj@cs.com**; **www.lufkinhamfest.com**.

Wisconsin (Milwaukee) — Nov 5 D F H R
8 AM-2 PM. *Spr:* Milwaukee Repeater Club. Elk's Lodge #46, 5555 W Good Hope Rd. *TI:* 146.91 (127.3 Hz). *Adm:* $6. Tables: $10 (electricity $5 extra). Ken Jaeger, KC9MXZ, Box 2123, Milwaukee, WI 53201; 414-491-0686; **kc9mxz@arrl.net**; **www.mrc91.org**.

75, 50 AND 25 YEARS AGO

October 1936

- The cover photo shows a ham carefully stepping from a tall ladder onto his roof, with an open-wire feed line in the background.
- The editorial discusses the momentum that is gathering for the idea of band-usage plans for each ham band, to segregate the different modes of operation.
- George Grammer, W1DF, presents "A Medium-Power Transmitter for 7, 14 and 28 Mc." The rig is designed for C.W. operation and can be adapted for grid-bias modulation.
- George, a busy man at HQ, also gives us "A Crystal Filter and Noise Silencer for the 'High-Performance' Super."
- O. S. Keay, W9SJK, and Joe Pehouhek, W9EFK, describe "A Cheap and Efficient Vertical Antenna for 7- and 14-Mc. Operation."
- Paul Zottu, of RCA's Research and Development Lab., discusses "Multi-Tube Oscillators for the Ultra-High Frequencies."
- In "5-Meter Crystal Control with Push-Pull Output, John Reinartz, W1QP, tells us about using the type 800 tube on that ultra-high frequency band.
- "A Novel All-Band Transmitter of One-Kilowatt Capability," by Bill Eitel, W6UF, and Jack McCullough, W6CHE, is a three-stage rig that uses four type 35T tubes. The rig features a high-power crystal oscillator, a high-efficiency doubler, and a push-pull final.

October 1961

- The cover photo shows W1JKS hard at work in the ARRL Lab.
- The editorial discusses the issue of international reciprocal amateur licensing, and the work Senators Barry Goldwater and Andrew Schoeppel have done to introduce a bill into Congress to authorize the FCC to issue licenses to citizens of other countries.
- R. V. McGraw, W2LYH, describes his "Specialized Communications Receiver" that uses 25 tubes in a triple-conversion circuit to cover 80 through 10 meters.
- Mac Reynolds, W9EVI, gives us a hair-raising account of the HKØTU DXpedition, in "Waging War on Malepo Island." The "war" was waged to overcome the difficulties of landing on the island caused by its sheer cliffs. "Malepo," by the way, means "bad hair."
- John Troster, W6ISQ, once again has us rolling on the floor laughing with his look at an oft-heard on-the-air DX situation, in "- - - 499X es Pse QSL QSL - - ."
- An item in "Strays" notes that both K5YPP and KØYPP are named Jim Roberts.
- In Part IV of "A Complete Two-Band Station for the V.H.F. Beginner," Ed Tilton, W1HDQ, describes the crystal-controlled converters for 50 and 144 Mc.
- In "A Junk Key," noted DXer and contester Katashi Nose tells about his first semi-automatic key. Nose begins with, "This bug was built when I could not afford a real bug." He built it from a jigsaw blade, small metal pieces, a wooden spoon, wire, solder (for weight on the jigsaw blade) and six binding posts, at a total cost under $2.

October 1986

- The cover's photo montage shows hams providing communication support for the 1986 Pittsburgh Marathon.
- The editorial, "Those New Bands," discusses our amateur bands at 10, 18, 24 and 902 MHz.
- "The W2PV Four-Element Yagi," by Bill Myers, W1GQ, presents design data for a high-performance antenna, with a practical example for the 24-MHz band.
- Jerry Pittenger, K8RA, gives us Part 2 of "An All-Band, 1500-Watt-Output 8877 Linear Amplifer," with detailed instructions for building the RF deck and power supply.
- In "Broadband Dipoles — Some New Insights," Frank Witt, AI1H, designs and builds an efficient unit for 80 meters.
- Part 3 of "Electromagnetic Pulse and the Radio Amateur," by Dennis Bodson, W4PWF, discusses the application of EMP transient-protection devices to Amateur Radio equipment.
- Part 12 of the series "Under Construction," by Doug DeMaw, W1FB, tells us how to build a time-standard receiver for "WWV and CHU in Your Workshop."

Al Brogdon, W1AB ♦ Contributing Editor

Field Organization Reports

JULY 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**.

400
KØIBS
376
KI4KWR
K8OLY
375
KA2ZNZ
330
KT2D
280
KB2RTZ
318
KB2BAA
296
KD8EBY
290
WB9YBI
271
N8OSL
244
WB8RCR
243
WB9FHP
236
W2MTA
230
WB9JSR
220
KB2ETO
215
N9VC
206
WD8USA
205
K6HTN
198
KK1X
195
K2TV
NX9K
194
K2HAT
186
KB2KOJ
185
K8RDN
182
WA2BSS
180
AG9G
W5DY
W7FQQ
170
WD9FLJ
KK3F
N2RDB

165
N7CM
161
K2ABX
160
KGØGG
159
W2LIE
155
K7EAJ
150
KE5HYW
AA3SB
146
KJ6HWL
145
K4JGA
W3YVQ
W5KAV
144
W3CB
KBØDTI
141
KC2SFU
140
K7BFL
N2JBA
KW1U
KC2SYM
K4JUU
WK4P
135
K9LGU
WM2C
WE2G
KE5YTA
WØLAW
W4DNA
130
NC3F
WB2FTX
K6JT
K4IWW
125
NN7H
KA8IAF
KB1NMO
KB8RCR
WB8WKQ
124
K4BEH
W2DWR
W9WXN
120
KØVTT
WS6P
KA4FZI
KB5SDU

N8IO
WB8HHZ
W8UL
K4GK
WA5LOU
N7IE
118
KØMEL
115
N8CJS
K7OAH
NX8A
114
KT5SR
W4CAC
112
N2DW
110
W7QM
W7GB
KE4CB
N5NVP
N2GS
KC5OZT
KA3OCS
N5EEO
K4BG
WA4UJC
N9MN
KF7GC
WB6OTS
K7BDU
W7QM
N7XG
N7YSS
WI2G
W2EAG
109
N2GJ
WB4GHU
108
WØSJS
106
KA4IZN
105
W4TTO
103
K1EIC
101
N3RB
KØLQB
KJ7NO
100
W6WW
K4SCL
W5GKH
KK5NU
N5OUJ
N1JX
WD8Q

WG8Z
WB8SIQ
WA3EZN
WØCLS
NØMEA
WAØVKC
WX4CB
NR2F
KA1G
NU8K
K1REV
N3SW
W3TWV
WB4FDT
NM1K
WB6UZX
K8VFZ
99
KK7DEB
98
N9WLW
97
K5MC
W8CPG
95
KB9KEG
N2VC
W8DJG
N2WKT
94
AD4BL
KC5ZGG
92
AE5VY
90
N8DD
K4MSG
WB4BIK
AA2SV
WA2NDA
N4ELI
W3GQJ
KJ4HGH
K1JPG
KZ8Q
N3KB
N1LKJ
W9MBT
W7JSW
KB7RVF
KB3LNM
K3IN
KD8CYK
KD8LZB
N5ASU
86
W2CC
KC5MMH
85
N2YJZ

KK7TN
NA7G
83
W8IM
82
KF5IOU
81
N2VQA
W2KFV
80
K5CRX
WD8DIP
KD8KWG
KB8HJJ
KØDEU
NIØI
NØMHJ
KCØZDA
K8KV
KC7ZZ
KD8NWE
78
KO6V
KA2EJD
77
KC2UMX
76
W5XX
NA9L
K2BRG
75
KC2EMW
WDØGUF
74
KB5PGY
73
N1TF
72
AG6EF
71
N9DVL
70
AD8BC
WB8YYS
KDØAYN
KØDLK
NØDUW
NØDUX
NUØF
WØFUI
KBØJKO
N3NTV
KØPTK
KØRXC
NØUKO
KD7ZUP
WA2AQQ

The following stations qualified for PSHR in previous months, but were not recognized in this column: (June) NC4VA 291, N1UMJ 290, KW1U 145, KD1LE 130, W1GMF 120, N1LKJ 110, N1IQI 110, N4MEH 90, W4KLB 90, KK1X 70. (May) N9WLW 162.

Section Traffic Manager Reports

The following Section Traffic Managers reported: AK, AZ, CT, EB, EMA, ENY, EPA, EWA, GA, IA, IL, IN, KS, LA, LAX, MDC, ME, MI, MN, MS, NC, NFL, NLI, NNJ, NNY, NTX, OH, OK, OR, ORG, SD, SFL, SJV, SNJ, STX, TN, UT, VA, WI, WCF, WNY, WPA, WV, WY.

Section Emergency Coordinator Reports

The following ARRL Section Emergency Coordinators reported: EWA, GA, IN, MI, MDC, MN, MO, MT, NLI, NM, NNJ, NTX, OK, SD, SFL, STX, 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.

W5KAV 2621, WB9FHP 1461, KK3F 1378, WB5NKD 1342, W6WW 1333, K1JPG 731, WB5NKC 698, K6JT 685, KW1U 659, W8UL 651, WB9JSR 638, N4ELI 566, WD4DNC 528, NX9K 525, K7BDU 524, W7QM 507, WB8SIQ 502, W9WXN 501.

Stations earning BPL by Originations plus Deliveries: NM1K 125, K8LJG 114.

The following stations qualified for BPL in these previous months, but were not recognized in this column: (June) N1IQI 1944, KW1U 954, W1GMF 857, W9WXN 501.

SILENT KEYS

Silent Keys Administrator ♦ sk@arrl.org

It is with deep regret that we record the passing of these amateurs:

W1CER **DeMaw**, D. D., Tolland, CT
KB1DMT **Sousa**, Mario L. Jr, Newington, CT
KD1EMT **Herring**, Michael V., Brookhaven, MS
KA1HIV **Mancuso**, Michael A., Millville, MA
*K1IJU **Peacor**, C. Norman, Providence, RI
NF1J **Stankiewicz**, Warren C., Ione, CA
♦ WA1JSD **Lambert**, David A., Brownwood, TX
N1KEC **Rawson**, Robert O., Guilford, CT
W1PE **Peters**, Robert W., Mesquite, TX
N1PPS **Strang**, Donald B., Harvard, MA
W1QDR **Barnes**, Raymond B., Charlton, MA
K1QPM **Jeanfaivre**, Roger B., West Hartford, CT
K1RQG **Demaso**, Joseph M., Bucksport, ME
N1SFW **Gosselin**, Albert D., Sanbornville, NH
W1TOC **Bavor**, Gordon F., Norwalk, CT
WA1URA **Moore**, Frank N., Grabill, IN
♦ W1USJ **Jarvis**, William V., West Lebanon, NH
W1WA **Dennis**, William A., Sanbornville, NH
N2AWI **Christopher**, Barbara K., Newburgh, NY
K2EJP **Cohen**, Harvey L., Rochester, NY
W2GCX **Gerber**, Eugene, Palm Springs, CA
K2INA **Liga**, Joseph D., Eatontown, NJ
N2JEU **Arnold**, Robert D., Canastota, NY
K2JME **Eck**, Jean, Madison Heights, VA
WB2JNK **Weissman**, Martin D., Schenectady, NY
KC2JRR **Snyder**, Ronald F., Ontario, NY
W2JWF **Ekblad**, Stig E., Sedro Woolley, WA
KB2LAO **Sabulis**, Joseph J., Wallkill, NY
K2MAF **Berard**, Emmett J., Niagara Falls, NY
WA2MXU **Korotitsch**, Michael, Schenectady, NY
W2NDY **Zendler**, John A., Lakeland, FL
W2ORP **Riccio**, Joseph A., Port Charlotte, FL
KE2QJ **Kuecken**, John A. "Jack," Pittsford, NY
WA2QNZ **Scull**, Ronald R., Roselle Park, NJ
KB2RA **Bieber**, Walter J., New City, NY
K2RY **Wenrich**, John A. "Jack," Hamlin, NY
KA2USU **Beauchamp**, Ted M. III, Roselle Park, NJ
♦ N2VA **Maziarz**, Donald R., Warrenton, VA
K2VCI **Reynolds**, Charles H., Webster, NY
K2VKJ **Rawlins**, Ben, Vineland, NJ
W2WGL **Pankiewicz**, Charles L., New Hartford, NY
WE2Y **Fuchs**, John F., Boulder, CO
W2YHO **Gross**, Herman, Great Neck, NY
♦ K2YLM **Smith**, Earl B., Winthrop, ME
WK3A **Haas**, Harry L., Narvon, PA
N3AQN **Swanson**, Stanley L., Kane, PA
W3BF **Heydt**, Robert G., Mertztown, PA
W3BZJ **McCray**, Francis L., Corry, PA
WA3CLD **Dimmick**, Ray R., Hellertown, PA
KC3GE **Moriarty**, John J., Norristown, PA
W3HDO **White**, George M., Washington, DC
KA3ILY **West**, Joseph R., Springfield, PA
W3JMK **Kittel**, Jeanne, Norristown, PA
K3KFL **West**, Joseph V., Newtown Square, PA
K3QAF **Aurick**, Lee II, Lancaster, PA
W3UGD **Yascavage**, Albert J. Sr, Hunlock Creek, PA
K3VKP **Iannarelli**, Anthony J., Bensalem, PA
W3WBD **Trostle**, Robert S., West Grove, PA
N3WOU **Albert**, Charles B., Saint Michaels, MD
N3ZEL **Gosselin**, Jacqueline Y., Eighty Four, PA
W4ACL **Phillips**, William O., Smithfield, NC
WB4AFN **McMeans**, Heath L. Jr, Birmingham, AL
K4AK **Sprague**, Denton E., Albuquerque, NM
W4AOJ **Lucas**, Kenneth, Gastonia, NC
W4AUN **Kessinger**, Glendon T., Mount Washington, KY
WA4BBT **Baber**, Russell A., Winchester, KY
AA4CM **Moody**, Henry C. Jr, Ellerslie, GA
♦ AA4DQ **Bishop**, Ralph M., Half Moon Bay, CA
KB4DVF **Auberry**, Windle L., Shepherdsville, KY
KA4EAD **Isaacs**, Albert F. Jr, Miami, FL
W4EBY **Spear**, Andrew F. Jr, Birmingham, AL
K4ESB **Bayne**, Edward S., Maryville, TN
W4GQN **Swope**, James N., Red Bank, TN
KT4GZ **Montgomery**, Robert E., Bristol, TN
WD4HBU **Fleeman**, George W., Durham, NC
KI4ICE **Swift**, Eddie R. Sr, Greenbrier, TN
N4IKK **Grace**, David R., Longwood, FL
N4ITZ **Gibson**, Fay N., Smyrna, TN
AD4KO **Killough**, Marty N., Indian Trail, NC
WB4LHN **Wilson**, Aubrey H., Murfreesboro, TN
KE4LK **Martin**, Marion O., Cold Water, MS
W4LTM **Leatherman**, Matthew A., Richmond, VA
WA4MKA **Anderson**, Joseph L., Chattanooga, TN
♦ KI4O **Stevens**, Richard L., Stephens City, VA
KF4OKA **Anthony**, Gordon, Stockbridge, GA
W4PLS **Reed**, William D. Jr, Roanoke, VA
KF4RNO **Conrad**, Gary, Marietta, GA
AA4RV **Hope**, James W., Three Rivers, MI
WA4RYO **Woody**, W. David., Pittsboro, NC
N4SLP **Patterson**, Patricia J., Stoneville, NC
KD4TGZ **Williams**, Tommy O., Cullman, AL
WA4TIL **Long**, Manson C., Dallas, NC
W4ULM **Newton**, Hilbert A., Fredericksburg, VA
W4UW **Genaille**, Richard A., Winston Salem, NC
N4VCS **Jones**, Kenneth A., McMinnville, TN
KC4VL **Reed**, Lawrence A., Owensville, IN
KI4VVC **Johnson**, John David., Raleigh, NC
KB4WNH **Brorup**, Chris M., Eatonton, GA
K4ZJ **Morris**, Dennis C., Hampton, GA
KF5BNB **Brown**, Edward Lee, Saltillo, MS
K5BOC **Griffin**, Randy, Mountainburg, AR
K5CHZ **Morrison**, Robert Jr, Hattiesburg, MS
KC5CQ **Sims**, Curtiss G., New Holland, OH
KD5EFG **Cates**, Mike H., Guntown, MS
♦ W5EJT **Jank**, Eugene Gene A., Shavano Park, TX
ex-N5FO **Frazer**, James A., Harmony, PA
KA5GUM **Richter**, Roland T., Waco, TX
KB5GVO **Rolston**, Gordon C., Marysville, WA
N5HGN **Smith**, Dennis, Meridian, MS
KE5HTG **Williamson**, Willie Wade., Tallulah, LA
K5JIN **Warner**, Michael D., Buchanan Dam, TX
W5NAA **Becker**, Donald W., San Antonio, TX
♦ W5PGX **Spratley**, Ashby W. Jr, Garner, NC
W5RJ **Jones**, Roy Glenn, Butler, MO
♦ WA5RNV **Mangold**, Ivan A., San Antonio, TX
KD5TEX **Keahey**, Gordon D., Forney, TX
KM5UH **Kostka**, George W., Columbus, MS
♦ W5UHF **Luce**, Harold, Hattiesburg, MS
W5UTL **Ward**, Howard B., Meridian, MS
K5VAK **Boswell**, Harmon "Mims" Jr, Kosciusko, MS
W5WTY **Colby**, Don A., Richardson, TX
AC5WZ **Lane**, Ronald E., El Dorado, AR
WY5Y **Law**, Robert L., Inola, OK
♦ K5YQX **Schalles**, Elmer G., Mountainair, NM
W6ALG **Lewis**, Stanley, San Pedro, CA
K6AVA **King**, Gorley F. Jr, Nampa, ID
KH6EXR **Aki**, Charles P., Kahului, HI
KD6FFN **Schaar**, Larry C., Deer River, MN
K6FVH **Coile**, Russell C., Pacific Grove, CA
WB6GJG **Finley**, David R., Fresno, CA
K6HEC **Clement**, Howard E., San Diego, CA
W6JD **Westover**, Douglas E., Palo Alto, CA
W6KUE **Folkes**, Charles C., Van Nuys, CA
KA6LNO **Neal**, John J., Stockton, CA
ex-KC6M **Buberl**, Jerry, San Diego, CA
WB6NTF **Foston**, Arthur L., Fresno, CA
WA6QPA **St Andre**, Clarence J., San Lorenzo, CA
K6SEZ **Senior**, Wilfred, Albany, CA
W6STU **Matthews**, Glenis E., El Cajon, CA
K6UGK **Noss**, Wilburt O., Mount Judea, AR
KI6UTI **Valerio**, Anthony M., San Francisco, CA
W6VFZ **McIlroy**, Richard B., Hanford, CA
W6WLE **Sheldon**, Daniel E., San Jose, CA
W6WYW **McCoy**, Jack C., Sonora, CA
WB6YAM **Lacalamita**, James A M., Salinas, CA
N7AE **Stratte**, Joseph J. III, Spokane, WA
KA7DUF **Kirk**, Martin P., Molalla, OR
KA7HWT **Exendine**, Catherine N., Bellevue, WA
W7IR **Diven**, Liscum, Scottsdale, AZ
♦ KL7IWF **Volker**, Lawrence W., Conover, NC
KB7OSX **McRoberts**, Barbara L., Seattle, WA
WA7TEH **Barker**, Gerald E., Clearfield, UT
♦ W7WHB **Sahnow**, Gordon C. Jr, La Center, WA
♦ WA7WHP **Roose**, Dale A., Tucson, AZ
KA8ADJ **Edler**, Charles W. Jr, Owendale, MI
K8BGJ **Du Val**, Charles R., Elkhorn, WI
WD8DKZ **Winbigler**, Richard D., Newark, OH
W8DTW **Williams**, David T., Amherst, OH
KD8EEJ **Bennett**, Edward M. Jr, Lancaster, OH
W8FTV **King**, Robert R., West Liberty, OH
W8HSJ **St John**, Howard E., Gladstone, MI
WA8JWP **Blahnik**, Lawrence H., Rapid River, MI
W8KS **Stenback**, Kenneth L., Riverview, FL
WD8MSJ **Walsh**, Richard L., Dayton, OH
W8MVE **Fries**, Robert P., Republic, OH
K8OI **Head**, Stanley W. Jr, Toledo, OH
W8PR **Hearsum**, D. R., Dayton, OH
WA8PYY **Benjamin**, Charles H., Hilliard, OH
WB8RRF **Stevens**, Donald P., Petersburg, MI
W8TIV **Clifton**, Charles R., Dayton, OH
K8UP **Fleming**, John F., Oak Park, MI
♦ N9AG **Lehman**, Scott A., Greenville, OH
K9CCF **Wildman**, William, Sheboygan, WI
WA9DWY **Katz**, Marvin D., Aurora, IL
WD9EAU **Griffith**, Gordon T., Wauwatosa, WI
♦ W9EGE **Ege**, William E., Fulton, IL
WB9EZY **Vogt**, Thomas J., Clinton, WI
WA9GAR **Aegerter**, John C., Milwaukee, WI
KD9I **Coons**, William D., Lombard, IL
KA9IOX **Ceckowski**, Donald H., Fort Wayne, IN
N9LTM **Walker**, Dorman K., Fort Wayne, IN
N9NUE **Morrison**, Orace W., Warsaw, IN
KG9NY **Sheets**, Albert N., Indianapolis, IN
KB9OEN **Starr**, Harold, West College Corner, IN
WB9PKJ **Johnson**, Elizabeth, Green Bay, WI
♦ W9PPH **Katz**, William B., Highland Park, IL
K9PSI **Lyons**, Virgil E., Birdseye, IN
WB9PUJ **Bokern**, Richard, Fort Wayne, IN
W9QMU **Gray**, Leslie D., Quincy, IL
WA9RJO **Himmer**, Corene, Cahokia, IL
KA9UMA **Shrader**, Herbert L., Chicago, IL
WA9WUA **Stiltner**, Andrew F., Keystone, IN
♦ W9ZA **Neuffer**, Kenneth T., Sun City West, AZ
N9ZDD **Nelson**, Jerry C., Spring Valley, WI
KB9ZKY **Owens**, Herbert, Berea, KY
KQ0A **Solomon**, Harvey M., El Prado, NM
N0BUC **Roth**, Elmer R., Aberdeen, SD
W0EL **Nyman**, James D., Hibbing, MN
KA0EOE **Anderson**, Marvin N., Ceresco, NE
W0IAV **Deister**, William R., Kingwood, TX
K0JIH **Walker**, Embert Bert D., San Antonio, TX
KC0JPL **Pew**, John, Blue Springs, MO
♦ WA0KDC **Gilliland**, Charles A., Hiawatha, KS
W0KE **Bleich**, Kenneth E., Creve Coeur, MO
K0MZZ **Frank**, Fred J., Overland Park, KS
♦ KD0NHQ **Boesel**, Charles F. IV, Wentzville, MO
W0NOW **Haley**, John E., Fremont, NE
WB0NQD **Wilson**, Marion R., Independence, MO
KA0OKM **Bush**, Harley L., Dubuque, IA
K0OLG **McFeters**, John J., Coon Rapids, MN
KC0PEH **Davis**, Dennis D., Dix, NE
W0QP **Tyson**, Donald B., Rapid City, SD
W0RCW **Johnson**, Herbert L., Fort Dodge, IA
KA0RDM **Kaske**, Alan D., Minneapolis, MN
KK0TT **Collins**, Lloyd C., Paola, KS
N0WVD **Skinner**, Larry D., Wichita, KS
WB0YMG **Viste**, Elizabeth A., Sioux Falls, SD
DJ8WD **Probsthain**, Hartmut, Unterschleissheim, Germany
EA5BS **Perez**, Francisco Bernabeu, Cartagena, Spain
F5TIM **Archimbal**, Pierre, Condat Sur Ganaveix, France
LA7OF **Bøe**, Thormod, Horten, Norway

♦ 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.

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- V+U/V+V/U+U operation
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- 1000+ Memory channels
- WIRES ready

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- 0.05ppm OCXO included
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50/2M/220/440 HT

- Wideband RX - 900 Memories
- 5W TX (300mw 220Mhz)
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- Internet WIRES compatible

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DXE-40VA-1TB	Foldover High Performance Freestanding, Low Profile, 24 ft.	$179.95
DXE-40VE-1	Fast Taper, High Performance 40 Meter	$179.95
DXE-40VE-1TB	Foldover 40 Meter 1/4 Wave Freestanding, Heavy Duty	SPECIAL $179.95
DXE-60VE-1P	Fast Taper High Performance 60 Meter	$229.95

Visit DXEngineering.com for Full-Size 80 Meter Verticals

We Have First Rate Products, Reliable Performance, & Great Prices—

Full Size 75/80 Meter Quarter-Wave Vertical Antennas!

New!

DX Engineering's FULL SIZE quarter-wave vertical antennas provide the highest possible performance. Now you can achieve the strongest possible presence at your power level and be competitive!

The 68-foot tall antennas have rugged base sections starting from 2, 3 and 4-inch diameter aircraft-grade aluminum tubing. The VA-1 requires simple guying, while the VA-2 and VA-3 models are very stout antennas that can stay up with no guying necessary and no worry on your part. The VA-2 and VA-3 antennas can easily be lowered with the supplied Heavy Duty Plus Stainless Pivot Base and the optional hand winch.

- Ultra-WIDE SWR bandwidth
- Highest Wind Ratings—high strength 6063/6061 tubing manufactured to DX Engineering specifications
- High Power Handling Capacity—BIG high strength, UV-protected Extren® insulator
- Reliability Second to None—specially manufactured stainless steel and aluminum saddle clamps, stainless steel bolts, and precision machining
- Easy Tilt Up and Down—specially manufactured heavy duty stainless steel Pivot Base supplied with VA-2 and VA-3 antennas

DXE-7580FS-VA-1 Vertical Antenna, standard HD...**$379.50**
DXE-7580FS-VA-2 Vertical Antenna, Heavy Duty.....**$675.50**
DXE-7580FS-VA-3 Vertical Antenna, Ultra Duty ...**$1,675.50**

DXE-VRW-1 Manual Winch

This optional winch for the VA-2 and VA-3 Vertical Antennas allows easy one-man raising and lowering. You can use the DXE-VRW-1 winch on similar DX Engineering antennas in a multi-antenna installation.

DXE-VRW-1 Manual Winch Add-on Raising Kit ..**$169.99**

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

See DXEngineering.com for details.

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
DXE-213DU006	6 ft.	$15.88
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
DXE-213DU200	200 ft.	$210.88

RG-8/U DXE-8U Cable Assemblies with PL-259 Connectors

DXE-8UDU002	2 ft.	$12.88
DXE-8UDU003	3 ft.	$13.88
DXE-8UDU006	6 ft.	$16.88
DXE-8UDU009	9 ft.	$20.88
DXE-8UDU012	12 ft.	$24.88
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
DXE-8XDU150	150 ft.	$69.88

DXE-400MAX Cable Assemblies with PL-259 Connectors

DXE-400MAXDU003	3 ft.	$13.88
DXE-400MAXDU006	6 ft.	$15.88
DXE-400MAXDU009	9 ft.	$19.88
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

FREE SHIPPING on $50.00 or more Coax order!

Coaxial Cable Prep Tools

- Precision, two-step operation
- No nicks or scratches to conductor
- Premium, long-lasting cutter blades
- For foam or solid dielectric cable preparation

DXE-UT-8213	Cable Stripper for RG-8, RG-213, etc	$39.95
DXE-UT-808X	Cable Stripper for RG-8X, 9258, etc	$39.95
DXE-UT-80P	PL-259 Assembly Tool	$22.95
DXE-UT-80N	2-Piece N Connector Tool	$22.95
DXE-CNL-911	Coax Cable Cutters	$23.75
DXE-170M	Precision Shear Side Cutters	$7.95

Now available in cost-saving tool kits with carrying case

DXE-UT-CASE	Molded carrying case only	$22.95
DXE-UT-KIT1	Basic Coax Cable Prep Kit	$99.95
DXE-UT-KIT2	Complete Coax Cable Prep Kit	$174.95

We Will Beat Any Competitor's Prices—Call Us For Details!

$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

Plus Great Customer Service and Fast and Inexpensive Shipping!

Great for wire antenna spreaders or insulated stacking frames! Build your favorite antenna design!

50 Ft. Telescoping Fiberglass Tubing Mast Kit

- Tubing custom made just for DX Engineering
- Smoothly telescoping sections
- Neutral light gray color
- Uses DX Engineering Stainless Steel Element Clamps to assemble slit lengths

DXE-FTK50 Telescoping Tubing Kit.....**$138.00**

Telescoping Fiberglass Tubing

- 1/8" nominal wall x 8 feet long

Unslit Tubing

DXE-FT0500-8	0.500" O.D.	**$6.45**
DXE-FT0750-8	0.750" O.D.	**$8.95**
DXE-FT1000-8	1.000" O.D.	**$9.95**
DXE-FT1250-8	1.250" O.D.	**$11.95**
DXE-FT1500-8	1.500" O.D.	**$18.95**
DXE-FT1750-8	1.750" O.D.	**$20.95**
DXE-FT2000-8	2.000" O.D.	**$25.95**

Tubing with One End Slit

DXE-FT0750-8S	0.750" O.D.	**$13.95**
DXE-FT1000-8S	1.000" O.D.	**$14.95**
DXE-FT1250-8S	1.250" O.D.	**$16.95**
DXE-FT1500-8S	1.500" O.D.	**$23.95**
DXE-FT1750-8S	1.750" O.D.	**$25.95**
DXE-FT2000-8S	2.000" O.D.	**$30.95**

High power tuner performance at low power pricing!

LDG ELECTRONICS

LDG-AT-200PROII 250 Watt Autotuner

The AT-200 features over 16,000 3D memories, automatically storing tuning data for frequencies and bands as you use them. When you transmit on or near a frequency you've used before, the AT-200 can restore the tuning data almost instantly. It learns as you use it, adapting itself to your operating patterns for faster and faster tuning. The 3D memory system allows up to eight antenna settings to be stored for each frequency.

- Up to 250 watts—handles any transceiver
- 1.8 to 30 MHz, 100 watts on 6 meters
- Matches virtually all coax-fed antennas
- Optional LDG remote balun for long wires, etc.

LDG-AT-200PROII.....just **$234.00**

Many other LDG models in stock at low prices at www.DXEngineering.com

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.

DX ENGINEERING IS NOW AN AUTHORIZED DISTRIBUTOR!

ROHN™ Products LLC

Rohn Commercial Towers

Autotuned Stealth Antenna

A Complete, Engineered System for Antenna-Restricted Areas

- Automatic Bandswitching—tunes for lowest SWR
- 80-10 meter operation with 46 ft. wire antenna
- 40-10 meter operation with a thin 26 ft. wire antenna
- Allows operation in HOA areas
- Handles up to 200 watts SSB/CW
- Single coax cable connection
- Stainless steel mounting plate and hardware—no corrosion
- Requires 12 Vdc for operation
- Includes radial plate, radials & antenna wire

New!

Designed for the Ham with restrictions on visible antennas, the ATSA is engineered for fast, inconspicuous installation and maximum performance. Power is supplied through the coaxial cable, and bandswitching/tuning is automatic and instantaneous. The unique MatchBoxx™ module assures the lowest possible SWR at any frequency. The single antenna wire can be stealthily routed away from the ground-mounted controller package for minimum visual impact. Just "plant" it in the bushes with supplied spikes and lay out the minimum length radials. You can further camouflage the controller with a plastic boulder or other landscaping.

The ATSA is great for EMCOMM—the complete package can be preassembled and deployed anywhere in minutes!

DXE-ATSA-1 Complete Stealth HF Antenna System
SPECIAL INTRODUCTORY PRICE.....**$459.00**
DXE-SA80-AOK 80m Optimizer Coil Stealth Add-On Kit....**$49.95**

RTTY & More
PSK-31
SSTV
WSJT

SignaLink™ From Tigertronics

TIG-SL-USB.....**$86.95**

Then choose a cable for each radio!

Any Radio Interface Cable*, only **$12.95** when purchased with SignaLink™ unit

.....YOUR TOTAL $99.90

For your complete digital solution!

**except the special Elecraft K3 cable*

- Easiest installation and setup—Macintosh or PC
- Software CD ROM included
- Built-in low noise sound card
- USB port powered
- Works with ALL radios
- Supports all sound card digital and voice modes
- Requires radio interface cable

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We Will Beat Any Competitors' Prices! Call us for complete details.

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Order by 4:00 pm ET for Same-Day Shipping • Tech/International: 330.572.3200 • Prices good through 11/15/11 Sale Code 1110QS

LDG ELECTRONICS

We're #1

Our customers have always known we're #1. But did you know that LDG was the first company with a "no questions asked" two-year transferable warranty on ALL our products? LDG autotuners also have the highest resale value of any autotuner on the market. Our customers feel good about owning LDG products and so will you!

Call us or log-on today!

- *RF Sensing*
- *Tunes Automatically*
- *No Interface Cables Needed*

NEW! AT-200ProII

The AT-200ProII features LDG's new "3-D memory system" allowing up to eight antenna settings to be stored for each frequency. Handles up to 250 watts SSB or CW on 1.8 – 30 MHz, and 100 watts on 54 MHz (including 6 meters). Rugged and easy-to-read LED bar graphs show power and SWR, and now includes LEDs for the antenna position and if the tuner is in bypass. A function key on the front panel allows you to access data such as mode and status. Includes six foot DC power cable. ***Suggested Price $259.99***

Z-11ProII

Meet the Z-11ProII, everything you always wanted in a small, portable tuner. Designed from the ground up for battery operation. Only 5" x 7.7" x 1.5", and weighing only 1.5 pounds, it handles 0.1 to 125 watts, making it ideal for both QRP and standard 100 watt transceivers from 160 - 6 meters. The Z-11ProII uses LDG's state-of-the-art processor-controlled Switched-L tuning network. It will match dipoles, verticals, inverted-Vs or virtually any coax-fed antenna. With an optional LDG balun, it will also match longwires or antennas fed with ladder-line. Includes six foot DC power cable.
Suggested Price $179.99

radio not included

Z-817

The ultimate autotuner for QRP radios including the Yaesu FT-817(D). Tuning is simple; one button push on the tuner is all that is needed - the Z-817 takes care of the rest. It will switch to PKT mode, transmit a carrier, tune the tuner, then restore the radio to the previous mode! 2000 memories cover 160 through 6 meters. The Z-817 will also function as a general purpose antenna tuner with other QRP radios. Just transmit a carrier and press the tune button on the tuner. Powered by four AA internal Alkaline batteries (not included), so there are no additional cables required.
Suggested Price $129.99.

We have a tuner that will work for you!

We make tuners that will work with any transceiver. Don't know which one is right for you? Give us a call or see the Tuner Comparison Chart on our web site for more selection help!

radio not included

AT-897Plus for the Yaesu FT-897

If you own a Yaesu FT-897 and want a broad range automatic antenna tuner, look no further! The AT-897Plus Autotuner mounts on the side of your FT-897 just like the original equipment and takes power directly from the CAT port of the FT-897 and provides a second CAT port on the back of the tuner so hooking up another CAT device couldn't be easier. ***Suggested Price$199.99***

AT-600Pro

The AT-600Pro handles up to 600 watts SSB and CW, 300 on RTTY (1.8 – 30 MHz), and 250 watts on 54 MHz. Matches virtually any kind of coax-fed antenna and will typically match a 10:1 SWR down to 1.5:1 in just a few seconds. You can also use it with longwires, random wires and antennas fed with ladder line just by adding a balun. Two antenna ports with a front-panel indicator, and separate memory banks for each antenna. LED bar-graph meters shows RF power, SWR and tuner status, tactile feedback control buttons and an LED bypass indicator. Operates from 11 – 16 volts DC at 750 mA. Includes six foot DC power cable.
Suggested Price $359.99

Z-100Plus

Small and simple to use, the Z-100Plus sports 2000 memories that store both frequency and tuning parameters. It will run on any voltage source from 7 to 18 volts; six AA batteries will run it for a year of normal use. Current draw while tuning is less than 100ma. The Z-100Plus now includes an internal frequency counter so the operating frequency is stored with tuning parameters to make memory tunes a blazingly fast 0.1 seconds; full tunes take an average of only 6 seconds. Includes six foot DC power cable.***Suggested Price $159.99***

LDG Electronics, Inc. 1445 Parran Road, St. Leonard, MD 20685 ***Phone 410-586-2177 • Fax 410-586-8475***

The #1 Line of Autotuners!

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. Interfaces to the CAT port (ACC) on the back of the radio with the provided cable. One button push on the tuner and the Z-817H takes care of the rest. 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). 2000 memories cover 160 through 6 meters.

Suggested Price $159.99

- ***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, for either manual or automatic tunes, and status LEDs. 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. For your Icom radio that is AH3 or AH-4 compatible. ***Suggested Price $179.99***

YT-100

For Yaesu FT-857, FT-897 and FT-100 (and all D models) an integrated tuner, powered by the interface. Press the tune button on the tuner, and everything else happens automatically. ***Suggested Price $199.99***

KT-100

For AT-300 compatible Kenwood transceivers (except TS-480HX). The KT-100 actually allows you to use the Tune button on the radio. 2,000 memories for instant recall of the tuning parameters for your favorite bands and frequencies. ***Suggested Price $199.99***

YT-450

Designed for Yaesu's newest 100 watt radios. Interfaces directly with the Yaesu FT-450 and FT-950 radios. Press the tune button on the tuner and the rest happens automatically. 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! Seamless connection to a PC.

Suggested Price $249.99

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!

Suggested Price $249.99

FREE!

RBA-1:1 Balun or RU-4:1 Unun

When You Buy A S9V 43', 31' or 18' Multiband Antenna

Purchase an S9V 43', 31' or 18' antenna and fill out the included form. Mail it to LDG Electronics, and we will send you either a 200 watt balun or unun, your choice!

Antennas!

S9V 43' $199.99

80-6 meters *Fixed Operation*

The S9V 43' is a high-performance lightweight telescoping fiberglass vertical. The best value in high-performance 'tall' verticals!

S9V 31' $99.99

40-6 meters *Fixed or Portable Operation*

S9V 18' $49.99

20-6 meters *Fixed or Portable Operation*

The S9V 31' and 18' are tapered, ultra-lightweight fiberglass vertical antennas. Friction-locking sections and high-tech polymer tube rings allow the antenna to be quickly and safely deployed in practically any environment without tools!

S9RP $39.99

Aluminum Radial Plate

Includes 20 sets of stainless steel nuts & bolts

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Don't Miss Out - Call or visit them TODAY!

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LDG

hy-gain ROTATORS

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

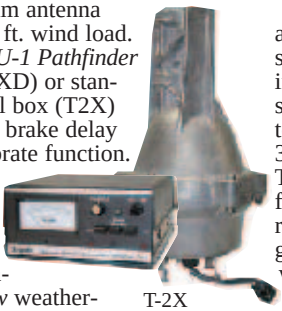
HAM-IV

HAM-IV
$649.95

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

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

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.

http://www.hy-gain.com
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NEW! Automatic Rotator Brake Delay

RBD-5
$29.95

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

hy-gain

Antennas, Rotators & Towers

308 Industrial Park Road,Starkville, MS 39759, USA

IC-V82 2M FM HT

- TX: 144-148 MHz • RX: 136-174 MHz
- Power: 7W • Memories: 200
- D-Star upgradable with optional UT-118

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

IC-92AD 2M/440 D-Star & FM HT

- TX: 144-148, 420-450 MHz • RX: 0.495-999 MHz (cell blkd)
- Power: 5/2.5/0.5/0.1W • Duel RX
- Optional HM-175GPS Speaker Mic adds GPS capabilities

ID-880H 2M/440 FM Analog & D-Star Digital Dual Bander Mobile

- TX: 144-148, 430-450 MHz • RX: 118-173.995, 230-549.995, 810-999.99 MHz (cell blkd) • Power: 50/15/5W
- Memories: 1052

IC-2820H 2M/440 FM Mobile

- TX: 144-148, 430-450 MHz • RX: 118-549.95, 810-999.990 MHz (cell blkd) • Power: 50/15/5W
- Packet ready (9600 BPS – 6-pin DIN) • Upgradable D-Star DV (digital voice) & GPS capabilities w/optional UT-123

IC-9100 HF/6/2M/440 MHz All Mode

- TX: HF/6/2M/440 MHz • RX: 0.03-60, 136-174, 420-480 MHz • Optional 1.2 GHz, 1-10W Operation
- Power: 2-100W HF/6/2M & 2-75W 440 MHz
- Memories: 297 • Optional D-Star Board • Auto Tuner
- Optional 3 kHz & 6 kHz Roofing Filters (first IF)
- USB Port for CI-V Format PC Control and Audio In/Out

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

PW-1 HF/6M 1KW Linear Amplifier

- TX: 160-15M/6M • Power: 1000W (180-264 VAC), 500W (90-132 VAC) • Automatic band change & antenna tuner • Two input & Four output connectors
- Easily connects to any current Icom HF transceiver

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Regular	$39	$76	$111	Monthly *QST* via standard mail for US members
Canada	$49	$93	$132	Monthly *QST* via standard mail for Canadian members
Intl *QST*	$62	$118	$167	Monthly *QST* via air mail for international members
Intl CD	$39	$76	$111	Annual CD-ROM (*QST*, *NCJ* and *QEX*) for international members
Blind	$8	$16	$24	No *QST* delivery, all other member benefits apply
Family	$8	$16	$24	Reside at the same address as the primary member, no additional *QST*. Membership dates must correspond with primary member.

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Family Member Name _____ Call Sign (if any) _____

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☐ Total enclosed payable to ARRL $ _____

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Card Number _____ Expiration Date _____

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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-281A 2M FM Mobile

- TX: 144-148 MHz • RX: 136-174 MHz
- Power: 65W • Memories: 200


AvMap G6 APRS

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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FT-250R 2M FM HT

• TX: 144-148 MHz • RX: 136-174 MHz
• Power: 5/2/0.5W • Memories: 209

FT-60R 2M/440 FM HT

• TX: 144-148, 430-450 MHz • RX: 108-520, 700-999 MHz (cell blkd) • Power: 5/2/0.5W • Memories: 1000

VX-8GR 2M/440 FM HT w/Built-in GPS

• TX: 144-148, 430-450 MHz • RX: 108-999 MHz (cell blocked) • Memories: 1200+ • Power: 5/2.5/1/0.05W
• GPS unit and antenna is built-in for APRS® data

FT-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!

Quadra System VL-1000

HF/6M 1KW Linear Amplifier

• TX: 160-15M/6M • Power: 1000W on 160-15M & 500W on 6M (220 VAC), 500W (110 VAC)
• Automatic band change & antenna tuner
• Two input & Four output connectors
• Easily connects to any current Yaesu HF transceiver

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 20W using optional FNB-78 13.2V @ 4.5 Ah NiMH battery packs

FT-450D HF/6M Compact Transceiver

• TX: HF/6M • RX: 0.03-56 MHz • Power: 10-100W
• Memories: 500 • Auto Tuner • Same as the FT-450AT with new features: Key illumination, Foot stand, Selectable 300 Hz/500 Hz/2.4 kHz CW IF Filters, Classically designed main dial and knobs, dynamic microphone

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 MTU tune units for 160M, 80/40M and 30/20M bands allowing you to pull through weak signals

FT-2000D RF output is 200W, PS is external

FTDX-5000MP

FTDX-5000 Series – Covers HF and 6M;

Three different configurations all running 10-200W on CW, SSB, FM, RTTY & PKT and 5-50W on AM • RX: 0.03-60 MHz • Memories: 99 • The "D" and "MP" model comes with SM-5000 Station Monitor that features an excellent bandscope • The "MP" also comes with high stability ±0.05ppm OCXO & 300 Hz roofing filter

FTDX-5000 Basic Model & ±0.5ppm TCXO
FTDX-5000D With Station Monitor & ±0.5ppm TCXO
FTDX-5000MP With Station Monitor, ±0.05ppm OCXO & 300 Hz Roofing Filter

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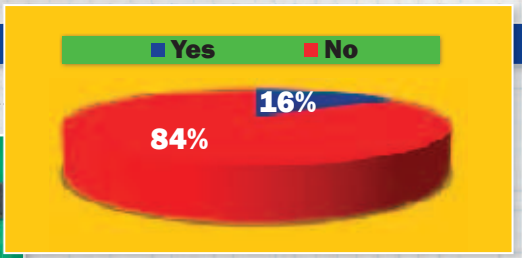
QST QuickStats

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.

www.arrl.org/QuickStats

Online QuickStats Poll Results for July 11 through August 5.
Get on the web and vote today at **www.arrl.org/quickstats**!

Are you active on 6 meter FM?



Is it becoming more difficult to find parts for your homebrew projects?

Yes **57%**
No **25%**
I don't homebrew **18%**

Have your neighbors ever complained about your outdoor antennas?

Yes **15%**
No **80%**
I don't have outdoor antennas **5%**

What is your favorite source for used Amateur Radio equipment?

Online auction sites such as eBay **20%**
Amateur Radio websites **20%**
Hamfest flea markets **36%**
Ham equipment dealers **16%**
Other **8%**

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, $15.95. 4Wx6$^{3}/_{4}$Hx2D 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, $15.95. Includes N-to-SO-239 adapter. 3$^{3}/_{4}$Wx6$^{1}/_{2}$Hx2$^{3}/_{4}$D inches. 1.3 lbs.

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MFJ *IntelliTuner*™ Automatic Tuners

More hams use MFJ tuners than all other tuners in the world!

World's most advanced Automatic Antenna Tuners feature world renowned MFJ AdaptiveSearch™ and AutomaticRecall™ algorithms -- world's fastest ultra-wide range tuning. Nine World Class models! Choose your features: Digital/Analog/Audio SWR-Wattmeter, Antenna Switch, Balun, Radio Interface, Digital frequency readout, Remoteable, Coax/Balanced Lines/Wire Tuning, Field Upgradeable . . .

MFJ-998 1500 Watt *Legal Limit IntelliTuner*™

Only the MFJ-998 gives you fully automatic antenna tuning for your legal limit full 1500 Watts SSB/CW linear amplifier!

MFJ-998 $699.95

Ultra-fast Automatic Tuning

Instantly match impedances from 12-1600 ohms using MFJ's exclusive *IntelliTune*™, *Adaptive Search*™ and *InstantRecall*™ algorithms with over 20,000 *VirtualAntenna*™ Memories.

Safe auto tuning protects amp

MFJ's exclusive *Amplifier Bypass Control*™ makes tuning safe and "stupid-proof"!

Digital/Analog Meters

A *backlit* LCD meter displays SWR, forward/reflected power, frequency, antenna selected, an auto-ranging bargraph power indication, and much more.

Has quick-glance auto-ranging Cross-Needle SWR/Wattmeter.

MFJ VirtualAntenna™ Memory

MFJ new *VirtualAntenna*™ Memory system gives you 4 antenna memory banks for *each* of 2 switchable antenna coax connectors. Select up to 4 antennas on each antenna connector. Each antenna has 2500 memories, 20,000 total. Has binding post for end-fed long wire antennas.

Download & Upgrade Remotely

Download from internet and upgrade your MFJ-998 firmware as new features are introduced.

Plus Much More!

Built-in radio interface controls most transceivers.

Automatically bypasses with excessive tuning power.

Use balanced line antennas with external **MFJ-912, $59.95**, 1.5 kW 4:1 balun.

Small 13Wx4Hx15D inches easily fits into your ham station. 8 pounds. Requires 12-15VDC at 1.4 amps maximum or 110 VAC with **MFJ-1316, $21.95**.

for 600 Watt amps

AL-811/ALS-600/ALS-500

For 600 Watt amps like Ameritron AL-811/ALS-600/ALS-500M. Matches 12-800 Ohms. 10,000 *Virtual Antenna*™ memories. Cross-Needle SWR/Wattmeter. 10Wx2¾Hx9D inches.

MFJ-994B $359.95

***No Matter What*™ Warranty**

Every MFJ tuner is protected by MFJ's famous one year *No Matter What*™ limited warranty. We will repair or replace your MFJ tuner (at our option) for a full year.

300 Watt...Best Seller

Digital Meter, Ant Switch, Balun

The *world's best selling* automatic antenna tuner is *highly acclaimed the world over* for its ultra high-speed, wide matching range, reliability, ease-of-use! Matches virtually *any* antenna.

MFJ-993B $259.95

300 Watt...*Extra* Wide Range

SWR/Wattmeter, 10000 VA Memories

***Extra** wide matching range at less cost.* Exclusive dual power level: 300 Watts/6-1600 Ohms; 150W/6-3200 Ohms. Cross-Needle SWR/Wattmeter.

MFJ-991B $219.95

200 Watt ...Compact

Digital Meter, Ant Switch, Wide Range

World's fastest compact auto tuner uses MFJ *Adaptive Search*™ and *InstantRecall*™ algorithms. 132,072 tuning solutions instantly match virtually any antenna with near perfect SWR.

MFJ-929 $219.95

200 Watt ...Econo

Small, Ant Switch, 20K VA Memories

High-speed, wide matching range and compactness at low cost! Leave in-line and forget it -- your antenna is *always* automatically tuned! 2-position antenna switch.

MFJ-928 $199.95

200 Watt *MightyMite*™

Matches IC-706, FT-857D, TS-50S

***No** extra space needed!* Just set your IC-706/7000, FT-857D, TS-50S on top of this matching low-profile automatic tuner -- it's all you need for a completely automated station using *any* antenna! Just tune and talk!

MFJ-925 $179.95

G5RV Antenna

Covers all bands, 160-10 Meters with antenna tuner. 102 ft. long. Can use as inverted vee or sloper. Use on 160 Meters as Marconi.1500 Watts. Super-strong fiberglass center/feedpoint insulators. *Glazed ceramic* end insulators. All hand-soldered connections. Add coax, some rope and you're *on the air!*

MFJ-1778M, $39.95. G5RV Junior. Half-size, 52 ft. 40-10M with tuner, 1500 Watts.

MFJ-1778 $44.95

200W...Weather-sealed

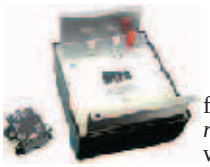
for Remote/Outdoor/Marine

***Fully** weather-sealed for remote Outdoor/Marine use*! Tough, durable, built-to-last the elements for years.

MFJ-926B $399.95

200 Watt...Remote

Coax/Wire Ant, No pwr cable needed



Weather protected fully automatic *remote* auto tuner for wire ***and*** *coax* antennas -- an MFJ exclusive. Powers through coax -- No separate power cable needed.

MFJ-927 $259.95

Free MFJ Catalog

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http://www.mfjenterprises.com for instruction manuals, catalog, info

MFJ TUNERS

New, Improved MFJ-989D 1500 Watt *legal limit* Antenna Tuner

World's most popular 1500 Watt Legal Limit Tuner just got better -- much better -- gives you more for your money!

New, improved MFJ-989D *legal limit* antenna tuner gives you better efficiency, lower losses and a new *true* peak reading meter. It easily handles *full* 1500 Watts SSB/CW, 1.8 to 30 MHz, including MARS/WARC bands.

New dual 500 pF *air variable capacitors* give you twice the capacitance for more efficient operation on 160 and 80 Meters.

New, improved *AirCore*™ *Roller Inductor* gives you lower losses, higher Q and handles more power more efficiently.

New *TrueActive*™ peak reading Cross-Needle *SWR/Wattmeter* lets you read *true* peak power on all modes.

MFJ-989D $389.95

New high voltage *current balun* lets you tune balanced lines at high power with no worries.

New *crank knob* lets you reset your roller inductor quickly, smoothly and accurately.

New larger 2-inch diameter *capacitor knobs* with easy-to-see dials make tuning much easier.

New cabinet maintains components' high-Q. Generous air vents keep components cool. $12^{7}/_{8}$Wx6Hx$11^{5}/_{8}$D inches.

Includes six position ceramic antenna switch, 50 Ohm dummy load, indestructible multi-color Lexan front panel with detailed logging scales and legends.

The MFJ-989D uses the superb time-tested T-Network. It has the widest matching range and is the easiest to use of all matching networks. Now with MFJ's new 500 pF air variable capacitors and new low loss roller inductor, it easily handles higher power much more efficiently.

***No Matter What*™ Warranty**

Every MFJ tuner is protected by MFJ's famous one year *No Matter What*™ limited warranty. We will repair or replace your MFJ tuner (at our option) for a full year.

More hams use MFJ tuners than all other tuners in the world!

MFJ-986 Two knob ***Differential-T***™

MFJ-986 $349.95

Two knob tuning (differential capacitor and *AirCore*™ roller inductor) makes tuning foolproof and easier than ever. Gives minimum SWR at only one setting. Handles 3 KW PEP SSB amplifier input power (1.5 KW output). Gear-driven turns counter, lighted peak/average Cross-Needle SWR/Wattmeter, antenna switch, balun. 1.8 to 30 MHz. $10^{3}/_{4}$Wx$4^{1}/_{2}$Hx15 in.

MFJ-962D ***compact*** kW Tuner

MFJ-962D $299.95

A few more dollars steps you up to a KW tuner for an amp later. Handles 1.5 KW PEP SSB amplifier input power (800W output). Ideal for Ameritron's AL-811H! *AirCore*™ roller inductor, gear-driven turns counter, pk/avg lighted Cross-Needle SWR/Wattmeter, antenna switch, balun, Lexan front, 1.8-30MHz. $10^{3}/_{4}$x$4^{1}/_{2}$ x$10^{7}/_{8}$ in.

MFJ-969 300W ***Roller Inductor*** Tuner

MFJ-969 $219.95

Superb *AirCore*™ Roller Inductor tuning. Covers *6 Meters* thru 160 Meters! 300 Watts PEP SSB. *Active* true peak reading lighted Cross-Needle SWR Wattmeter, *QRM-Free PreTune*™, antenna switch, dummy load, 4:1 balun, Lexan front panel. $3^{1}/_{2}$Hx$10^{1}/_{2}$Wx$9^{1}/_{2}$D inches.

MFJ-949E ***deluxe*** 300 Watt Tuner

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.

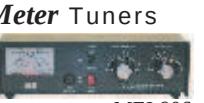
MFJ-904H, $149.95. Same but adds Cross-needle SWR/Wattmeter and 4:1 balun for balanced lines. $7^{1}/_{4}$x$2^{1}/_{4}$x$2^{3}/_{4}$ inches.

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

Visit: http://www.mfjenterprises.com or call toll-free 800-647-1800

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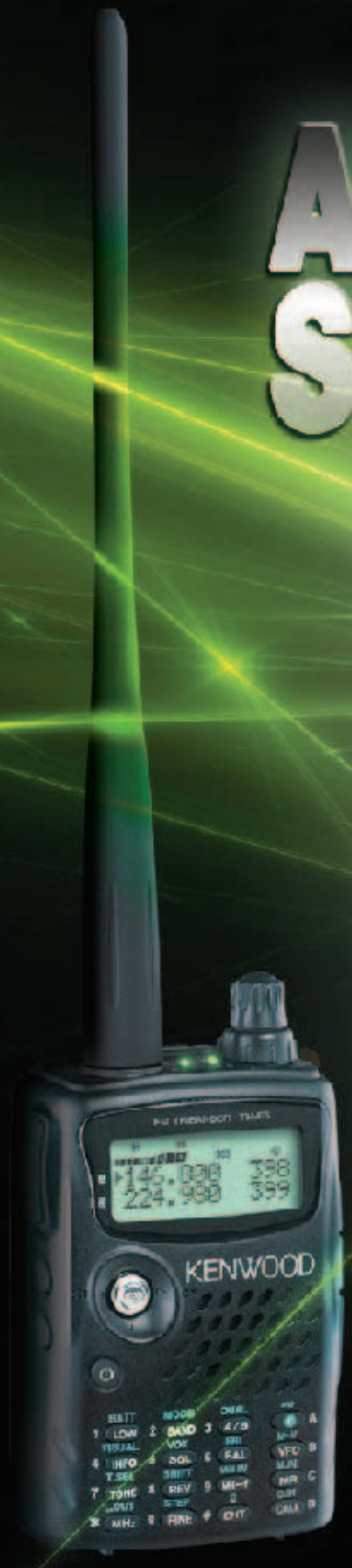
AIRWAVE SUPERIORITY



Never before has a compact HT offered as many features, and such high powered performance as the TH-F6A. Arm yourself with one today and gain your own airwave superiority.

- **Triband 144/220/440 MHz all at 5W**
- **Receives 2 frequencies simultaneously even on the same band**
- **0.1~1300MHz high-frequency range RX (B band)[1]**
- **FM/FM-W/FM-N/AM plus SSB/CW receive**
- **Bar antenna for receiving AM broadcasts**
- **Special weather channel RX mode**
- **435 memory channels, multiple scan functions**
- **7.4V 2000mAh lithium-ion battery (std.) for high output[2] and extended operation**
- **16-key pad plus multi-scroll key for easy operation**
- **Built-in charging circuitry for battery recharge while the unit operates from a DC supply**
- **Tough construction: meets MIL-STD 810 C/D/E standards for resistance to vibration, shock, humidity and light rain**
- **Large frequency display for single-band use**
- **Automatic simplex checker**
- **Wireless remote control function**
- **Battery indicator • Internal VOX • MCP software**

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

TH-F6A
TRIBANDER

KENWOOD

Customer Support: (310) 639-4200
Fax: (310) 537-8235

www.kenwoodusa.com

JQA-1205 091

ADS#38211

Scan with your phone to download TH-F6A brochure.

MFJ 160-6 Meter Antenna

Self-supporting 43 foot vertical -- no guy wires required . . . 1500 Watts . . . exceptional performance . . . low-profile . . . includes base mount and legal limit balun . . . assembles in an hour . . .

MFJ-2990
$359.95

New!

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

Exceptional Performance

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

With an automatic antenna tuner there's no fuss -- just talk!

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

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

Fully self-supporting, Extremely low wind loading, Very low visibility . . .

With just 2 square feet wind load, the fully self-supporting MFJ-2990 -- *no guy wires needed* -- has the lowest wind-loading and lowest visibility of any vertical antenna! The key is a six foot section of tapering diameter *stainless steel* whip that flexes in strong wind instead of stressing the bottom sections. Its 2-inch O.D. and .120 inch thick walled tubing bottom section makes it incredibly strong -- it'll stay up!

Weighs just 20 pounds -- you can easily put it up by yourself because its corrosion resistant *6063 aircraft aluminum* tubing and stainless steel construction make it light *and* super-strong.

Assembles in an hour

You can easily assemble it in an hour! Ground mounting lets you completely hide its antenna base in shrubbery. Includes ATB-65 high-strength antenna mount. Requires ground system -- at least one radial. More extensive ground system will give much better performance.

Great for Stealth Operation in antenna restricted areas

This very low-profile antenna is perfect for stealth operation in antenna restricted areas. Hide it behind trees, fences, buildings, bushes. Use it as a flagpole. Telescope it down during the day. Put it up at night and take it down in the morning before the neighbors even notice!

Quick and easy installation makes it great for DXpeditions, field day and other portable and temporary operations.

MFJ *Automatic* Tuners

MFJ-998
$699.95

For legal limit 1500 Watt SSB/CW amplifiers. Auto-ranging LCD and Cross-Needle SWR/Wattmeter, antenna switch, amp bypass, matches 12-1600 Ohms, 1.8-30 MHz.

MFJ-993B
$259.95

Dual power range -- 300 Watt range matches 6-1600 Ohms. 150 Watt/6-3200 Ohms. Auto-ranging LCD and Cross-Needle SWR/Wattmeter, antenna switch, 1.8-30 MHz.

MFJ *Manual* Tuners

MFJ-989D
$389.95

1500 Watts SSB/CW, 1.8-30 MHz. Active peak-reading Cross-Needle SWR/Wattmeter, balun, dummy load, antenna switch, aircore roller inductor.

MFJ-949E
$179.95

World's most popular tuner! 300 Watts, 1.8-30 MHz. Peak/Average Cross-Needle SWR/Wattmeter, 8 pos. antenna switch, dummy load, 1kV capacitors.

Window Feedthru

MFJ-4602
$69.95

Bring 3 coaxes, balanced line, random wire, ground thru window. Connectors mounted on *stainless steel* panel. 3/4" thick *pressure-treated* weather-proof wood.

Free MFJ Catalog

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• 1 Year *No Matter What*™ warranty • 30 day money back guarantee (less s/h) on orders direct from MFJ

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MFJ Weather-Proof *Window Feedthrough Panels*

Weather-proof window feedthrough panels bring coax, balanced lines, HF/VHF/UHF antennas, random wire antennas, ground, rotator/antenna switch cables and DC/AC power into your hamshack without drilling through walls!

MFJ Weather-Proof *Window Feedthrough Panels* mount in your window sill. Lets you bring all your antenna connections into your hamshack *without* drilling holes through walls.

Simply place in window sill and close window. One cut customizes it for any window up to 48 inches. Use horizontally or vertically. Connectors are mounted on inside/outside stainless steel plates and attached to a 4 foot long, 3½ inch high, ¾ inch thick *pressure-treated* wood panel. Has excellent insulating properties. Weather-sealed with a heavy coat of long-lasting white outdoor enamel paint. Edges sealed by weather-stripping. Seals and insulates against all weather conditions. Includes window locking rod.

Inside/outside stainless steel plates ground all coax shields. Stainless steel ground post brings ground in.

MFJ-4603 Universal Window Feedthru Panel

MFJ-4603 $89.95

Four 50 Ohm *Teflon*® SO-239 coax connectors lets you feed HF/VHF/UHF antennas at full legal power limit.

A 50 Ohm *Teflon*® coax *N-connector* lets you use any antenna up to 11 GHz, including 450 MHz, UHF, satellite, moon bounce and 2.4/5.8 GHz Wi-Fi antennas.

A 75 Ohm, 1 GHz *F-connector* makes it easy to bring in television, Satellite, HD, cable TV and FM radio signals.

A pair of high-voltage *ceramic feedthru insulators* lets you bring in 450/300 Ohm balanced lines directly to your antenna tuner.

Has random/longwire antenna *ceramic feedthru insulator*.

***5-way** binding posts* lets you supply 50 Volts/15 Amps DC/AC power to your outside antenna tuners/relays/switches.

Stainless ground post brings in ground connection, bonds inside/outside stainless steel panels together and drains away static charges.

MFJ's exclusive *Adaptive Cable Feedthru*™ lets you bring in rotator/antenna switch cable, etc. without removing connectors (up to 1¼X1⅝ in). Adapts to virtually *any* cable size. Seals out rain, snow, adverse weather.

3 Coax, Balanced Line, Random Wire

Best Seller! 3 *Teflon*® coax connectors for HF/VHF/UHF antennas. Separate high voltage *ceramic* feed-thru insulators for balanced lines and longwire/random wire, Stainless steel ground post.

MFJ-4602 $69.95

6 Coax

6 high quality *Teflon*® coax connectors for HF/VHF/UHF antennas. Stainless steel ground post. Full 1500 Watt legal limit.

MFJ-4601 $59.95

4 Balanced Line, 2 Coax

4 pairs of high-voltage *ceramic* feed-thru insulators for balanced lines and 2 coax connectors.

New! MFJ-4600 $79.95

5 Cables, any-size

5 *Adaptive Cable Feedthrus*™. Pass any cable with connector: 2 cables with large connectors up to 1¼x1⅝ inches and 3 cables with UHF/N size coax connectors. Seals out weather.

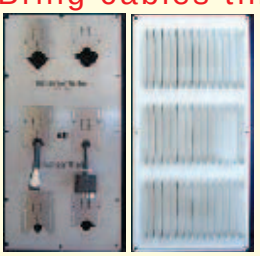
MFJ-4604 $99.95

All-Purpose FeedThru/CableThru™

***Stacks** MFJ-4603 **and** MFJ-4604!* Gives you every possible cable connection you'll ever need through your window without drilling holes in wall -- including UHF, N and F coax connectors, balanced lines, random wire, ground, DC/AC power and cables of any size for rotators, antenna switches, etc.

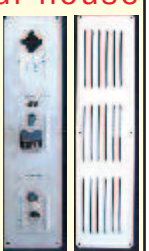
MFJ-4605 $159.95 New!

Bring cables thru eave of your house



MFJ-4616 shown with standard full-size vent (not included) it replaces. For *6 Cables* $26.95

MFJ-4613 shown with standard half-size vent (not included) it replaces. For *3 Cables* $14.95



Replace your standard air vents on the eave/sofitt of your house with these *MFJ AdaptiveCable*™ *Air Vent Plates* and…

Bring in coax, rotator, antenna switch, power cables, etc. *with connectors* up to 1¼x1⅝ inches!

Sliding plates and rubber grommets adjust for virtually any cable size to seal out adverse weather, insects and varmints. Use existing vent hole, mounting screws and screw holes.

AdaptiveCable™ *Wall Plates*

MFJ-4614 *For 4 Cables* $34.95

Bring nearly any cable -- rotator, antenna switch, coax, DC/ AC power, etc. -- through walls *without removing connectors* (up to 1¼x1⅝ inches). Sliding plates and rubber grommets adjust hole size to weather-seal virtually any size cable.

Includes *stainless steel* plates for each side of wall, sliding plates, rubber grommets, weather stripping and screws.

MFJ-4612 *For 2 Cables* $24.95

MFJ-4611 *For 1 Cable* $14.95

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http://www.mfjenterprises.com for more info, catalog, manuals, dealers

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

MFJ-4225MV **$99.95**

22 Amps continuous, 25 Amps maximum. Like MFJ-4125 but adds Volt/Amp meters, cigarette lighter plug. Adjustable 9-15 VDC Output. 5¼Wx 4½Hx6D in. Weighs 3.7 lbs. Use 85-135 VAC or 170-260 VAC input. Replaceable fuse.

40 Amp Continuous

MFJ-4245MV **$149.95**

40 Amps continuous, 45 Amps max. Adjustable 9-15 VDC output. Volt/Amp meters, cigarette lighter plug, front 5-way binding posts, two rear quick connects. 5.5 lbs. 7½Wx 4¾Hx9D inches. Use 85-135 VAC or 170-260 VAC input. Replaceable fuse.

70 Amp Continuous

MFJ-4275MV **$249.95**

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!

High Current Multiple DC Power Outlets

Power multiple Transceivers/accessories from a* single *DC power supply . . . Keeps you neat, organized and safe . . .Prevents fire hazard . . . Keeps wires from tangling up and shorting . . . Fused and RF bypassed . . . 6 foot, 8 gauge color coded cable . . .

Versatile 5-Way Binding Posts

MFJ-1118 **$84.95**

MFJ-1118, $84.95. Power two HF and/or VHF rigs and six accessories from your main 12 VDC supply. *Built-in 0-25 VDC voltmeter*. Two pairs 35 amp 5-way binding posts, fused and RF bypassed for transceivers. Six pairs RF bypassed binding posts provide 15 Amps for accessories. Master fuse, ON/OFF switch,"ON" LED. 12½x2¾x2½ in.

MFJ-1116 **$59.95**

MFJ-1116, $59.95. 8 pairs binding posts, 15A total.Voltmeter, on/off switch.

MFJ-1112 **$44.95**

MFJ-1112, $44.95. 6 pairs binding posts, 15 Amps total.

MFJ-1117 **$64.95**

MFJ-1117, $64.95. Powers *four* transceivers simultaneously (two at 35 Amps each and two at 35 Amps combined). 8x2x3 inches.

All PowerPoles™

MFJ-1128 **$104.95**

MFJ-1128, $104.95. 3 high-current outlets for transceivers. 9 *switched* outlets for accessories. Mix & match included fuses as needed (one-40A, one-25A, four-10A, four-5A, three-1A fuses installed). 0-25 VDC *Voltmeter*. Extra contacts, fuses. 12Wx1¼Hx2¾D".

MFJ-1126 **$84.95**

MFJ-1126, $84.95. 8 outlets, each fused, 40 Amps total. Factory installed fuses: two 1A, three 5A, two 10A, one 25A, one 40A. *0-25 VDC Voltmeter*. Includes *extra PowerPoles®, extra* fuses -- *no extra cost*. 9Wx1¼Hx2¾ inches.

MFJ-1129 **$114.95**

PowerPoles™ AND 5-Way Binding Posts

MFJ-1129, $114.95. 10 outlets each fused, 40 Amp total. 3 high-current outlets for rigs -- 2 *PowerPoles®* and one 5-way binding post. 7 *switched* outlets for accessories (20A max) -- 5 *PowerPoles®* and 2 binding posts. Fuses include (1- 40A, 2-25A, 3-10A, 3-5A, 2-1A installed). *0-25 VDC Voltmeter*. Includes extra *PowerPoles®* and fuses, 12½Wx1¼Hx2¾D inches.

MFJ-1124 **$64.95**

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30 Amps Continuous

Linear with 19.2 lb.Transformer

This heavy-duty linearly regulated MFJ-4035MV has *abolutely no RF Hash*. It delivers 30 Amps continuous, 35 Amps maximum from its massive 19.2 lb. transformer. Front panel adjustable 1-14 VDC output with convenient detent at 13.8 VDC. Volt/Amp Meters. 1% load regulation, 30 mV ripple. Over-voltage/current/temperature protection, 5-way binding posts, 2 pairs of quick-connects and a covered cigarette lighter socket for mobile accessories. Front panel replaceable fuse. 110 VAC input. 9½Wx6Hx9¾D in.

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MFJ *Pocket size* Morse Code Reader™

Hold near your receiver -- it instantly displays CW in English! Automatic Speed Tracking . . . Instant Replay . . . 32 Character LCD . . . High-Performance Modem . . . Computer Interface . . . Battery Saver . . . More!

Is your CW rusty?

Relax and place this tiny pocket size MFJ Morse Code Reader near your receiver's speaker . . .

Then watch CW turn into solid text messages as they scroll across an easy-to-read LCD display.

No cables to hook-up, no computer, no interface, nothing else needed!

Use it as a backup in case you mis-copy a few characters - - it makes working high speed CW a breeze - - even if you're rusty.

Practice by copying along with the MFJ-461. It'll help you learn the code and increase your speed as you instantly see if you're right or wrong.

Eavesdrop on interesting Morse code QSOs from hams all over the world. It's a universal language that's understood the world over.

MFJ *AutoTrak*™ automatically locks on, tracks and displays CW speed up to 99 Words-Per-Minute.

Simply place your MFJ-461 close to your receiver speaker until the lock LED flashes in time with the CW. Digs out weak signals. Phase-Lock-Loop even tracks slightly drifting signals.

MFJ-461 $89.95

Of course, nothing can clean up and copy a sloppy fist, especially weak signals with lots of QRM/QRN.

The MFJ-461's serial port lets you display CW text full screen on a bright computer monitor -- just use your computer serial port and terminal program.

When it's too noisy for its microphone pickup, you can connect the MFJ-461 to your receiver with a cable. A battery saving feature puts the MFJ-461 to sleep during periods of inactivity. It wakes up and decodes when it hears CW.

Uses 9 Volt battery. Fits in your shirt pocket with room to spare - smaller than a pack of cigarettes. Tiny 2¼x3¼x1 inches. 5½ ounces.

Super easy-to-use! Just turn it on -- it starts copying instantly!

MFJ-26B, $9.95. Soft leather protective pouch. Clear plastic overlay for display, push button opening, strong, pocket/belt clip secures MFJ-461.

MFJ-5161, $16.95. MFJ-461 to computer serial port cable (DB-9).

MFJ-5162, $7.95. Receiver cable connects MFJ-461 to your radio's external speaker 3.5 mm jack.

MFJ-5163, $10.95. Cable lets you use external speaker when MFJ-461 is plugged into radio speaker jack. 3.5 mm.

MFJ Morse Code *Reader and Keyer* Combination

Plug MFJ's CW Reader with Keyer into your transceiver's phone jack and key jack.

Now you're ready to compete with the world's best hi-speed CW operators -- and *they won't even know you're still learning the code!* Sends and reads 5-99 WPM.

Automatic speed tracking. Large 2-line LCD shows send/receive messages. Use paddle or computer keyboard.

Easy menu operation. Front panel speed, volume controls. 4 message memories, type ahead buffer, read again buffer, adjustable weight/sidetone, speaker. RFI proof.

MFJ-464 $199.95 *(Keyboard, paddle not included.)*

MFJ-551, $39.95. RFI suppressed keyboard, a must to avoid RFI problems.

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MFJ-564 Chrome
MFJ-564B Black
$69.95

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MFJ-557 $39.95

MFJ-557 Deluxe Code Practice Oscillator has a Morse key and oscillator unit mounted together on a heavy steel base -- stays put on your table! Portable. 9-Volt battery or 110 VAC with MFJ-1312D, $15.95. Earphone jack, tone and volume controls, speaker. Adjustable key. Sturdy. 8½x2¼x3¾ inches.

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MFJ-108B, $21.95. Dual 24/12 hour clock. Read UTC *and* local time *at-a-glance.* High-contrast 5/8" LCD, brushed aluminum frame. Batteries included. 4½Wx1Dx2H in.

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MFJ-407D $79.95

MFJ-401D, $69.95. Econo Keyer II has front-panel volume/speed controls (8-50 wpm), tune switch. Internal adjust weight, tone. Solid state keying. Tiny 4x2x3½ inches.

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MFJ-422D $189.95

Best of all CW worlds -- a *deluxe MFJ Curtis*™ *keyer* that fits right on *Bencher paddle*! Adjustable weight and tone, front panel volume and speed controls (8-50 WPM), built-in dot-dash memories, speaker, sidetone, semi-automatic/tune or automatic modes. Use 9V battery or 110 VAC with MFJ-1312D, $15.95. 4⅛x2⅝x5¼ in.

MFJ-422DX, $99.95.

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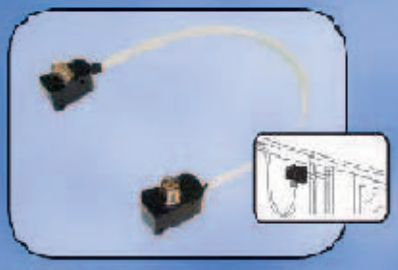

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Window Gap Adapter!

Max Power: [illegible] 100W PEP
VHF: 60W FM
UHF: 40W FM
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VSWR: <500MHz 1.3:1
>500MHz 1.5:1
Impedance: 50Ohm
Length: 15.75'
Conn: 24k Gold Plated SO-239s

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Ultra-Compact 8 Band Antenna!

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

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

Each band tunes independently
Approx 2:1 band-width:
80M 22kHz
40M 52kHz
20M 52kHz
15M 134kHz
10M 280kHz

COMET CHA-250B
Broadband HF Vertical!

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

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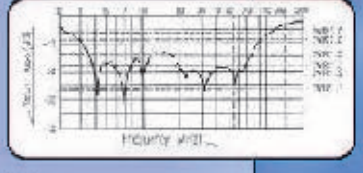
If you suffer from an antenna restricted area, must manage with space restrictions or you simply want to operate incognito you will be forced to make significant antenna compromises. The CHA-250B makes the most of the situation, making operating HF easy!!

Max Power: 250W SSB/125W FM
TX: 3.5 - 57MHz
RX: 2.0 - 80MHz
Impedance: 50Ohm
Length: 23'5"
Weight: 7lbs 1 oz
Conn: SO-239
Max Wind Speed: 67 MPH



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

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SWR: Less than 1.5:1 at center frequency
Rotation Radius: "V" 12'6" "H" 17'5"
Length: "V" 24'5" "H" 33'10"
Weight: 11 lbs 14 ozs
Wind load: 3.01 sq feet
Max Wind Speed: 87 MPH

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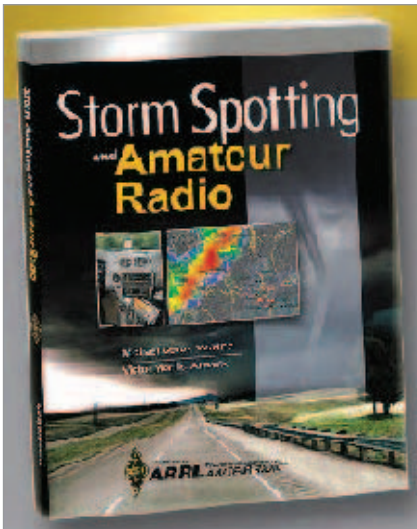

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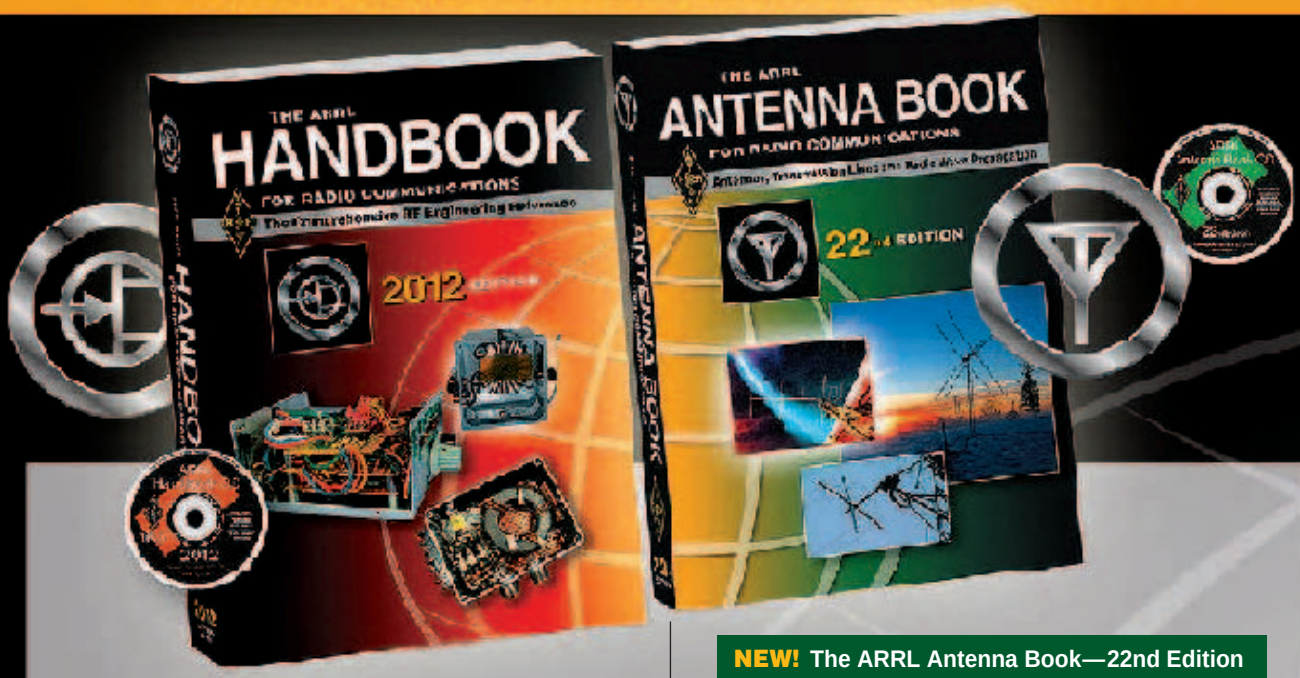

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PM-30
$89.95
PM-30UV
$99.95

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.
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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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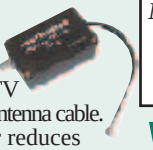
Installs between VCR/TV and cable TV/antenna cable. Eliminates or reduces interference caused by nearby HF transmitters.



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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

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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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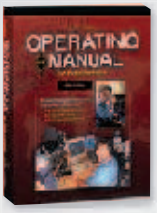

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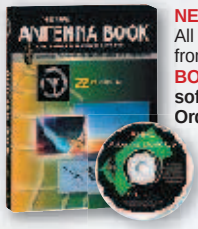

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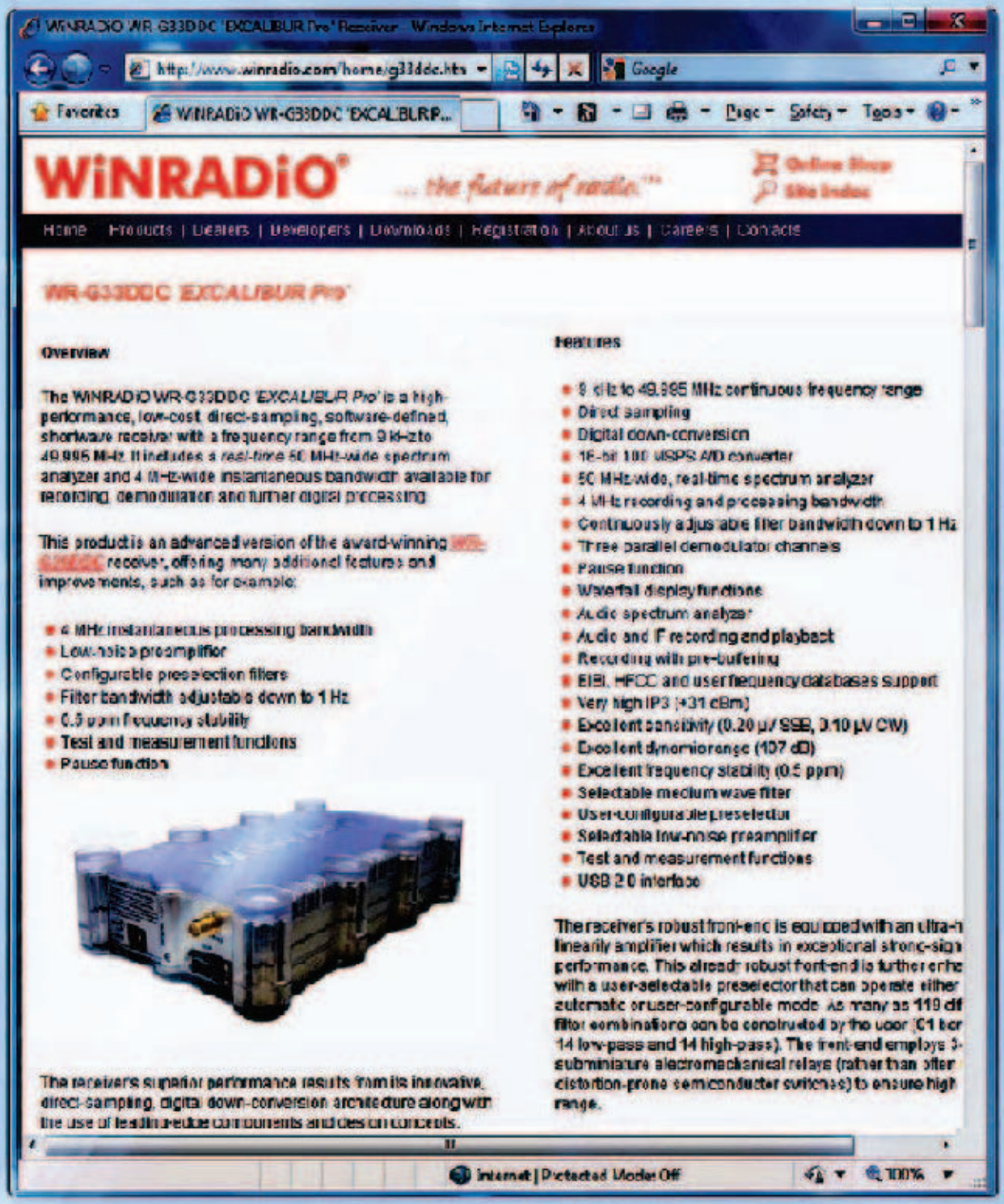

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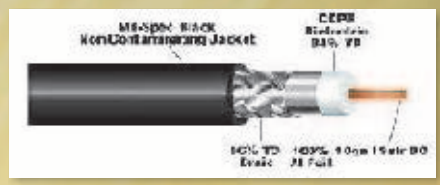

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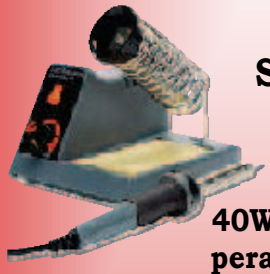

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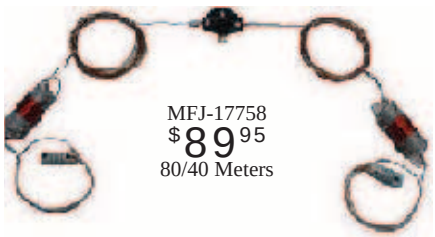

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34051	3M™ LED Tape Light Utility Vehicle – Standard Kit* (one light strip)	4 ft. (1.22 m)	1	2
34052	3M™ LED Tape Light Utility Vehicle – Deluxe Kit* (two light strips)	4 ft. (1.22 m)	1	2

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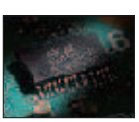

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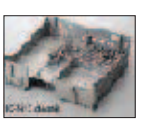

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AD/DA Converters

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3 Roofing Filters

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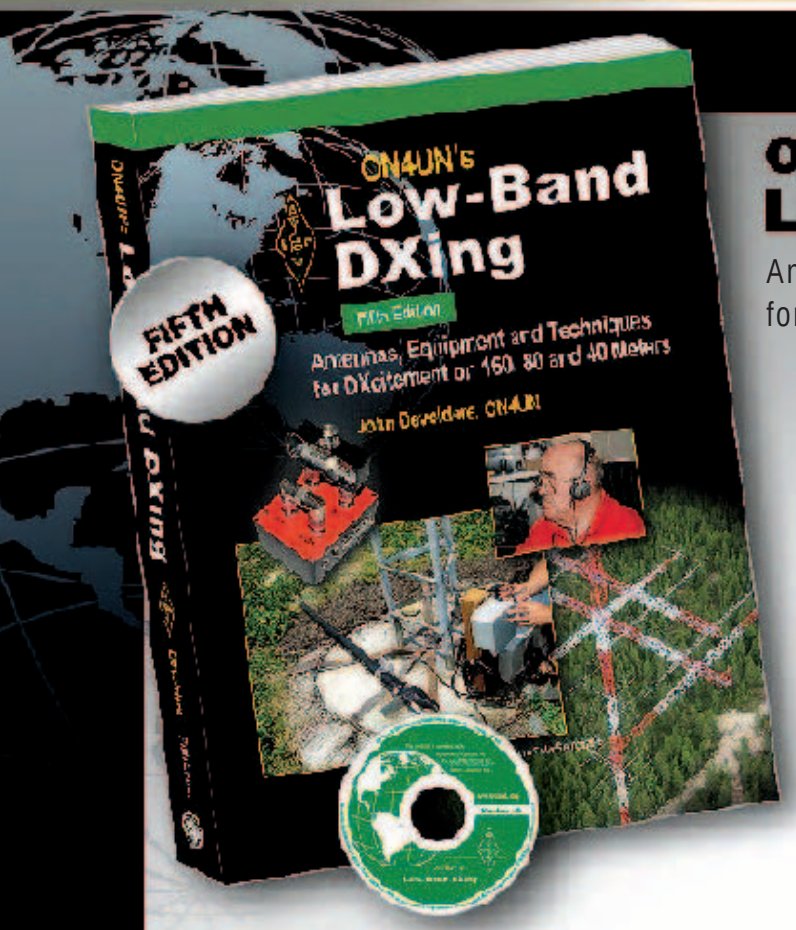

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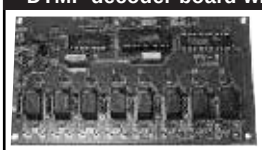

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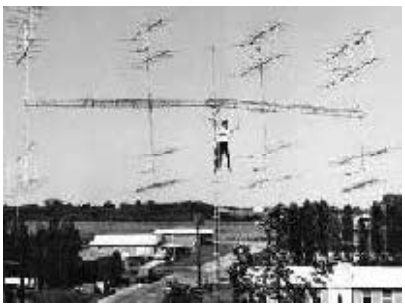

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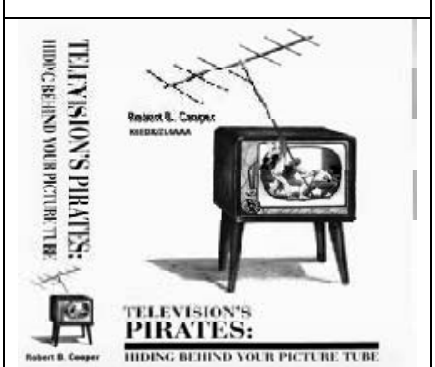

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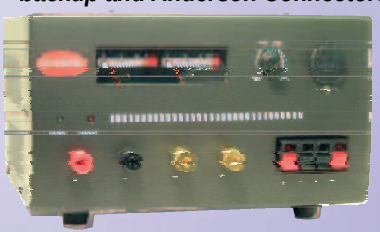

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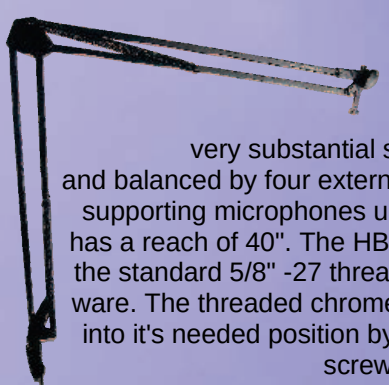

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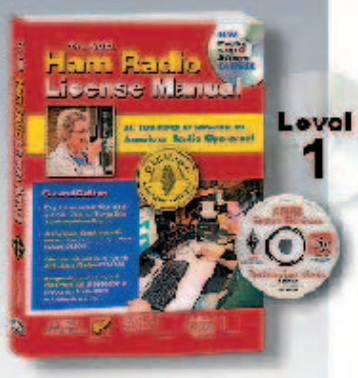

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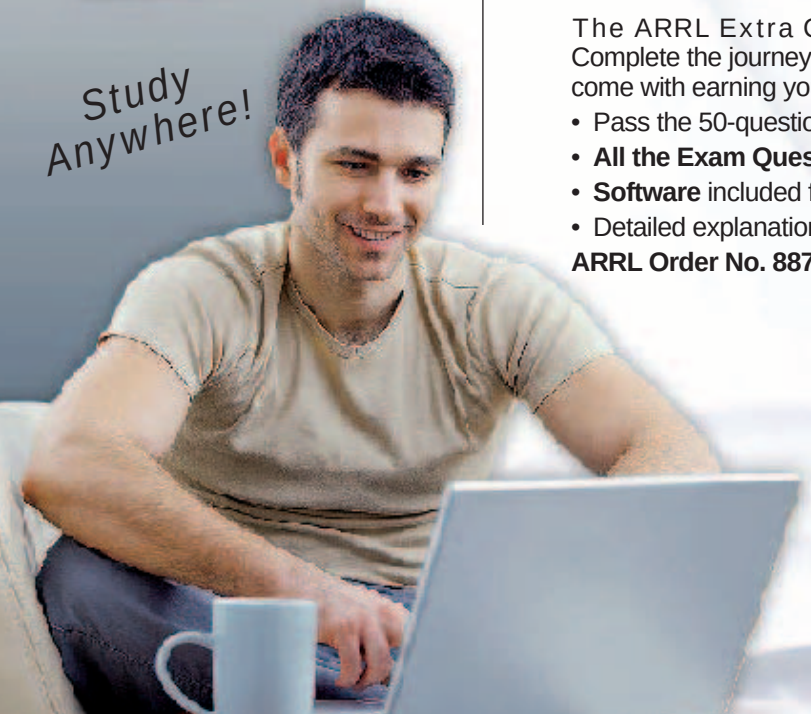

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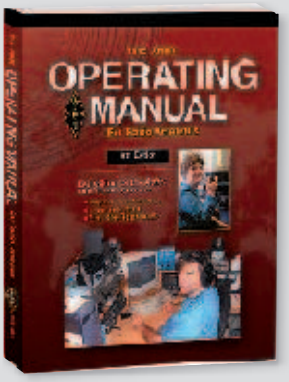

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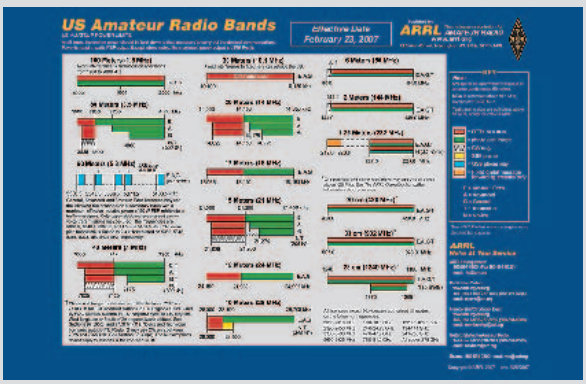

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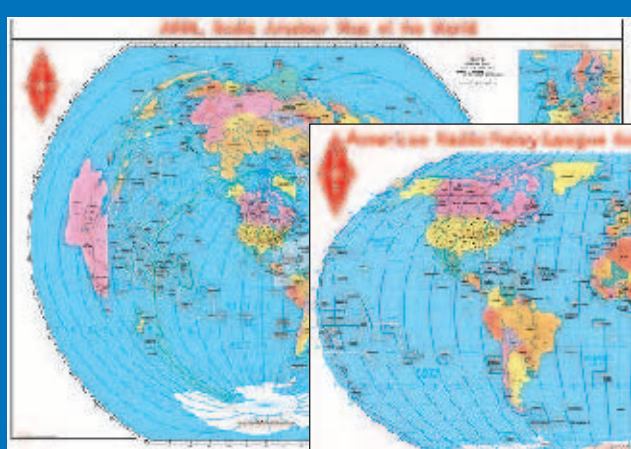

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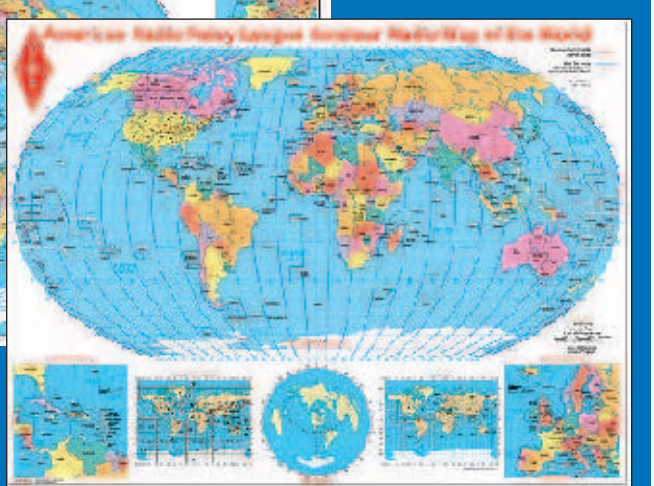

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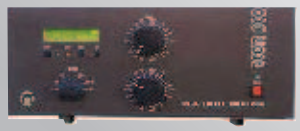

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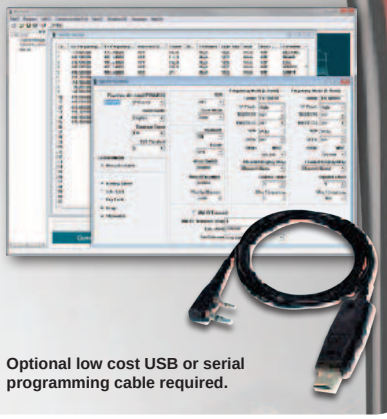

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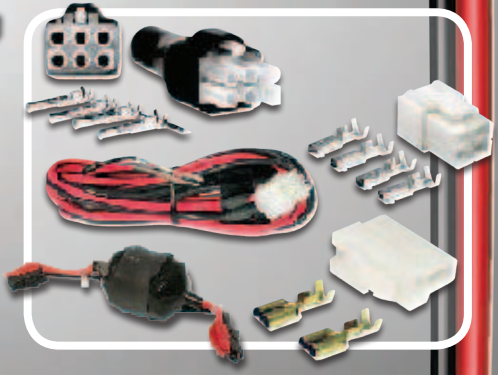

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