QST

Official Journal of ARRL The national association for AMATEUR RADIO

Devoted entirely to **Amateur Radio**

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November 2008

QST reviews:

Battery Boost Regulators from **TG Electronics** and **MFJ Enterprises**

DSP Speakers: **GAP Hear It Speaker** and **West Mountain Radio CLRspkr**

The 2008 Photo Contest

Inside:

How To Deal With CC&Rs

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HAM-IV
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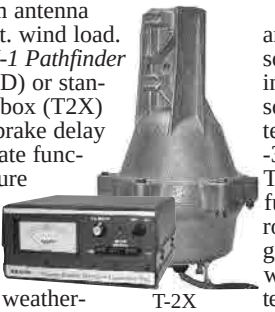
The most popular rotator in the world! For medium communications arrays up to 15 square feet wind load area. *New* 5-second brake delay! *New* Test/Calibrate function. *New* low temperature grease permits normal operation down to -30 degrees F. *New* alloy ring gear gives extra strength up to 100,000 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

For ***king-sized*** antenna arrays up to 25 sq.ft. wind load area. Control cable connector, *new* hardened stainless steel output shaft, *new* North or South centered calibration, *new* ferrite beads on potentiometer wires reduce RF susceptibility, *new* longer output shaft keyway adds reliability. Heavy-duty self-centering steel clamp and hardware. Display accurate to 1°. Machined steel output.

HDR-300A Rotator Specifications	
Wind load capacity (inside tower)	25 square feet
Wind Load (w/ mast adapter)	**not applicable**
Turning Power	5000 in.-lbs.
Brake Power	**7500 in.-lbs.**
Brake Construction	solenoid operated locking
Bearing Assembly	**bronze sleeve w/rollers**
Mounting Hardware	stainless steel bolts
Control Cable Conductors	**7**
Shipping Weight	61 lbs.
Effective Moment (in tower)	**5000 ft.-lbs.**

ROTATOR OPTIONS

MSHD, $99.95. Heavy duty mast support for T2X, HAM-IV and HAM-V.
MSLD, $39.95. Light duty mast support for CD-45II and AR-40.
TSP-1, $34.95. Lower spacer plate for HAM-IV and HAM-V.

Digital Automatic Controller

DCU-1
$749.95

Automatically controls T2X, HAM-IV, V rotators. 6 presets for favorite headings, 1° accuracy, 8-sec. brake delay, choice for center of rotation, crisp *plasma* display. Computer controlled with many logging/contest programs.

AR-35 Rotator/Controller

AR-35
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For UHF, VHF, 6-Meter, TV/FM antennas. Includes automatic controller, rotator, mounting clamps, mounting hardware. 110 VAC. One Year Warranty.

RBD-5
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NEW! Automatic Rotator Brake Delay

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Footprint: 1.1"x .75"
Max Antenna: 40"

For Medium Size Antennas

MODEL / ANT CONN / COAX CONN

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

For Tall or Multi-band HF Antennas

MODEL / ANT CONN / COAX CONN

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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Contents

This Month in QST

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Technical

News and Features

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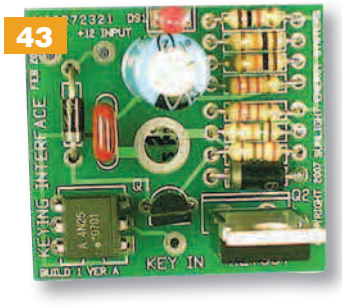
QST Workbench



Our Cover
The results of the Third Annual ARRL Photo Contest are in! With more than 60 submissions (our most ever!), the judges had a difficult time choosing the best ones. This month's cover boasts three winners: Steven Reyer, WA9VNJ, of Mequon, Wisconsin, took our background photo, a composite shot featuring a Mexican beach, QSL cards and a keyer paddle. The upper photo, taken by Serge Ticknor, W7MC, of Phoenix, Arizona, shows off his 10-20 meter Tennadyne T6 LPDA and 10 meter Cushcraft Ringo. The lower photo is a self-portrait of Paul Signorelli, WØRW, with a PRC319 Backpack Pedestrian Mobile, 10 foot whip, shot near his home in Colorado Springs. Check out the rest of the winners, including the first place photo, on page 20.

Radiosport

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10 W 2 m/70 cm*
Dual Band FM Mobile
FTM-10SR *70 cm 7 W

Great New Features to Support Outdoor Motor Sports Activities
Mobile Transceiver... Great Appearance ... Easy to Operate

DUAL BAND DUAL RECEIVE

50 W 2 m/70 cm*
Dual Band FM Mobile
FTM-10R *70 cm 40 W

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1.5 W Ultra Compact
2 m/70 cm Dual Band FM Hand held
VX-3R

50 W 2 m Ultra Rugged VHF FM Mobile
FT-1802M 2 m Band

65 W 2 m Rugged FM Mobile
FT-2800M 2 m Band

QUAD BAND DUAL RECEIVE

50 W 10 m/6 m/2 m/70 cm*
Quad Band FM Mobile
FT-8900R *70 cm 35 W

DUAL BAND DUAL RECEIVE

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

DUAL BAND

50 W 2 m/70 cm*
Dual Band FM Mobile
FT-7800R *70 cm 35 W

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6 m/2 m/70 cm Tri-Band FM Hand held
6 m / 2 m / 70 cm Tri-Band
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VX-6R

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HF/50 MHz 100 W Transceiver

FT-950

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- Original YAESU IF DSP advanced design, provides comfortable and effective reception. IF SHIFT / IF WIDTH / CONTOUR / NOTCH / DNR
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- Built-in high stability TCXO (±0.5 ppm after 1 minute@77 ° F)
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- Large Multi-color VFD (Vacuum Fluorescent Display)
- Optional Data Management Unit (DMU-2000) permits display of various operating conditions, transceiver status and station logging.
- Optional RF μ -Tune Units for 160 m, 80/40 m and 30/20 m Bands

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

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

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

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

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

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

DMU-2000
Data Management Unit (option)

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"It Seems to Us"

The Next Time Could Be Different

"Labor Day Weekend 2008 and the two that followed will be long remembered at ARRL Headquarters. On three successive weekends major tropical events made landfall in the United States: Hurricane Gustav in Louisiana on September 1, Tropical Storm Hanna in South Carolina on September 6, and Hurricane Ike in Texas on September 13. The three siblings inflicted death and severe destruction on our Caribbean neighbors — but bad as they were, they did not create the sort of havoc on our shores that followed Katrina's visit to New Orleans and southern Mississippi three years ago."

Gustav was eerily similar to Katrina and could have landed the same sort of blow on New Orleans. The volunteers in the ARRL field organization and the staff in Newington were ready for this worst-case scenario. One of the changes we made since 2005 was to hire Dennis Dura, K2DCD as full-time ARRL Emergency Preparedness & Response Manager. Using new teleconference facilities that we acquired after Katrina, prior to landfall Dennis organized regular conference calls so the volunteer leaders in the potentially affected areas could brief one another and coordinate among themselves. This also let us in Newington — a staff team was present for each call — know what external resources might be needed. We shipped several sets of Ham Aid "Go Kits" to staging locations in the Gulf area so the equipment could be put to use as soon as it might be needed; some gear saw service as soon as it arrived. Fortunately, Gustav's path took it west of New Orleans and spared the evacuated city the full force of its wind and waves.

Hanna kept the forecasters guessing where it might go as it meandered around the Turks & Caicos Islands. The storm finally decided to bypass Florida and move up the Eastern Seaboard. ARRL preparations were along the same lines as for Gustav, with the ultimate focus on the field organizations in North and South Carolina. Except for local flooding and power outages, Hanna did not leave too much of a mark — but already there was another storm brewing that would turn out to be the worst of the lot.

For three days, Hurricane Ike raked Cuba from east to west before heading toward Texas. Initially the forecasters could not pinpoint what area would be hit the hardest, but eventually Ike took dead aim on Galveston and Houston — the fourth most populous city in the country. Once again we prepared for the worst-case scenario, relying mainly on the same volunteers who had put in many hours for Gustav less than two weeks earlier (and some of whom had been involved in the early stages of Hanna). The voices on the conference calls were becoming pretty familiar!

Galveston Island and the Bolivar Peninsula will never look the same as they did before September 13. Houston itself experienced widespread but relatively minor damage, although the disruptions to normal life caused by massive power outages are continuing as these words are being written, ten days later. Ike's effects are still being felt many miles from Galveston Bay. Thousands of dislocated people are still being sheltered and fed — some not yet allowed to return home, and many with no homes left to return to. In addition, a great swath of the country's midsection felt the wind and rain of Ike's remnants. On top of that, at the same time the hurricane was hitting the Texas coast the remnants of a Pacific storm were dumping torrents on parts of West Texas.

Despite this extraordinary chain of meteorological events, normal communications facilities held up pretty well. This was in sharp contrast to Katrina, which wiped out a large part of the communications infrastructure of southern Louisiana and Mississippi. Amateur Radio operators and equipment were in place and ready at many Emergency Operations Centers before the 2008 hurricanes struck, but by and large were not called upon to supply critical communications links. Cellphone providers were able to maintain service to most of their customers, again in sharp contrast to Katrina. When the voice circuits became overloaded, text messages could still get through. At least until their cellphone batteries ran down, most people were able to call for assistance and to stay in touch with loved ones even if their power was off and the landlines were down.

This is good news. At least in the telecommunications field, Katrina's lessons were well learned. Our hats are off to the communications professionals — many of them hams — who made it happen.

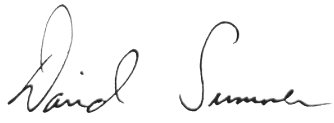
Does this mean that Amateur Radio no longer has a role to play? Absolutely not! Emergency managers must have the assurance that backup communications will be there when it's needed. Cash-strapped non-governmental disaster response organizations continue to rely on Amateur Radio volunteers to support their mission of delivering aid directly to the affected public.

Amateurs in the affected areas received many communications assignments and were able to carry them out with available personnel. However, it is somewhat sobering that we were not able to assemble a longer list of qualified volunteers willing to be deployed, had they been needed, from adjacent areas. We will be working to improve this in the future.

Even more sobering is the thought of what could have happened — and what no doubt *will* happen sometime — if things had been just a bit different. Gustav could have made a direct hit on New Orleans. Hanna could have swept across Florida. Ike came ashore as a Category 2 hurricane; had it been a Category 4 or 5, literally millions of people would have been forced from their homes.

Not every hurricane season is going to be like 2005. Not every storm is going to be a Katrina. But when they are, we must be prepared.

It is better to be ready and not needed, than to be needed and not ready.



David Sumner, K1ZZ
ARRL Chief Executive Officer

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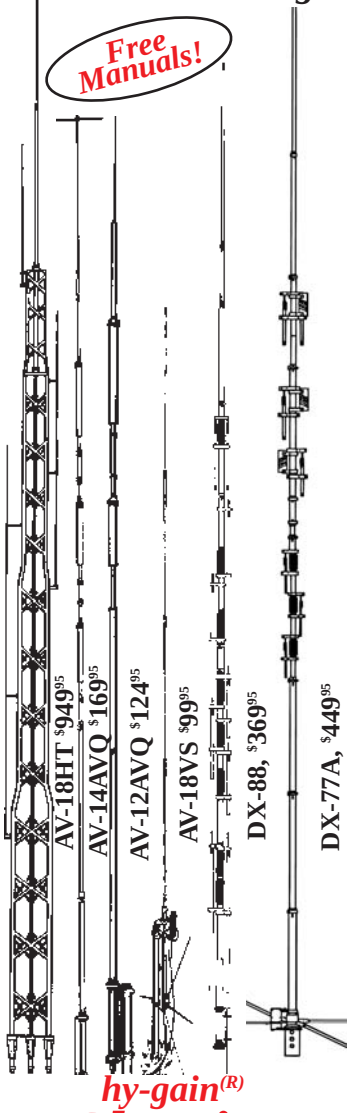

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Standing 53 feet tall, the famous *Hy-Gain HyTower* is the world's best performing vertical! The AV-18HT features automatic band selection achieved through a unique stub-decoupling system which effectively isolates various sections of the antenna so 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, $169.95. (10,15,20,40 Meters). 18 ft., 9 lbs. **The** Hy-Gain AV-14AVQ uses the same trap design as the famous Hy-Gain Thunderbird beams. Three separate air dielectric Hy-Q traps with oversize coils give superb stability and 1/4 wave resonance on all bands. Roof mount with Hy-Gain AV-14RMQ kit, $89.95.

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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.

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***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
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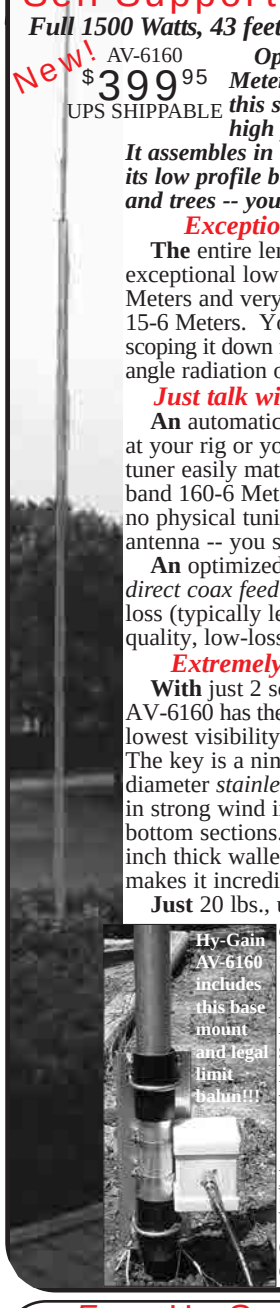
AV-14AVQ	**$169.95**	**10,15,20,40**	**1500 W PEP**	**18 feet**	**9 pounds**	**80 MPH**	**1.5-1.625"**
AV-12AVQ	$124.95	10,15,20 M	1500 W PEP	13 feet	9 pounds	80 MPH	1.5-1.625"
AV-18VS	**$99.95**	**10 - 80 M**	**1500 W PEP**	**18 feet**	**4 pounds**	**80 MPH**	**1.5-1.625"**
DX-88	$369.95	10 - 40 M	1500 W PEP	25 feet	18 pounds	75 mph no guy	1.5-1.625"
DX-77A	**$449.95**	**10 - 80 M**	**1500 W PEP**	**29 feet**	**25 pounds**	**60 mph no guy**	**1.5-1.625"**

Hy-Gain 160-6 Meters Self-Supporting Vertical

Full 1500 Watts, 43 feet, includes base mount

New! AV-6160 $399.95 UPS SHIPPABLE

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



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The entire length radiates to provide exceptional low angle radiation 160-17 Meters and very good performance on 15-6 Meters. You can shorten it by telescoping it down for more effective low angle radiation on higher bands.

Just talk with automatic tuner!

An automatic or manual antenna tuner at your rig or your rig's internal auto-tuner easily matches this antenna for all band 160-6 Meters operation. 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 with good quality, low-loss coax).

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With just 2 square feet wind load, the AV-6160 has the lowest wind-loading and lowest visibility of any vertical antenna! The key is a nine foot section of 1/8" diameter *stainless steel* whip that flexes in strong wind instead of stressing the bottom sections. Its 2-inch O.D.and .120 inch thick walled tubing bottom section makes it incredibly strong.

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

Assembles in an hour

Ground mounting hides antenna base in shrubbery. Requires at least one radial, but more the better.

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This Just In

Joel P. Kleinman, N1BKE
jkleinman@arrl.org

In Brief

- In the wake of three significant hurricane/tropical storm emergencies, ham radio operators in a number of states offered their communications skills to served agencies. See this month's Happenings for details.
- The third annual ARRL On-Line Auction kicks off October 23.
- Brennan Price, N4QX, has returned to the ARRL HQ staff as Technical Relations Manager. See Happenings for details.
- ARRL members can now access an archive of PDF copies of *QST* articles and columns from December 1915 through December 2004.
- Army MARS operators deployed in Iraq offered to relay health and welfare messages from family members who were impacted by the September storms to troops serving in Iraq.
- The Executive Committee of IARU Region 2 held its annual meeting in Lima, Peru in late August.
- The American Red Cross has clarified its policy concerning the participation of ham radio operators in passing health and welfare messages.
- The ARRL has applied to the FCC for expansion of the 500 kHz experimental license WD2XSH.
- The winner of the *QST* Cover Plaque Award for August is Steven Weber, KD1JV, for his article "A 40 Meter CW/SSB Transceiver for the Homebrew Challenge."
- The following conventions were held during September: Southwestern Division, Mesa, Arizona; W9DXCC, Elk Grove Village, Illinois; EMCOMM East, Rochester, New York; South Dakota Section, Sioux Falls; Virginia Section, Virginia Beach; San Francisco Section, Ferndale, California; ARRL/TAPR Digital Communications Conference, Chicago; Eastern Washington Section, Spokane Valley.
- The ARRL September VHF QSO Party was September 13-15, and the ARRL 10 GHz and Up Contest and the ARRL International EME Competition were September 20-21.
- These ARRL online course sessions are to begin October 17: Amateur Radio Emergency Communications Level 2 (EC-002); Antenna Modeling (EC-004); HF Digital Communications (EC-005); VHF/UHF — Life Beyond the Repeater (EC-008), and Radio Frequency Propagation (EC-011).

Media Hits

Allen Pitts, W1AGP

It's been a month for crisis news, and they seem to come about one a week! Yet another season in which hurricanes parade across the south, and while none have resulted in Katrina-like devastation, all are being taken seriously.

- The National Hurricane Center's station, WX4NHC, had four interviews on TV in one week regarding ham operations at NHC. They were on local affiliates of ABC, CBS, NBC and Telemundo.
- On September 5 BBC-America posted a story about Louisiana Amateur Radio responses that can be seen at **http://tinyurl.com/5e5jca** with comments by Gary Stratton, K5GLS.
- GovernmentExecutive.com summarized a story on September 2 praising the US Army's new mobile communications command vehicles but quoting Col Larerm Young saying, "One addition was needed: a high-frequency radio system capable of communicating with Amateur Radio operators, who often have the only radios operating after a disaster."
- The Baptist Press News (Nashville, TN) reported that Kentucky resident John Kitchen, KI4MTB, looking for news of his wife in Louisiana, grew tired of the phone failures in Hurricane Gustav and, joining with Tom Westerfield, packed a trailer with ham radios, scanners and [EchoLink] to communicate back to the North American Mission Board's disaster operations center in Alpharetta, Georgia.
- Even if not in the immediate hurricane zone, local media was interested in what their local hams were doing. KOAT-TV, Channel 7 (Albuquerque, MN) had a segment about us titled Emergency Communications In Place For Storm. Meanwhile across town, KOB-TV, Channel 4, also had segments about ham radio capabilities on August 31st and September 1 broadcasting from Charlie Christman, K5CEC's, ham shack and listening to the hurricane watch net.
- In Connecticut, News Channel 8 (New Haven, CT) had a unique opportunity on August 31 to sit in on one of the national conference calls with ARRL staff and section leaders on the southern coastlines. WTNH-TV's Crystal Haynes even was able to ask questions of the major players.
- Michigan television station WEYI-TV25 (Clio, MI) reported that the Mid-Michigan ham operators were ready to go if called upon, while farther south, WSFA – TV12 (Montgomery, AL) broadcast, "In a time of crisis, it's a tool that can save your life. Ham radios can come in handy during times of emergency — a lesson learned by Hurricane Katrina in 2005."
- Even Oregon got into it with two stories on KATU-TV2 (Portland, OR) thanks to Steve Sanders, KE7JSS, and Daniel Smith, KK7DS.
- In other news, a vacation that sounds like the script for a Chevy Chase movie but was saved by ham radio operator Nick Heineck, WL7K, was reported by Jennifer Moody in the Democrat-Herald (Albany, OR). "The Amateur Radio saved our bacon, really," he said. "It provided the communication when all else failed."

There were many smaller hits too. Like the constant rains, it all mounted up.

- Examples of these include the September 6 *Aiken Standard* (Aiken, SC) story on Bob Besley, K4NJN, and the Aiken County Emergency Services trailer crew. Also Cliff Fox, KU4GW, overcame his nervousness in a radio call-in show appearance on WACB in Taylorsville, NC. *The Rock Hill Herald* (Rock Hill, SC) report on KJ4EWQ, Caleb Brown (age 9), earning a Technician license with help from his grandfather.
- Anyone who doesn't realize the need for proactive PR action for their club should see the September 3 issue of *Bethany Beach Wave* (Bethany Beach, DE) and its "Coming in loud and clear" article about McGan Award winner Walt Palmer, W4ALT. "Walt's positive messages and commitment to Amateur Radio helped our club grow to over 100 members."
- Finally, WTSP-TV, Tampabays10 (St Petersburg, FL), put out a story titled "Local Ham operators prepare for Ike." Another weekend, another hurricane!

DON BUSH, KL7JFT

At the Saturday banquet of the 2008 ARRL Alaska Convention, Alaska SM Jim Larsen, AL7FS, and Kathy O'Keefe, KL7KO, presented ARRL President Joel Harrison, W5ZN, with a donation from the Anchorage Amateur Radio Club in the amount of $2500.

YLRL Leader Nancy Rabel Hall, KC4IYD, is 15th Severson Winner in Ohio

NASA

Nancy Rabel Hall, KC4IYD, winner of Ohio's 15th Annual Severson Award

An Ohio rocket scientist who has distinguished herself nationally raising the awareness of women in ham radio is the 15th recipient of the Allan Severson, AB8P (SK), memorial award. Nancy Rabel Hall, KC4IYD, of North Ridgeville, Ohio, treasurer of the Young Womens Radio League (YLRL) and YLRL Webmaster, was so honored during the annual Ohio Section Conference September 13. Nancy, who has also served as YLRL president, "has an ever present enthusiasm which reflects the spirit of the late Al Severson," declared Section Manager Joe Phillips, K8QOE, as he presented her with the certificate.

The Severson award is the highest honor of the Ohio Section of the ARRL. It annually goes to the Ohio Section ham who exemplifies the spirit of the late Division Director — as it is printed on the certificate — whose devotion to serve Amateur Radio inspired a whole generation of Ohio Section leadership.

Nancy is a Research Scientist working at the NASA Glenn Research Center and has been at NASA for 18 years.

Japan-Guam Connection

In August, Dave Patton, NN1N, became the first ARRL HQ representative to visit Guam. Dave, who is Membership and Volunteer Programs Manager, was returning from the Ham Fair in Tokyo, sponsored by the Japan Amateur Radio League, where he helped check cards for DXCC credit and gave a talk. On Guam, the westernmost US territory, he visited with members of the Marianas ARC and others.

COURTESY MASA EBISAWA, JA1DM

Card checking team **(from the left): Rear row — Mitsu, JN1LQH; Michiko, JO1GST; Ms Sachiyo; Sam, JJ1SKG; Katsumi, JI1JMK; Masa, JA2TBS, and Yoshi, JA2MNB. Front row — Hiro, JA1SLS; Masa, JA1DM; Dave, JL8UHZ, and Yama, JA1SGU.**

Inside HQ

Survey Says....We're Listening!

What do our members think about ARRL products and services? How can we make our products and services more functional, useful and informative to our members? One technique that we use is on-line research surveys. We send these on-line surveys to selected members via e-mail. The colorful, interactive software that we use for these surveys makes them fun and easy to use. Perhaps you have participated in one of them.

These surveys usually have a 35-40% response rate, which is quite high. For those of you who are professional researchers, we know that these surveys are not completely statistically accurate, but they do provide us with useful information that has proven invaluable in improving our products and services.

We determine which members to survey based on what we are trying to find out. For example, if we want to know how members feel about the *ARRL Repeater Directory*, we survey those members who have purchased *Repeater Directories* in the past. Based on the results of this research, we improved the *Repeater Directory* listings structure and we created the larger sized Desktop Edition.

We periodically survey members about this publication, *QST*. As Publisher, I was gratified that in our latest survey, more than 75% of you indicated that you are either "satisfied" or "highly satisfied" with *QST* technical content. This percentage is virtually identical to past surveys we have conducted. Although this is a high satisfaction rate, we do not intend to rest on our laurels.

In the survey, we also learned that more than 75% of those responding would like additional coverage of emerging technology similar to Steve Ford's Eclectic Technology column. You also indicated that you would like more product reviews of Amateur Radio related technology items similar to the review we did on PC Sound Cards in the May 2007 issue. We will be looking to expand this type of coverage as well. Most of you believe that the number and complexity of our construction articles is just about right so we will continue publishing these articles in the same manner as we do today.

One trend that clearly emerges from our research is that our readers like useful and practical information about Amateur Radio. *QST* columns and features such as The Doctor is In, Hints and Kinks, Product Review and our newest addition, Hamspeak, all received high marks. We will continue adding more of this type of content.

Who responded to the survey? More than half of you have Amateur Extra class licenses. It is no surprise that over 95% of those responding are male. A quick review of the "what is your occupation" question reveals that the majority of respondents are engineers, technicians, professors and teachers. One thing that we have learned is that our members are an opinionated, engaged and well educated group of radio amateurs.

73,

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

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ARRL is an incorporated association without capital stock chartered under the laws of the State of Connecticut, and is an exempt organization under Section 501(c)(3) of the Internal Revenue Code of 1986. Its affairs are governed by a Board of Directors, whose voting members are elected every three years by the general membership. The officers are elected or appointed by the directors. The League is noncommercial, and no one who could gain financially from the shaping of its affairs is eligible for membership on its Board.

"Of, by, and for the radio amateur," the ARRL numbers within its ranks the vast majority of active amateurs in the nation and has a proud history of achievement as the standard-bearer in amateur affairs.

A *bona fide* interest in Amateur Radio is the only essential qualification of membership; an Amateur Radio license is not a prerequisite, although full voting membership is granted only to licensed amateurs in the US.

Membership inquiries and general correspondence should be addressed to the administrative headquarters:
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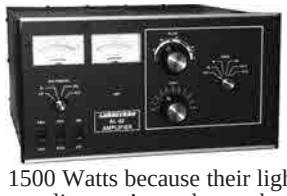

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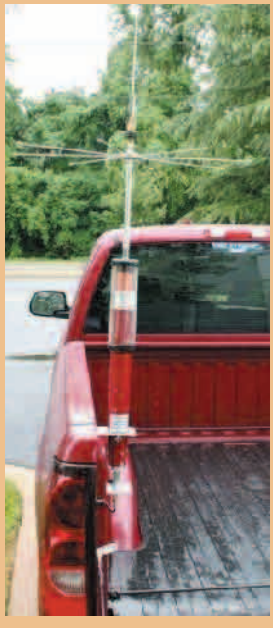

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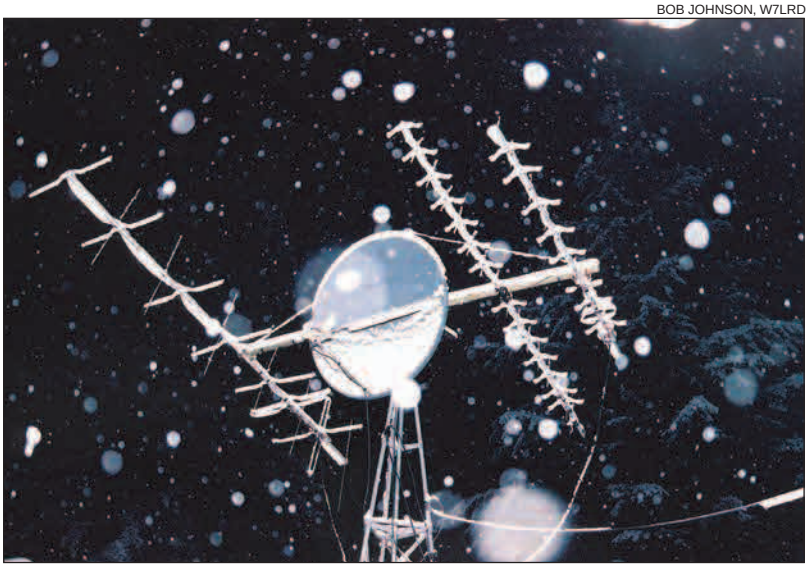
BOB JOHNSON, W7LRD



The winner! **Bob wrote only this on the back of his print: "Snowy up and down link, OM!" He expanded on those comments later: "Photography is a secondary hobby for me, but ham radio is first. Satellites take up more than half of my efforts. Satellites take a lot of planning and building. I am a 'regular' on AO-7. I am 'almost' ready for the next high earth orbit satellite. I find this niche of ham radio very challenging and rewarding. After over 45 years the thrill of successful efforts never gets old."**

Presenting:

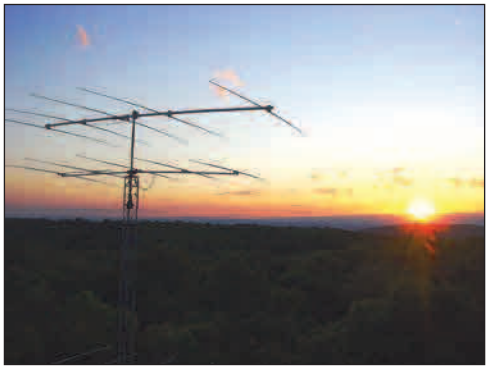
The Winner (and Near Winners) of the 2008 ARRL Photo Contest

A record number of entries produced a slew of photos good enough to be called winners. Our thanks again this year to all who entered. The judges — members of the *QST* graphics, production and editorial staff — had the difficult task of choosing the best of the best.

The $100 prize-winning entry appears at the left. Hearty congratulations Bob Johnson, W7LRD, of Renton, Washington! The 2009 ARRL Photo Contest will be announced in a spring 2009 issue.

Aside from the photos displayed here, three more appear on the cover of this issue (see page 5 for a description). In addition, one of the near-winners appeared on the cover of the Radiosport insert in the October 2008 issue (it's the one in the middle). Submitted by Paul O'Kane, EI5DI, it shows a 3B7C (St Brandon 2007 DXpedition) antenna an hour after sunrise.

RAY HIGGINS, W2RE



Quite the sunset: **Ray Higgins, W2RE, of Poughquag, in upstate New York, writes: "This photo was taken 5/30/08 on my tower of a view to the west with the sunset in the mountains. Antennas on tower are 5 el 15M and 5 el 10M."**

ROMAN-JOHN WOJCIK, K2RJW

Things are looking up at W1AW: **During a 2006 visit to Newington, Roman-John Wojcik, K2RJW, of Wantagh, New York, snapped the aluminum on the 120 foot main tower at W1AW.**

ROBERT H. BROWN JR, KS4TD

Solitude: **Robert H. Brown Jr, KS4TD, enters with this view of the Maury County Amateur Radio Club (W4GGM) 2007 Field Day at Chickasaw Park in Columbia, Tennessee. The operator is Brian Howell, KE4KVC, caught on camera after midnight in a hundred-year-old log cabin.**

JOE OSTROWSKI, KI5FJ

KI5FJ Antennas in the New Mexico Sunrise: **Joe Ostrowski, of Dona Ana, writes: My old but effective TH-3 tribander and 2 meter beams at 35 feet, plus 6 meter triangular loop, 6 and 2 meter verticals.**

New JA Tech

I am pleased to report my son, Yoshiki, KHØUA, who is 8 years old and a non-native English speaker, has passed the FCC Technician exam held by the ARRL Tokyo VE Team in August. He was born in JA and he is living in JA — and he doesn't have a JA license yet. — *Kuny Nakada, 7L1FPU/W1FPU*

KUNY NAKADA, 7L1FPU/W1FPU

Newly licensed Technician KHØUA with the ARRL Tokyo VE team after the examination. Above: Yoshiki holds his CSCE.

LARRY FISHER, KA3LOH

Web site: **Just in time for Halloween, "Spiderham" enhances the wire antennas at KA3LOH, in Kempton, Pennsylvania.**

RICH FISHER, NS7K

Summertime: **Taken in my backyard in Clearfield, Utah during one of storms this past summer. —** ***Rich Fisher, NS7K***

DAVE SWEIGERT, N9FAA

Mock disaster prep: **Antelope Valley ham radio operators David Sweigert, N9FAA (left), and Don Naber, KI6K, test a mountaintop mobile UHF-VHF emergency mobile relay system. It was nicknamed "Golden Guardian" after the November 13, 14 15 and 17 region-wide mock disaster drill that will simulate a 7.8-level earthquake.**

Have a Good Photo?

If you have a photo you'd like to share with other ARRL members, we're happy to have a look. A few suggestions will increase the odds that it will be selected for publication:

- Be sure it is a high-resolution digital image, well lit and in focus. Photos can be attached to an e-mail message, but they should not be reduced in size. Do not use the date stamp feature. Prints can be considered as well.
- Include caption information, including the full identification of everyone shown in the photo.
- Include the photographer's name and call sign so we can provide proper credit.
- If you have a large selection of photos, you can send them two or three at a time, using the same Subject line, or burn them to a CD and mail it to us.

Send your photos to **upfront@arrl.org** or UpFront in QST, 225 Main St, Newington, CT 06111.

JOHN SALMI, KB1MGI

How's your gas mileage, OM? **John Salmi, KB1MGI, of Chemsford, Massachusetts was on the New York State Thruway with his sons KB1LQC and KB1LQD when they spotted what looked like a very large ham radio vehicle. Before they could make W1SLA's acquaintance, they learned it's just the name of the bus company, Wisla Express.**

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CORRESPONDENCE

HURRAH FOR STATE QSO PARTIES

♦ Hats off to ARRL Contest Branch Manager Sean Kutzko, KX9X, and the ARRL Contest Branch for lending a strong hand to boost state QSO parties (SQSOPs) [Radiosport insert, October 2008]. These events welcome newcomers into radio contesting, offering opportunities to improve operating skills, bag rare counties and partake of hours of enjoyment. But SQSOPs are a variable lot. While the best organized and most smartly designed state parties attract hundreds of fixed, mobile and portable participants, others pass with hardly a trace of RF near their recommended frequencies. Is it really a party if no one attends?

By designating 2009 as the year of the SQSOP and offering a state-party award and Web site (**www.arrl.org/awards/ysqso**), the ARRL has already gone "beyond the call of duty." But there may be ways to recognize the best practices of successful state 'test managers — perhaps by describing strategies that maximize mobile and portable participation by offering guidelines for optimizing the timing and length of parties (some are simply too long, and needlessly overlap other contests) and by identifying means by which clubs encourage a fun atmosphere and camaraderie.

Whatever comes of this effort, the ARRL Contest Branch's attention to state QSO Parties is greatly appreciated. Thanks for your effort and creativity, for the informative October *QST* section on Radiosport and for the outstanding article by Gil McElroy, VE3PKD, on the history of contesting.

RICH CINCOTTA, KI4FW, ARRL Life Member
Arlington, Virginia

NORTH TO ALASKA

♦ Waking up to my first morning at W1AW/KL7 at the Arctic Circle in Alaska — set up to correspond with the ARRL Alaska Convention and Alaska hamfest held in Anchorage 500 miles away — I was greeted with cool air and a view that reached hundreds of miles. The station was set up on a hill overlooking the "official" Arctic Circle visitor pullout. I was to be a guest operator for a couple days and was excited to get on the air. The station, set up in a large arctic tent, had three transceivers, two kW amplifiers and one 500 W amplifier, as well as two verticals and one 3-element Yagi; we also had a dipole and another antenna for 160 and 80 meters. A 17 kW generator provided daytime power. In the evening, due to generator noise, we switched to a battery bank for 80 meters.

I am not an experienced DXer, so my first pile-up made me a little nervous. But after the first hour, I got a rhythm of working a dozen or so stations, then taking a short break and starting all over again. It was quite satisfying to hear the other operators say that it how great it was to make the contact, not only with W1AW, but its location in Alaska at the Arctic Circle.

I want to thank ARRL and the Fairbanks and Anchorage radio clubs for the opportunity to take part in the Special Event Station. The station is gone, but the memories will remain with me of that day in the high arctic wilderness calling CQ, CQ, CQ de W1AW/KL7.

PET BUROKAS, KL1HB
Fairbanks, Alaska

A LOOK BACK IN TIME

♦ The new *QST* Online Archive is an awesome ARRL member benefit. While some chase DX or wallpaper, I spend my energy studying ham radio history, especially during sunspot minima. It's one thing to read the history books like *200 Meters and Down* or *Calling CQ*, but to have access to the actual magazines published in those times is — as they say in the TV commercial — "priceless." By reading these back issues, one can see just what the issues of the day were and how the amateur community responded; this is a treasure trove for any amateur historian. A big "thumbs up" to the unsung heroes who scanned all that stuff in. Thank you!

BRIAN CIESLAK, K9WIS
Waterford, Wisconsin

A WELCOME SURPRISE

♦ I am 66 years old and retired — and just a few weeks ago, I passed the Technician class license test. As part of a new ham welcome kit from ARRL, I received the book *Getting Started with Ham Radio* — what a marvelous source of a lot of educational information! I am currently studying for the General class license, but I have put that aside until I finish reading this book. I hope that all new hams could read this book before starting their license studies, as it does such a great job of making sense out of all the new information that we are exposed to. Thanks so much for getting this book to me.

JIM KERR, KC9OCI
Rochester, Indiana

PILING ON

♦ Kudos on "Some Tips for the New DXer" [September 2008, page 47] by Frank Getz, N3FG. Judging from the pile-ups I've monitored of late, these 11 DX tips should be required reading for both the new and experienced DXer.

DON MILLER, AE6IY, ARRL Life Member
Walnut, California

YOU'RE GROUNDED!

♦ I wanted to convey to you how very useful I found the article "Obtaining Good Ground" by Ed Sutton Jr, KD7PEI [August 2008, pages 37-40]. I think it was a perfect combination of the theoretical and the practical and left the reader with some real intuition about the mechanics of lightning strikes and how to combat their effects. I encourage you to have more articles providing this level of insight.

PAUL THOMPSON, W8IEB
Eugene, Oregon

DIFFERENT, BUT STILL THE SAME

♦ Ham radio operators have traditionally given signal reports such as RST599, where R is "Readability" on a scale of 1-5, S is "Signal Strength" on a scale of 1-9 and T is "Tone" or transmission quality of a CW signal on a scale of 1-9. There are currently a small number of stations urging that we change PSK31 signal reporting to RSQ — Readability, Signal Strength and Quality. I think that makes sense, but I think it is just plain silly to send RSQ 599. I think hams are smart enough to realize that last number in the signal report means *quality* rather than *tone* when referring to a PSK31 signal report — the concept is good, but the choice of letters is bad. I recommend that we continue to use the traditional ham radio RST signal report, simply modifying the T from its CW-oriented "tone" to an appropriate PSK31 signal report using RST — Readability, Signal strength and Transmission Quality. This allows us to use the traditional RST that is probably already printed on our QSL cards, but alter its meaning for appropriate use in reporting PSK31 signals.

JOHN REHAK, N6HI, ARRL Life Member
Phoenix, Arizona

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

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Output Power:
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Circuit:
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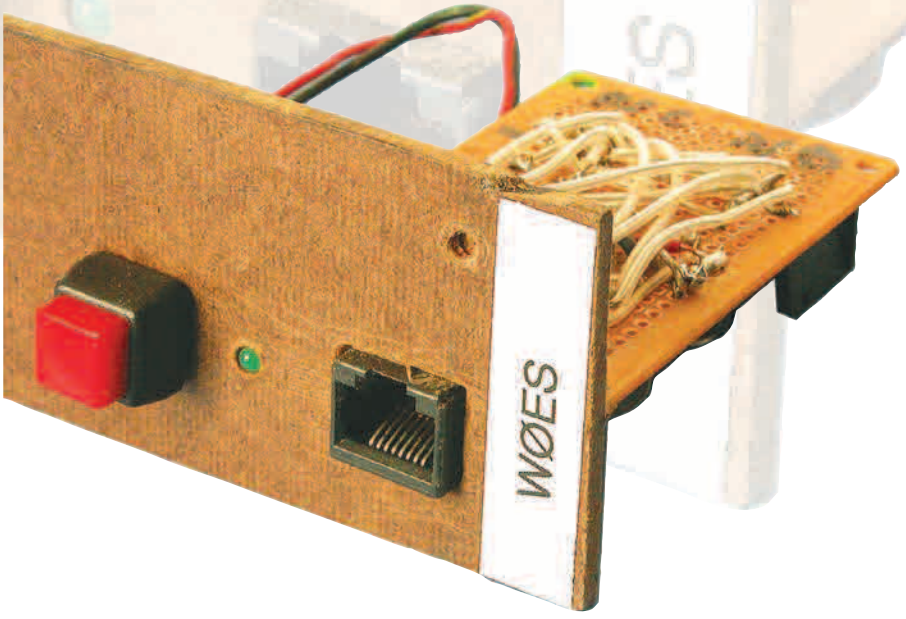
The Anatomy of a Homebrew Project

One of the joys of Amateur Radio is building your own gear. Here's a way to get started with a simple microphone switch.

Earl Schlenk, WØES



For those hams who think you have to be an engineer to build a ham radio project, here is a start to finish description of one that proves you don't. I have two ICOM radios both using a modular (telephone type) RJ-45 jack for the MIC input. I want to use the same desk microphone for both rigs without having to unplug one to plug in the other every time I use a different radio. I thought about how I could change them back and forth without fussing with the cables themselves.

How to Proceed?

My first thought was to get a switch, but these microphones have eight wires each and this would require a special switch. I began thinking about what kind of device could switch eight wires at once, then bingo — a relay! So I then went to the Internet and searched for an eight pole (the number of contacts to be switched), double throw (the number of ways it can be switched) relay. Not finding this exact relay, I found many four pole, double throw (4PDT) relays. Two of them would give me the switching I need.

Picking the Parts

Next, what voltage relay did I need? The obvious voltage for most hams is a nominal 12 V dc. I knew that I had the *how* figured out, I needed to select the relays themselves. I found the relays, 4PDT, 12 V dc at **www.futurlec.com**. These relays are printed circuit mounting type, small and, most important, cheap. You can probably find similar relays at many outlets.

Now that I have found the main switching devices, I needed to figure out how to build the switcher. I did not want to etch a printed circuit board, so I looked for a small board with predrilled holes. I found such a project board at RadioShack (#276-149) that fills the bill for this project. Next, I needed to figure out how to connect the microphone cords to this switching circuit. I found a PC mount 8-pin jack at Futurlec and I ordered three of these also. I also needed a switch to turn the relays on, so I ordered an SPST push-button switch.

Making it Happen

Now I had the guts of my project. While I was waiting for the parts to arrive, I started thinking about how I was going to wire it all together and enclose the device. Let's start analyzing what and how we will put it together. First, we are going to need 12 V dc to power the relays, so we need to have a pair of wires for this power. Next, how are we going to connect the relays? We want 8PDT, but we have two 4PDT, so we'll have to connect the relay coils in parallel, with one side of both coils going through a switch to the +12 V line and the other side of the coils to ground for power return. We will add a diode in parallel with the relays to absorb the reverse voltage as the relays are de-energized. This diode is wired in reverse, the cathode band on the diode to the positive side of the relay and the anode to ground. See Figure 1 for details of the switch and relay coil connections. Figure 2 shows the details of the relay connection points.

Let's call one jack J2 and the other J3. We can arbitrarily assign J2 as our normally closed jack, meaning that all leads from jack J2 go to the NC (normally closed) pins on our relays. Then, all J3 jack leads go to the NO (normally open) contacts. That leaves us with all the wiper leads going to our cable jack. Let's now arbitrarily assign our relays as K1 and K2. Keep in mind that both pin #1 leads of the radio jacks (J2 and J3 in Figure 3) go to the same set (NC, NO) of relay contacts as well as the mic jack (J1 in Figure 3) pin #1 to the switched or *wiper* contact. All seven of the other mic jack leads will follow this pattern.

Let us now draw our schematic to show

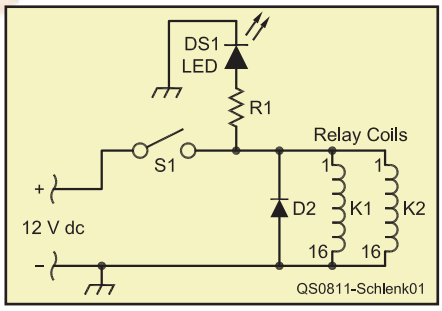


Figure 1 — Details of the switch and relay coil connections. Futurlec is at www.futurlec.com.

D2 — General purpose diode 1N4001, or equivalent.
DS1 — Light emitting diode, optional (Futurlec part LED3G).
K1, K2 — 4PDT relay, 12 V dc coil (Futurlec part DS4E-S-DC12V, or equivalent).
R1 — 1 kΩ, ¼ W resistor.
S1 — SPST push-button toggle switch.

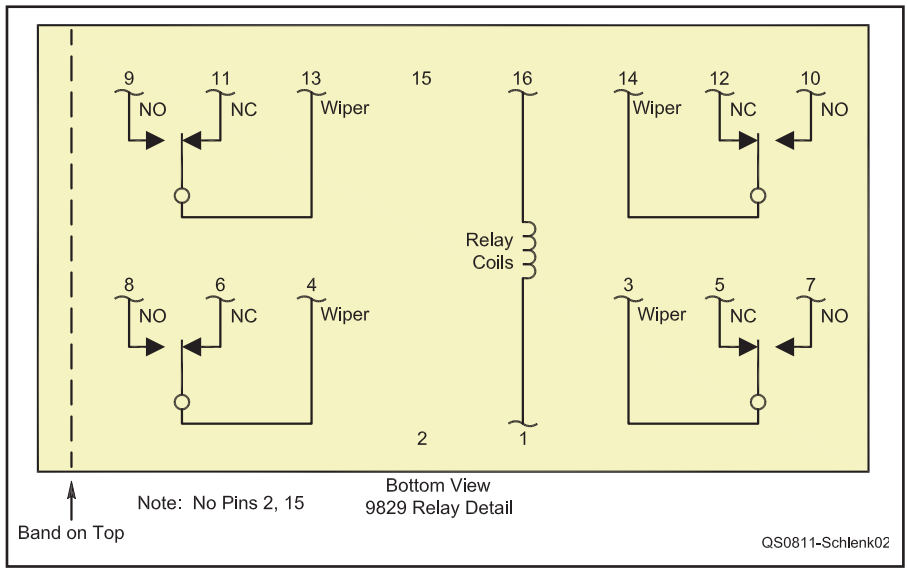


Figure 2 — Connections to relay from Futurlec. For other relays, see text for description of how to determine connectivity.

us how the jacks and pins are going to be wired together. See Figure 3. One critical thing to remember is that our wiring diagram will be a reverse of our actual wiring. That is because the components are on top and our wires are on the bottom. This requires us to take our time before soldering any connections. The left side of our jacks' pins as drawn, are on the right as we wire from the bottom of our board. This is not a problem for the relay coils but is a consideration for the jacks and relay contacts. The parts have arrived, and now the fun begins.

Let's start with our relays. The relays do not have any indication as to what pin does what. The relays do have a black band on the top on one side; use this as a reference mark. This is not a big problem, just a little patience and work to determine the pin functions. With an ohmmeter or test light, go from pin to pin and see what resistance measurement we get. We know that two of the pins have the coil between them and we know this coil will have a higher resistance than the closed contacts. We find that the pins in the middle read about 800 Ω between them or the test light is dim.

The other pins read zero or infinity between them, so we now have located our coil pins. Next, we have to find the relay contacts. Our ohmmeter shows us which remaining pins have continuity, but not their function. So let's put our meter across two of the leads that show continuity and put 12 V across our coil pins. We see that this continuity is gone now so we now have to find which pin of the pins we are measuring is the wiper of the contacts. With the relay energized by the 12 V, move the ohmmeter from one of the pins to another adjacent pin until

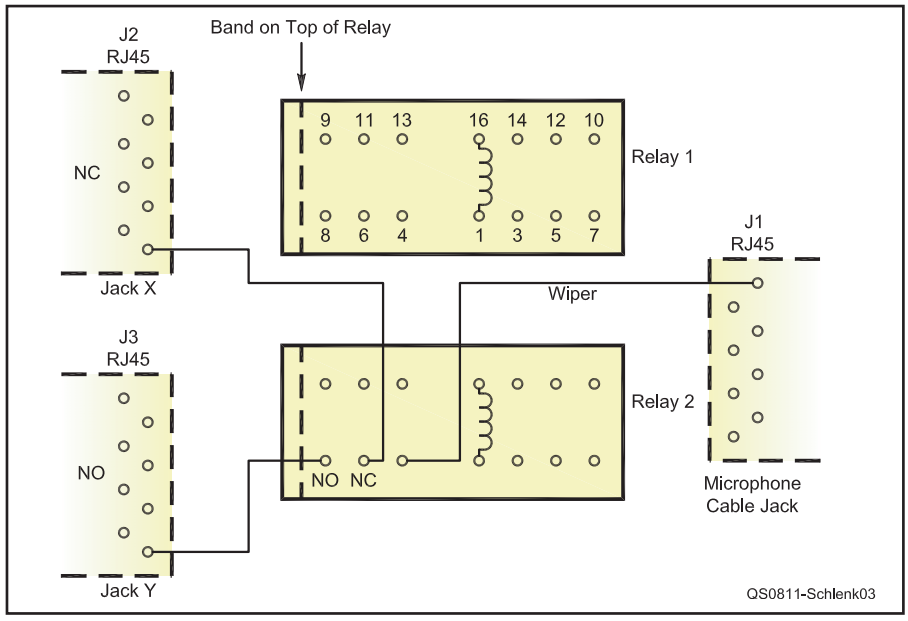


Figure 3 — Example of wiring for one pin of the RJ-45 jacks. Each other pin is wired in the same way. J1-J3 are telephone or Ethernet 8-pin RJ-45 type jacks (Futurlec part MODS8W8W).

we find which two pins now have continuity. Of the pins that now have continuity one is the wiper, and this wiper pin will have continuity with one of the adjacent pins when the relay is de-energized. Move the components around on the board to see which configuration you like the best. I found the configuration shown in Figure 4 to my liking.

Mounting the RJ-45 jacks takes a little maneuvering as the pins do not line up with the pre-drilled holes. I found that cutting off the plastic mounting studs allows sufficient wiggle room to get the pins in the holes on the board. Once you have bent the pins to easily go into the holes, put a little fast drying cyanoacrylate glue on the bottom of the jack to hold it on the board. Wiring the components together will be pretty simple, as we only have to make sure that the same pins on all three jacks go to the same set of relay contacts, keeping in mind that the NO jacks always go to the same NO contacts and the NC jacks always go to the NC contacts. This sounds a little confusing, but a little thought will make this clear.

As you look on the bottom of the board (see Figure 5) you will see if we take the same pin position on each jack as viewed from the

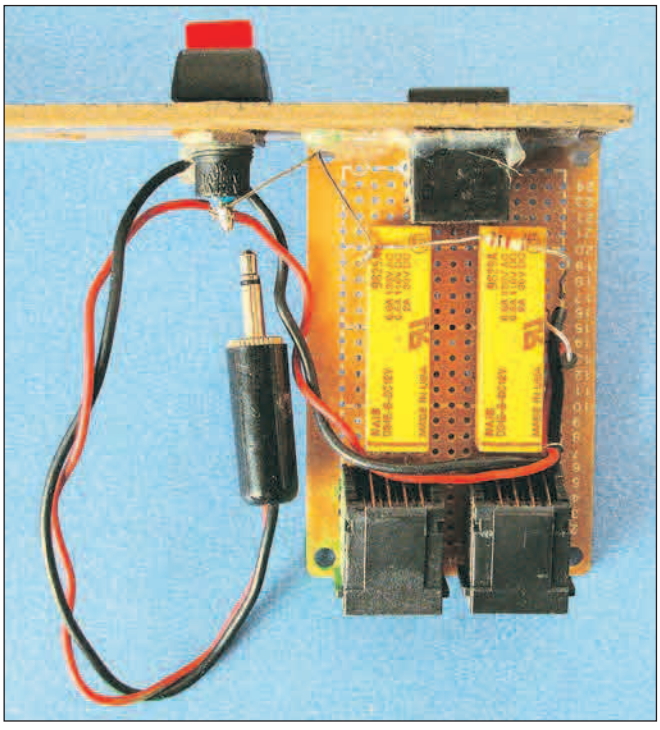


Figure 4 — View of top of board showing component layout.

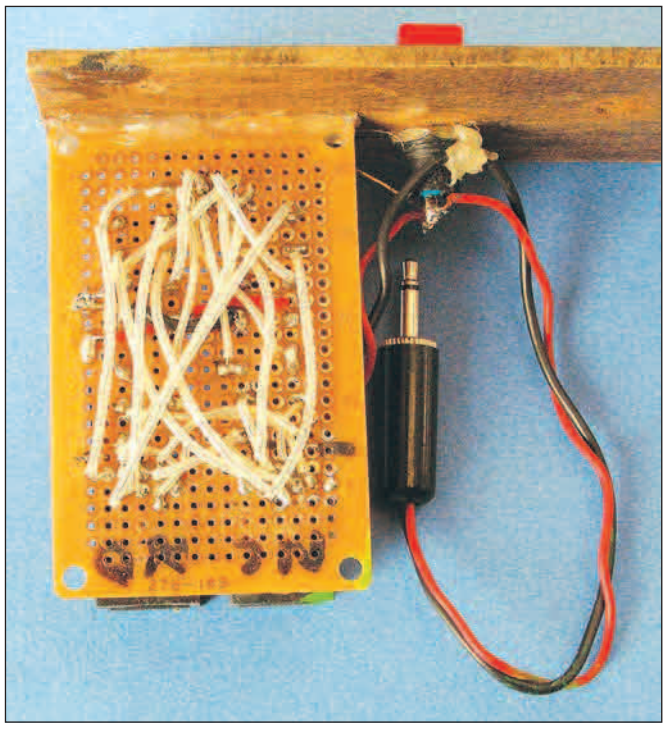


Figure 5 — Wiring on bottom side of board.

same jack position. For example, looking from the bottom left on each jack, take that pin and wire it to the appropriate relay pin. Wire all on the left top jack pins to the appropriate relay pin; double-check that you have the NO and NC pins from each jack going to the same set of relay contacts and follow this procedure with the remaining pins. A little thought will show how easy it will be to wire these connections without making a mistake.

Wrapping it Up

A few hints:

■ It is easier if you wire all the pins in the center of the board first, as they would be hard to get to if we wire the outside pins first. I stripped the insulation off some 24 gauge solid wire I had and then I slipped some insulation on the bare wire. This isn't necessary — it was just the way I chose to do it. You should wire it any way you prefer.

■ Take your ohmmeter or test lamp and check your wiring without any power to the board and, if okay, apply power to the board and check the wiring again. If you find any problems correct them. Mistakes are normal with this many connections, so don't get discouraged.

This project is simple, but complex in its way. It should give you confidence after building it. All the techniques used to build this are the same that you will use on more complicated circuits. The front of the completed project is shown in the lead photo. I have not mentioned an enclosure for this project since that will depend on available space. I also added an LED indicator, but that is entirely optional.

Earl Schlenk, WØES, was first licensed in 1956 as KNØRIO at the age of 11. He built his own ham gear from cannibalizing old radio and TV sets. He received his Amateur Extra class and his FCC commercial First Class Radio Telephone license with ship radar endorsement while in high school. He worked as a communication technician for a railroad for 33 years and is now retired. He obtained his current call in 2000. An ARRL member, his primary Amateur Radio interests are electronics and building efficient transmitting loop antennas for apartment dwellers. You can reach Earl at 1155 F Kinslar Dr, St Louis, MO 63129 or via **w0es@hotmail.com**. QST

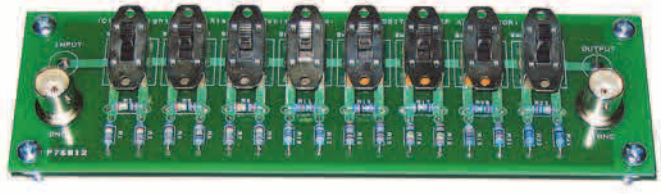
New Products

TENNADYNE FOLDED TERMINATED DIPOLE

The Tennadyne TD-90 folded terminated dipole antenna covers 2-30 MHz and is rated for 500 W PEP on SSB or 200 W on AM/RTTY. The antenna is 90 feet in length, has a 50 Ω impedance, requires no measuring or cutting, and is supplied with an SO-239 connector for the feed line. Price: $225. For more information, visit **www.tennadyne.com**.

STEP ATTENUATOR KIT FROM THE XTAL SET SOCIETY

The XSS-SA8 eight step attenuator kit from the XTAL Set Society is a useful addition to the radio workshop. The attenuator uses eight DPDT slide switches to enable or bypass π network resistive pads. Pads included are 20, 20, 20, 10, 5, 3, 2 and 1 dB, allowing signal attenuation from 0 to 81 dB in 1 dB increments. BNC connectors are used for input and output. Price: XSS-SA8 kit with all parts, PC board and manual, $49.95. XSS-SA8 PC board only, $19.95. For more information, or to order, visit **www.midnightscience.com**.



Greening Up your Station

Make your station more energy efficient and more environmentally friendly.

Steve Gradijan, WB5KIA

Is it possible to operate an energy efficient ham station and have fun? Here are a few things to consider that may help cut your energy usage and, over the long term, save a few dollars in the operational cost of your Amateur Radio station.

How does Your Station Stack Up?

How much power is your station consuming? Table 1 displays a power budget for a typical 100 W station, assuming a power supply efficiency of 75%. Not counting the air conditioner, depending on whether this station is receiving or key down transmitting, it uses 477 to 808 W. During a contest, assuming you operate 24 hours and half the time is spent listening, this station will consume about 500 W on average in CW or SSB (650 W for RTTY) per hour or about 12 kWh total. Operate 25 contests in a year, plus participate in a few other activities, and you may easily consume over 360 kWh per year. At a cost of $0.18/kWh, it costs $65 for the electricity to operate this station for a year.[1] Add a vacuum tube (pair of 3-500Z triodes for this calculation) 1.5 kW power amplifier, however, and your average consumption goes to about 1.4 kW for SSB or CW or almost 3 kW for RTTY. The corresponding costs increase to $181 or $389 per year. Your actual costs and power consumption will be different depending on amplifier design. The accompanying tables tell the story.

Energy Efficient Lighting

The possibility that a 13 W fluorescent bulb (see Figure 1) can provide the light output or lumens of a 60 W light bulb is attractive, but are these bulbs practical in an Amateur Radio station?

A fluorescent light bulb in a ham shack is normally an invitation to locally generated interference. The Phillips package of the new fluorescent bulbs intended to replace incandescent lights indicates that although bulbs do conform to Part 15, that interference to radios is a possibility. Many bulb display packages contain a warning similar to the one on branded Phillips bulbs. Bulbs branded GE do not have this package warning.

Figure 1 — Fluorescent light bulbs — Noise generators or friend?

I fully expected the noise level on my Kenwood TS-2000 to increase dramatically as I replaced a 60 W desk lamp adjacent to my transceiver with a GE 13 W fluorescent bulb. I had a scope hooked up to track the noise level change as I switched from incandescent to fluorescent lighting. Much to my surprise, I could not discern any measurable difference on the scope, S-meter or by listening for light bulb noise. I checked the Amateur Radio frequencies, 1.8 to 1296 MHz and could not detect any noise even though the bulb is within inches of the radio.

While fluorescent lighting is energy efficient, it is not entirely "green." These light bulbs contain mercury and need to be disposed of properly. They do use less

Table 1
Typical Station Power Consumption

Item	*Idle (Receive)*	*Transmit (Key Down)*
HF transceiver	2 A (37 W)	20 A (368 W)
Desktop PC CPU	150 to 220 W	
Desktop monitor	50 W	
Amplified PC speakers	9 W	
Laptop PC	About 90 W	
Incandescent light	60 to 150 W	
Fluorescent light	13 W per 60 W equivalent	
Antenna rotator bulb	1 W	
Air conditioner	Typical 1 kW average for small room unit.	
1500 W linear amplifier	240 W	4.5 kW

[1]Notes appear on page 35.

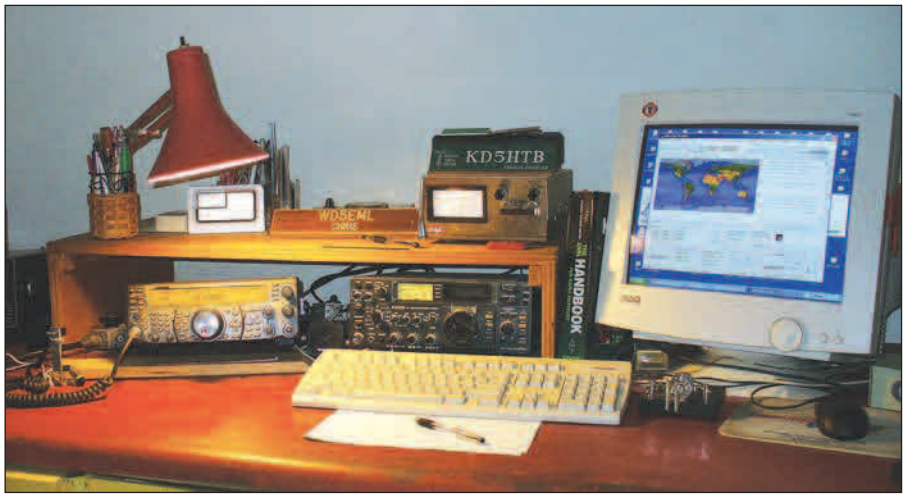


Figure 2 — The light from the latest fluorescent light bulbs is energy efficient and "green."

energy, however, and consequently radiate less heat.[2] If you replace two bulbs in your station, you will save about $12 during the same operating year.

Let's Play by the Rules

Is your adjustable power transceiver *always* set on the highest output power setting? FCC regulations require you use only power sufficient to make your contact.[3] If you are receiving signal reports of 20 dB over S-9, you can probably reduce your power and conform to regulations while saving energy, and still have as much fun.

Don't count on quite a proportional reduction in consumption as you reduce output power. For power budgeting purposes, a reduction in output of 50% will reduce your transmit dc power requirement by around 25% in the typical HF transceiver. Still, it makes a worthwhile reduction in consumption. This effect is taken into account in the translation of mode duty cycle to power consumption in Table 2.

Table 2

Average Power Consumed versus Operating Modes at 100 W Peak

Mode	*Duty Cycle (%)*	*Average Power (W) Consumed*
SSB	*~25*	*138*
CW	~35	193
FSK	100	368
FM	100	368
AM (25 W)	~120	117
AM (100 W)	~120	468

Low Power Operation

Hams have enjoyed using low power (QRP) to make contacts for many years. There is a special satisfaction in working distant stations using low power. Can you have fun? Certainly — that is why there are so many operators using QRP. They usually do this with 5 W or less of CW or PSK31 but it can be lots of fun with SSB, too. This past May, I made numerous SSB contacts on 6 meters with 5 W and received 59 signal reports from the other end for numerous contacts over a 1000 mile path.

Efficient Transmission Modes

Some transmission modes can operate with extremely weak signals. The weak signal detection software *WSJT*, developed by Joe Tayor, K1JT, allows a computer to actually copy signals below a transceiver's noise floor.[4] If you would rather hear the signals, PSK31 does a great job and is effective at very low power. Most PSK31 stations use 50 W or less power output. CW is the old reliable. The most popular mode, SSB, is still the most efficient voice mode. Full carrier AM and FM not only create a wider signal bandwidth, they are less power efficient than SSB for most Amateur Radio activities. FM and RTTY using FSK run at 100% duty cycle while transmitting. This means your transceiver is using its maximum power consumption during your entire transmission. While a 100 W carrier AM system is even more of a power hog, most modern transceivers run AM at a maximum PEP output of 100 W. That translates to a carrier output of 25 W, not as heavy a user as FM or RTTY, as shown in Table 2.

Bang for Your Buck

Do you really need a power amplifier? If you do, is the amplifier you are using very efficient? Antenna improvements often can increase your effective radiated power almost for free. You will just have the cost of the aluminum or wire for the antenna.

Are you squandering your output power by using inappropriate transmission cable? Generally, the smaller the size of your transmission line, the more energy loss per 100 feet of cable. Table 3 compares various types of coaxial transmission cable. Improving losses by 3 dB at the transmitting antenna will result in half an S-unit increase at the receiving end, not too noticeable unless right on the edge. A 5 to 6 dB improvement, on the other hand, will be a full S-unit change, more often helpful in getting through. Keep your cable runs shorter and more of your signal will go where you want it. If your runs must be long consider the use of lower loss parallel transmission lines.

Is the standing wave ratio (SWR) on your transmission cable greater than about 1.5 to 1? Yes, some transceivers' built-in antenna tuners can handle matching to a 3:1 or higher SWR. With a high SWR, however, more of your transmit energy will be dissipated as heat.

Improve Your Signal without Increasing Your Power Consumption

Beam antennas provide an almost free power boost, at least in terms of energy usage. You can achieve antenna gain in desired directions in multiple ways — by stacking antennas, adding elements to beams or combining verticals in appropriate phase. Antennas with parasitic elements increase your effective radiated power. Getting the antenna high may also lower your radiation angle, leading to more power headed toward distant stations.

Table 3

Matched Transmission Line Loss*

Line Type	*Loss/100 feet (dB)*					
Frequency (MHz)	*1*	*10*	*50*	*100*	*200*	*400*
RG58*	0.4	1.5	3.9	5.9	8.8	13.1
RG8X*	0.3	1.0	2.6	3.9	5.7	8.5
RG8/213*	0.2	0.6	1.4	2.1	3.0	4.5
9913	0.2	0.4	0.9	1.3	1.9	2.7
Window	0.02	0.08	0.2	0.3	0.4	0.7
Open Wire	0.02	0.06	0.1	0.2	0.3	0.5

*Typical values dependent on brand. Check manufacturer's specifications.

Alternative Energy

Solar charged batteries may save energy. The sun's energy is free but there is some cost. Lots of energy is required to manufacture both the solar cells and batteries. Unfortunately, the batteries cause pollution in their manufacture and require proper disposal.

Sneaky Ways of Saving Energy

- Don't operate from your house. Only operate while you are mobile and avoid operating with the engine idling. You are burning gasoline needlessly. A separate, portable generator is more efficient than using your automobile's engine to power the radio.
- Operate at night using only the panel lights on your transceiver.
- Turn your radio and PC off when you are away from them.
- Use your computer for station operation only if really needed. I still keep my main station log on paper although my 6 meter log, which is separate, is computerized to track grid squares and counties worked.

Final Thoughts

Are you continually running that amplifier? Is it a habit or do you really need all that energy? The difference between 100 W and 1 kW is only 10 dB, about 1.5 S-unit.

Improving SWR, minimizing transmission line losses, using more efficient antennas and using less illumination in your station all help reduce power consumption and lower your electricity bills. Interestingly, the simplest thing to reduce overall power consumption in a typical Amateur Radio station is to swap your incandescent light bulbs for fluorescent bulbs. Using common sense, your station can become more efficient and green.

Notes

[1]Check your electric utility bill to find out what your rate is. For planning purposes, it's probably safe to assume it will go up.

[2]**www.energystar.gov/ia/partners/promotions/change_light/downloads/Fact_Sheet_Mercury.pdf**.

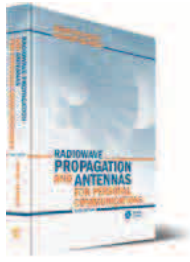
[3]FCC Part 97, Technical Standards 97.313(a): An amateur station must use the minimum power necessary to carry out the desired communications.

[4]**www.physics.princeton.edu/pulsar/K1JT/**.

Steve Gradijan is a geoscience consultant in the Dallas, Texas area. He holds an Amateur Extra class license and has BS and MS degrees in geology. An ARRL Life Member, he has been licensed for more than 44 years. You can reach Steve at 1902 Middle Glen Dr, Carrollton, TX 75007 or at **wb5kia@arrl.net**. QST

New Books

◊*Radiowave Propagation and Antennas for Personal Communications*, Third Edition, by Kazimierz (Kai) Siwiak, KE4PT, and Yasaman Bahreini. This book was developed as a text for a graduate engineering course on antennas and propagation with an emphasis on structures and systems appropriate for personal communications. As such it has considerable overlap with the interests of engineers involved with Amateur Radio, particularly those working in VHF and above.



It should be emphasized that this book's intended audience is engineering professionals with considerable background in electromagnetic theory using traditional vector calculus. While the introduction describes Maxwell's equations, the basis for most electromagnetic theory, this four page treatment might not be the best place to encounter this material for the first time.

The book is quite comprehensive in covering its material. Not only are many antenna and transmission systems developed and analyzed, but urban propagation around and within buildings and structures is considered — not something found in traditional propagation texts that I have encountered. Included is a section on electromagnetic effects on the human body related to RF exposure standards, but also considered were effects of the human body on body mounted receiver sensitivity and directivity, validated using measurements on real and simulated human bodies.

Each chapter includes a good selection of problems for readers to solve, thankfully with answers provided. A CD is included with a number of potentially useful programs. Included is a Fortran program that can be used to determine the near field of dipoles and helices and another that performs a similar analysis of loops. The book notes that they are designed for *DOS 5.0* or later and can provide spurious answers with some *Windows* based systems. Test samples are provided to allow validation if you don't have a DOS capable machine. Also provided is a selection of propagation software, designed to operate on most current *Windows* based systems. Included are *VOACAP, ICEPAC* and *REC533* from NTIA and *HamCap* from DXatas. This text would be a valuable addition to the technical library of anyone working in this field.

Published by Artech House, Norwood, Massachusetts. Hardcover. 494 pages with numerous diagrams and illustrations. Includes CD-ROM. Third edition, 2007, ISBN 159693073X, $139. — *Joel R. Hallas, W1ZR, Technical Editor, QST*

Feedback

◊In "Experimenter's RF Spectrum Analyzer" [Oct 2008, pp 36-40], the author reports that the correct nomenclature for the DDS IC in the Softmark DDS module discussed in the text and shown in Figure 5 is an AD9851 not an AD8751 as indicated.

◊In "Microwavelengths" [Oct 2008, pp 95-96], the bottom circuit in Figure 3 has the transverter output taken from the wrong end of the 10 kΩ resistor. It should be on the collector end. — *Ralph Simonton, AD6WZ*

New Products

KUHNE ELECTRONIC PLL-STABILIZED CRYSTAL OSCILLATOR

◊The MKU XO 1 PLL from Kuhne Electronic is a fixed frequency, high stability oscillator designed for use with VHF/UHF/microwave transverters. It is temperature stabilized and includes an input for an external 10 MHz reference signal. Standard frequencies include 96.0, 103.5, 105.667, 106.5, 111.0, 117.0, 120.0, 120.889, 122.25, 123.667, 124.5, 126.0, 135.667 and 138.0 MHz. Output power is 1 mW, and frequency stability is rated at 5 ppm over a wide temperature range without an external reference signal. For more information, see **www.db6nt.de**.

WEATHERPROOFING TAPE FROM TIMES MICROWAVE

◊Times Microwave Systems offers self-bonding silicone weatherproofing tape for protection of outdoor connector installations. The new tape kit, model WK-S, is easy to install and provides a long-term environmental seal for connections. Each kit can weatherproof up to 12 connections. Price: $24. For more information, check with your favorite dealer or visit **www.timesmicrowave.com**.

A Modular Receiver for Exploring the LF/VLF Bands

Part 1 — This easy-to-build stand-alone converter lets you explore an interesting part of the radio spectrum while you build the rest of the software defined receiver to be described in Part 2.

Larry Coyle, K1QW

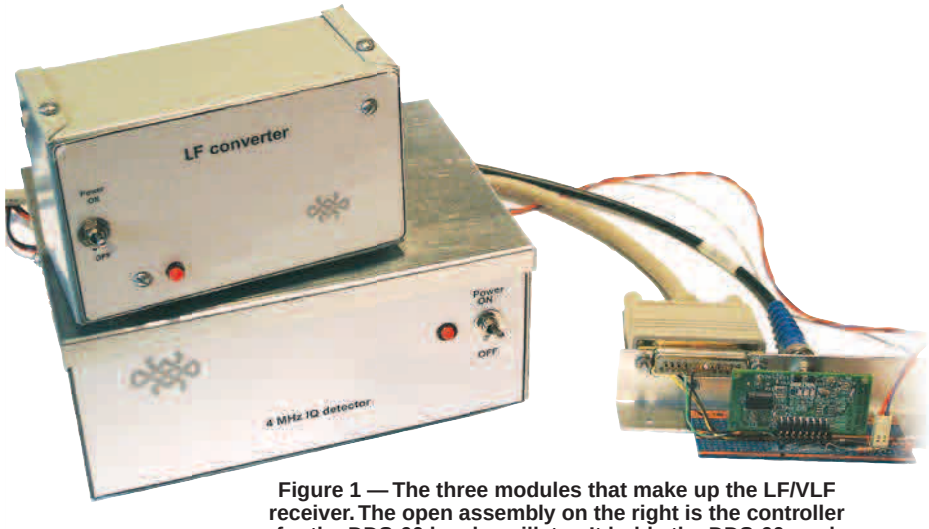


Figure 1 — The three modules that make up the LF/VLF receiver. The open assembly on the right is the controller for the DDS-60 local oscillator. It holds the DDS-60 card and is controlled by the computer parallel port.

Finding new worlds to explore in Amateur Radio can be difficult, but rewarding. For some enthusiasts, the RF spectrum below 530 kHz, below the AM broadcast band in the US, is just such a world. It encompasses the 30 to 300 kHz low frequency (LF) and 3 to 30 kHz very low-frequency (VLF) bands — terra incognita for most hams. The sidebar "What's Down There?" gives a brief overview of this part of the spectrum, where there's some truly interesting listening to be had. As my interest in these fascinating bands developed, I was disappointed to find that many general coverage receivers don't go much below 100 kHz and their performance isn't always very good. In fact, I never heard much of anything at such low frequencies. One solution seemed to be to just design my own gear — after all, that's what hams do, right?

Looking around at a number of publications and Internet sites, I found several circuit ideas that seemingly could be fashioned into a complete receiver design accessible to the average ham — one that could be built up from easy-to-get components and use only freely available software. I wanted it to be flexible and modular, so that it could be built up and tested in stages. I hoped to have each module useful as a stand-alone item.

Also, I thought I might use this project to dabble in the field of software-defined radio (SDR).

A Brief Look at the Design

The three modules making up the receiver are shown in Figure 1 and in block diagram form in Figure 2A. First in line after the loop antenna is a frequency converter by which almost dc to 510 kHz is transformed to 4000 to 4510 kHz. As a stand-alone unit, the converter can feed any general coverage receiver. This is the configuration shown in Figure 2B.

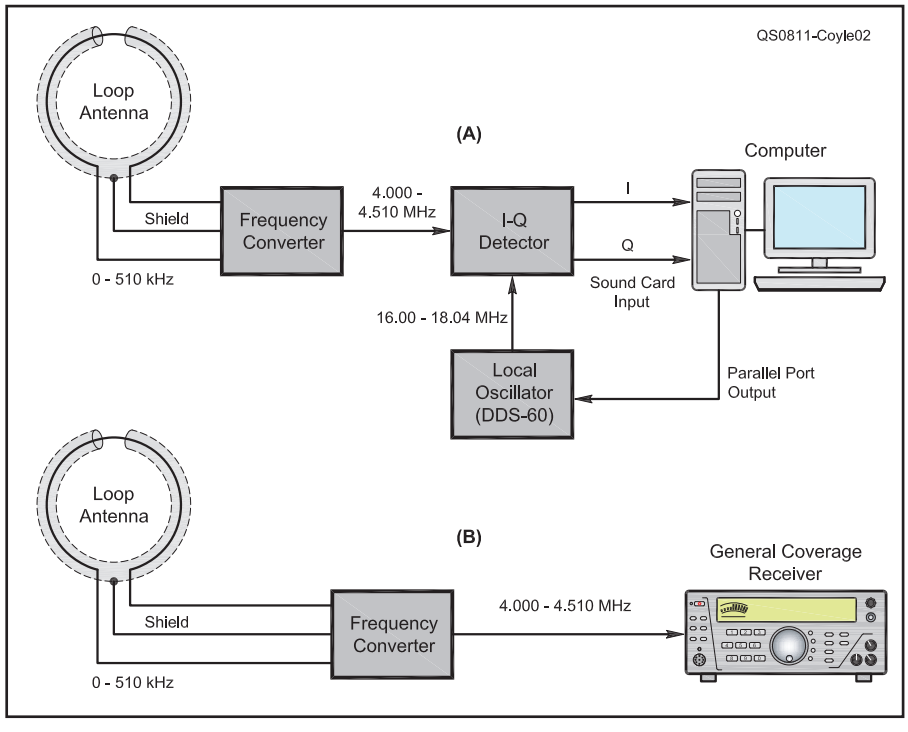


Figure 2 — Receiver block diagram. (A) is the complete setup. The computer runs the WINRAD program for the display and the DDS VFO program for DDS-60 local oscillator control. Alternatively, the LO may be any external signal generator that can supply 16 to 18.04 MHz at a level of 500 mV peak to peak or greater. (B) shows the frequency converter being used as a stand-alone module feeding a general coverage receiver.

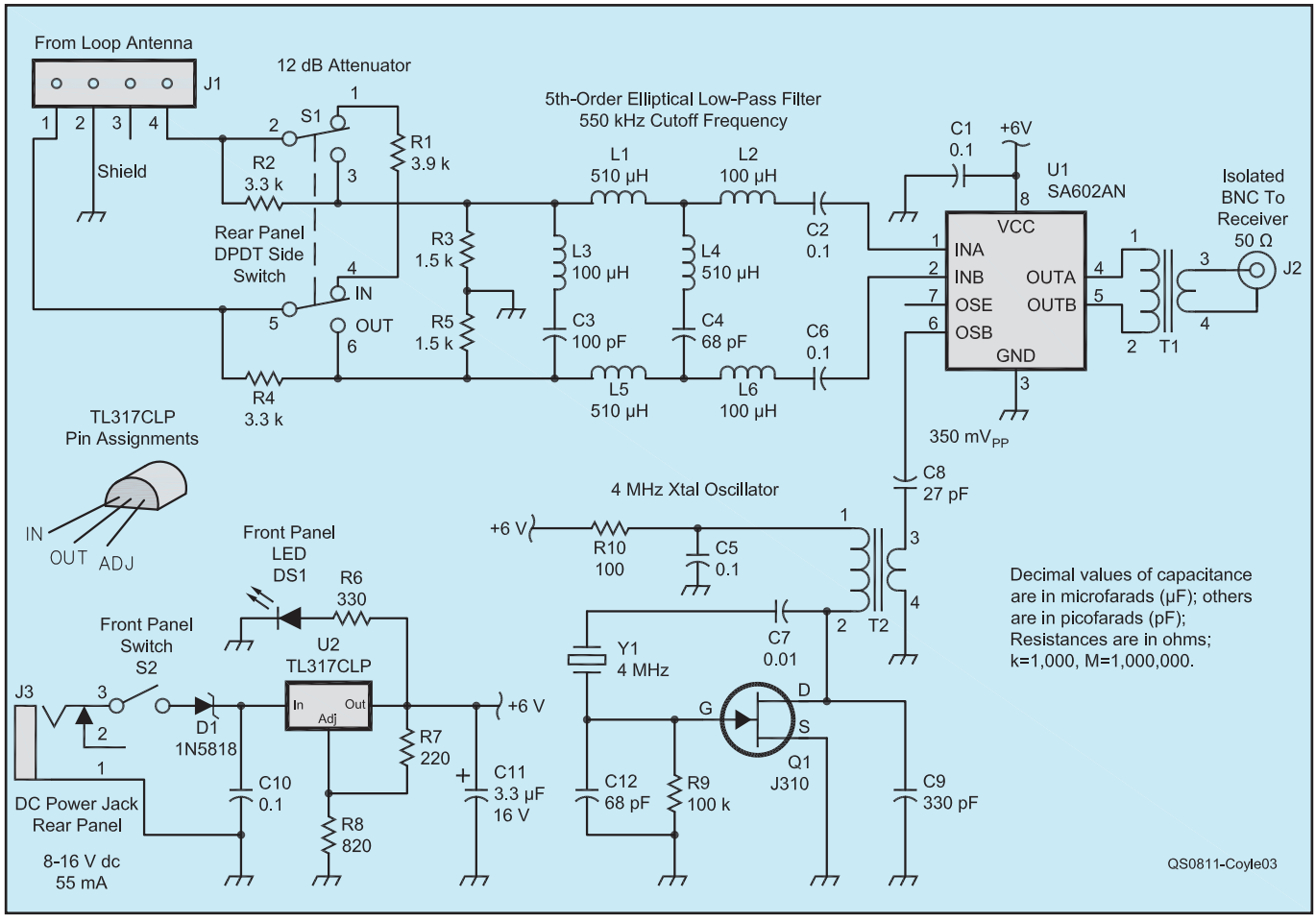


Figure 3 — Schematic diagram of the VLF converter module. Signals from a shielded loop antenna enter at connector J1. The input signal frequency ranges from near 0 to 510 kHz and the output spans 4000 to 4510 kHz. The converter module is designed to feed either the I-Q detector module or the input of any general coverage receiver having an impedance of about 50 Ω.

C1, C2, C5, C6, C10 — 0.1 µF ceramic capacitor.
C3 — 100 pF ceramic capacitor.
C4, C12 — 68 pF ceramic capacitor.
C7 — 0.01 µF ceramic capacitor.
C8 –– 27 pF ceramic capacitor
C9 — 330 pF ceramic capacitor.
C11 — 3.3 µF, 16 V electrolytic capacitor
D1 — 1N5818 Schottky diode.
DS1 — LED, red light-emitting diode.
J1 — 4-contact terminal strip connector.
J2 —BNC panel jack with isolated ground.
J3 — Coax jack dc power connector.
L1, L4, L5 — 510 µH inductor.
L2, L3, L6 — 100 µH inductor.
Q1 — J310 N-channel JFET.
R1 — 3.9 kΩ, ¼ W, 5% resistor.
R2, R4 — 3.3 kΩ, ¼ W, 5% resistor.
R3, R5 — 1.5 kΩ, ¼ W, 5% resistor.
R6 — 330 Ω, ¼ W, 5% resistor.
R7 — 220 Ω, ¼ W, 5% resistor.
R8 — 820 Ω, ¼ W, 5% resistor.
R9 — 100 kΩ, ¼ W, 5% resistor.
R10 — 100 Ω, ¼ W, 5% resistor.
S1 — DPDT slide switch.
S2 — SPST toggle switch.
T1 — Transformer. FT50A-77 ferrite toroid core, primary: 21 turns of 24 gauge, secondary: 4 turns of 24 gauge.
T2 — Transformer. FT37-61 ferrite toroid core, primary: 22 turns of 30 gauge, secondary: 2 turns of 24 gauge.
U1 — SA602AN mixer.
U2 — TL317CLP adjustable voltage regulator.
Y1 — 4 MHz crystal.

Simply feed the converter output into the receiver antenna connector and tune over the range 4000 to 4510 kHz. Ignore the first digit 4 and you will be reading 0 to 510 kHz directly.

Following the converter in Figure 2A is the I-Q detector. This is the real heart of the software defined receiver to be detailed in Part 2. Its name stems from the fact that its function is to extract both an in-phase *I* component of the signal as well as a 90° out-of-phase *Q*, or quadrature, component. This is the approach followed in most modern radio designs.

The reason I-Q detection is such a favored technique among receiver design engineers is that once you have both the I and Q components as a function of time, you know, literally, everything there is to know about that signal. If the I and Q signals are digitized, by feeding them into a computer sound card, for instance, the wide world of digital signal processing opens up. With the appropriate software, all modulation modes — AM, FM, CW, SSB, PSK and any others — can be detected.

The other module shown in Figure 2A is the local oscillator (LO) that feeds the I-Q detector. It's simply a tunable frequency generator running at a frequency four times the received frequency plus 4000 kHz.

You may want to build only the converter portion. It's quick and easy, requires no software and gives you the opportunity to poke around the LF and VLF bands. Later on, in Part 2, you can add the I-Q detector and get familiar with some basic software radio techniques — one of the most exciting and interesting developments in receiver design in decades and a real sea change in the art of radio communications.

Now For a Few Details.

The Converter

The converter module schematic is shown in Figure 3. A single SA602 integrated circuit, U1, serves as an active mixer.[1] My first

[1]Notes appear on page 39.

What's Down There?

First of all — yes, there is some ham activity at LF. The ARRL has sponsored an experimental project whereby a few hams in the US have received special FCC licenses to operate in the 500 to 510 kHz region. If you tune around this band segment you may hear WD2XSH (a call shared by 19 active participants) or WE2XGR (shared by five stations). Several European stations (mostly in the UK and Germany) are also active in this band. This US experimental program has been running since September 2007 investigating propagation conditions and the effectiveness of various modulation methods, including CW, SSB and digital modes. A large number of two-way contacts have been made from all over North America as well as across the Atlantic Ocean.*

Beacons Galore

Tune down into the 200 to 400 kHz range and you can hear many aeronautical beacons endlessly repeating their two or three letter identification codes in AM Morse code. These are low-power (50 W or less) transmitters typically located at the ends of airport runways to assist planes in landing. A fun challenge might be to try a little logging and DX listening on these stations.

Between 160 and 190 kHz there is a free experimental band in which the FCC permits the use of up to 1 W of power and a 15 meter long antenna with no license requirement.

Farther on down the LF band, at some future time we may get to hear ham activity between 135.7 and 137.8 kHz. A recent action of the International Telecommunication Union has allocated this band to the Amateur Radio Service.** The ITU has yet to set a date for this to go into effect, and of course each country must authorize ham activity in this portion of the spectrum before it can be used. In the UK and several other European countries this band is already available.

Navigation and Standard Signals

Continuing to even lower frequency, you may hear the LORAN C radio navigation system clattering away. This system uses high-powered pulsed emissions and is relatively broad band, occupying 90 to 110 kHz.

At 60 kHz, the National Institute of Standards and Technology (NIST) station WWVB broadcasts standard time and frequency information. This station is located in Boulder, Colorado and can be heard over most of North America. Coverage here in New England seems to be rather poor, though. I've only been able to pull it in a few times, and that with some difficulty. The modulation mode is a unique type of pulsewidth code that sounds a little like slow-speed CW. Most so-called atomic clocks use this signal for their time source.

Military Strategic Systems

At even lower frequencies we move into the VLF band. Here the spectrum is occupied by a number of high-powered military stations. These stations run hundreds of kilowatts (station NAA in Cutler, Maine, is the granddaddy of them all, putting out a full megawatt of power) and are used primarily to communicate with submerged submarines throughout the world. Incidentally, a group of dedicated amateur astronomers also monitor these stations. Abrupt changes in signal strength over long distances are indicators of sudden ionospheric disturbances, or SIDs, and are attributed to solar flares and high-energy gamma-ray bursts from distant sources in the galaxy.***

Even Mother Nature Joins In!

Finally, at around 12 kHz and below, you might hear some so-called natural radio phenomena — clicks, pops and whistles caused by distant lightning strikes from up to several thousand miles away.

All in all, these bands can be very exciting to listen on and, once your interest has been captured, there is a wealth of information available on the Internet.****

*The ARRL 600 Meter Experimental Group is under the management of Fritz Raab, W1FR. For the latest status, signal reports, station locations and other developments in this ongoing project, visit the Web site at **www.500kc.com**.

More details can be found in *The ARRL Letter* of November 9, 2007 at **www.arrl.org/arrlletter/07/1109/.

***The SID observing program is run by the American Association of Variable Star Observers (AAVSO), Cambridge, Massachusetts. Their Web site can be found at **www.aavso.org/observing/programs/solar/sid.shtml**.

****For starters, check out the Web sites maintained by the Amateur Radio Research and Development Corporation (AMRAD) and the Long Wave Club of America at **www.amrad.org/projects/lf/** and **www.lwca.org/**.

prototype used the built-in local oscillator (LO) on the SA602 chip, but I was disappointed by the high level of spurious signals. I recalled seeing a suggestion by Doug DeMaw, W1FB (SK) that it was better to use a separate, external oscillator, as it allowed some control over the LO level injected into the mixer, thus reducing the level of LO harmonics.[2] As shown in Figure 3, I wired in a single JFET Pierce oscillator — and noted a significant improvement in the number of spurious responses. Capacitor C8 is chosen to limit the signal level at pin 6 of U1 to be between 200 and 400 mV_{pp}. The separate oscillator adds a bit more complexity to the converter, but the improvement in performance is worth the trouble.

Output transformer T1 steps the 1500 Ω balanced output impedance of the mixer chip down to 50 Ω, which is a good input match for most communications receivers.

The SA602 mixer has some very attractive features. First, it greatly simplifies the circuit. Secondly, unlike a passive (diode ring, for example) mixer, it possesses a gain, about 18 dB. Thirdly, it's doubly balanced so very little of the oscillator energy gets through to the output.

On the other hand, the SA602 is not noted for having a wide dynamic range. In other words, its third-order intercept point (IP3) is a bit low, so it's subject to overloading from strong out-of-band signals. Indeed, despite all my precautions, a great number of spurious responses still showed up, especially below 100 kHz. I live in an area surrounded by several high-power AM and TV transmitters, so this wasn't surprising. My solution was twofold:

- A five pole elliptic low-pass filter at the input with a cutoff around 550 kHz to reject most of the broadcast band.
- A switchable 12 dB attenuator, also at the input. When the attenuator is switched in, most of these spurs nicely disappear. By the way, this doesn't affect the all-important signal-to-noise ratio, since at these low frequencies atmospheric and man-made noise far exceeds any front-end circuit noise. As a consequence, signals and noise are both attenuated by the same amount. Of course, if you are in an area free of high power transmitters, you may not need the attenuator.

Notice that with this design approach, there is no preselector to peak up desired signals and the full frequency range from near 0 up to about 510 kHz is covered with no front end tuning.

If you decide to use the converter module as a stand-alone device to feed a receiver directly, all you need is a small loop antenna (described below in more detail) and a dc voltage supply that can provide at least 8 V at 55 mA. Connect the converter output, J2, to

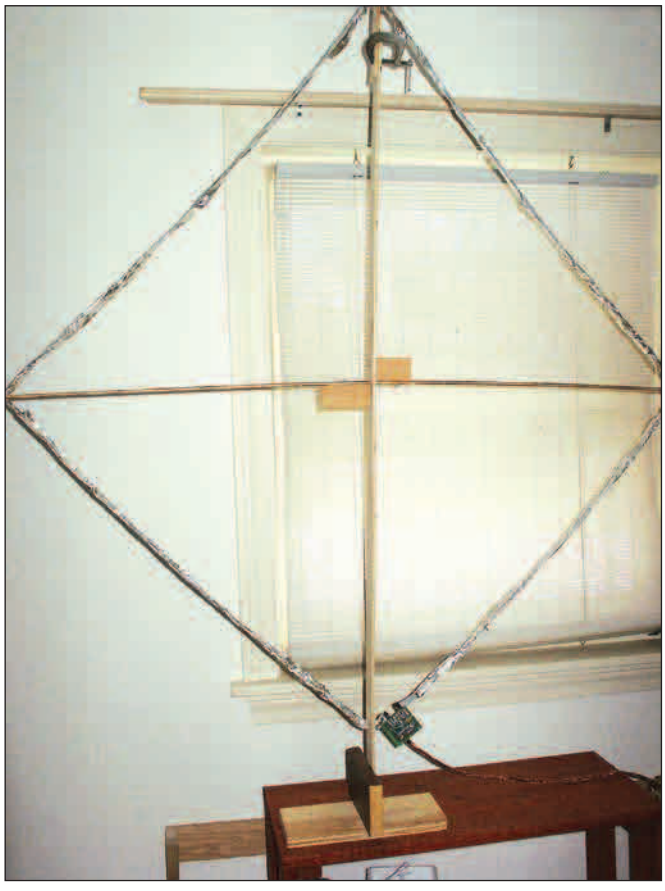


Figure 4 — The indoor loop antenna consists of 14 turns of wire on a lightweight wooden frame. Flat computer ribbon cable was used to make the fabrication easier. The small circuit board near the bottom of the loop is where the individual wires are cross-wired to make one 14 turn loop. Shielding was provided by wrapping with household aluminum foil, with a gap left near the peak of the antenna — a necessary precaution to avoid the shorted turn effect.

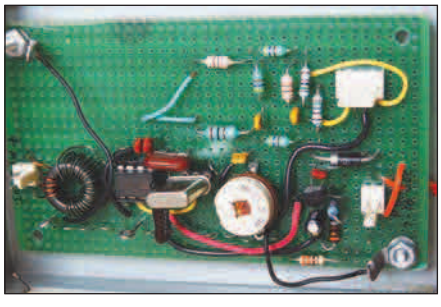


Figure 5 — Converter module circuit board.

the antenna connector on your receiver and you're good to go.

The LF/VLF range zero to 510 kHz appears on your receiver dial at 4000 to 4510 kHz.

The Antenna

At wavelengths of 600 meters and more (a whopping 2200 meters at 137 kHz) not many of us have the room for a resonant antenna. But loop antennas work well, and receiving antennas are easy to construct. Figure 4 is a photo of a square loop antenna, 30 inches on a side, with 14 turns of wire. Since this was to be a strictly indoor antenna, I used a 10 foot long piece of 14 conductor computer ribbon cable supported on a lightweight wooden frame. Dual-row IDC connectors on each end mate with two 14 pin dual-row headers on a scrap of perforated board where the interwiring is done to complete the 14 turn loop.

Balanced loop antennas respond to the magnetic component of the incoming electromagnetic field (for this reason they are sometimes referred to as magnetic antennas) and largely ignore the electric field. This is an advantage since many sources of man-made noise — such as power lines or household electrical wiring — fall into the category of close-in sources, closer than 1 λ, where the electric field predominates and the magnetic field is small.[3]

A further reduction in noise can sometimes be achieved by shielding the loop. This eliminates capacitively coupled common-mode signals from entering the receiver. Since the antenna would not be used outdoors, I used ordinary household aluminum foil to shield my loop. A small gap in the shield at the top end of the antenna was necessary so that the shield wouldn't act as a shorted turn. In my case, grounding the shield resulted in a noticeable reduction in received noise. As with any loop antenna, there is a deep null in the pattern, a feature that can sometimes be used to advantage in identifying an unknown station or reducing unwanted interference.

A ferrite rod wound with many turns of wire also functions well as an LF/VLF antenna. The ferrite rod acts as a magnetic flux concentrator, and greatly increases the effective receiving area of the antenna. I have not yet experimented with ferrite antennas, but it's on my list of things to do.

Construction

I used ordinary perforated board to construct these modules. Figure 5 shows the converter module. At low frequencies such as these, the problems of stray capacitance and inductance are not major considerations. Building the receiver in separate modules will help to eliminate potential feedback problems as the other modules are added. Watch this space!

Finally, I wish to give credit to Dan Brown, W1DAN, for his thoughtful criticism and advice during the writing of this article. Thanks, Dan!

Notes

[1]The SA602 mixer is also sold under part number NE602. A slightly more advanced version, SA612 (NE612), is pin-compatible and can be used as a drop-in substitute.

[2]D. DeMaw, W1FB, *W1FB's Design Notebook*, "An Improved DC Receiver," p 112, ARRL, 1990, out of print.

[3]Due to the immutable laws of physics, the electric and magnetic fields from more distant sources evolve into a fixed relationship, and there's nothing you can do about it.

Larry Coyle, K1QW, was first licensed in the 1950s when he was in high school. His professional career began as a radio broadcast engineer, and after graduating from college with an MSEE, he spent the next four decades designing electronics systems for military and aerospace applications. After running a freelance consulting practice for several more years, he retired. His interest in Amateur Radio never waned, and he is now the holder of an Amateur Extra class ticket, a member of the ARRL and the Wellesley (Massachusetts) Amateur Radio Society. You may catch him on any HF band operating low power (QRP) mostly on CW and PSK31 modes. You can also reach him at 100 Rolling Ln, Needham, MA 02492 or at **lmcoyle1@verizon.net**.

Strays

DXCC LISTS DEADLINE APPROACHING

◊December 31, 2008 is the date submissions are due for the 2008 DXCC Honor Roll List and the 2008 DXCC Annual list. Submissions must be postmarked by December 31, 2008. — *Bill Moore, NC1L, ARRL Awards Branch Manager*

An All-Weather Coax Bulkhead

Build a freeze proof lightning protection interface.

Jim Kocsis, WA9PYH

I designed and built a straightforward cable entrance facility a few years ago. It would work well for those who live in a climate where the weather never gets below freezing. Here in Northern Indiana, however, during winter we can go weeks and never get above 20° F. My design had a problem that I'm sure others with similar units will have if they are installed in a location similar to my mine.

The Problem

When the outside air reaches freezing temperatures, moisture forms on the connectors inside the house. Humidity in the air inside the house condenses on the cold connector, eventually getting inside and allowing RF to arc over. Since half of the bulkhead connector is outside, the cold transfers right through the connector. If the connector gets cold enough the water freezes to ice, making removal of the connector difficult if not impossible. In my case I have a wooden window seat directly beneath the coax connectors. When the weather warms, the ice melts and water drips on the wooden window seat below producing water spots. After a few winters of water and ice formation the corroded connectors needed to be replaced and the seat needed refinishing.

It Gets Even Worse

The worst possible thing almost happened one winter when we had *thunder snow* — lightning during snowfall — and I was unable to remove the PL-259 UHF plugs from the interface because they were frozen to the bulkhead connectors. I wasn't able to isolate my station equipment from possible lightning damage. Fortunately the thunder snow didn't last long and I didn't get hit. During one very cold winter I measured up to ¼ inch of ice that had formed around the connectors inside the house.

The Solution is at Hand

Obviously, something better was needed. This article describes a much improved design that eliminates all the problems and provides better cable grounding. This design has gone through one very cold winter and there has been no water on any of the connectors. They're as shiny and new looking as the day I installed them.

Overall Design

The new design is best understood by looking at Figure 1 and the photos. Note that each coax first passes through a grounded bulkhead at ground level, then through a wooden board that is the interface between inside and outside. The coax is brought a distance into the house allowing the connectors to remain at room temperature. Also, if one of the antennas is hit by lightning, the energy passes through the grounding bar directly to ground. The direct path is not through any metal at the window as with my old design.

Features

I have five coax runs, one 450 Ω window line and an 11 conductor cable that run to my operating position. I use all but two of the coax runs, allowing for expansion or backup. The coax runs are for a 2 meter vertical and a 2 meter and 436 MHz satellite antennas. The window line is for an HF dipole. The 11 conductor cable is for the azimuth/elevation rotators for the two satellite antennas. You can add more connectors or different types. The design can be adapted to whatever you use at your station.

You can completely isolate your equipment from the antennas and ground and do it quickly so that if a storm is forecast you

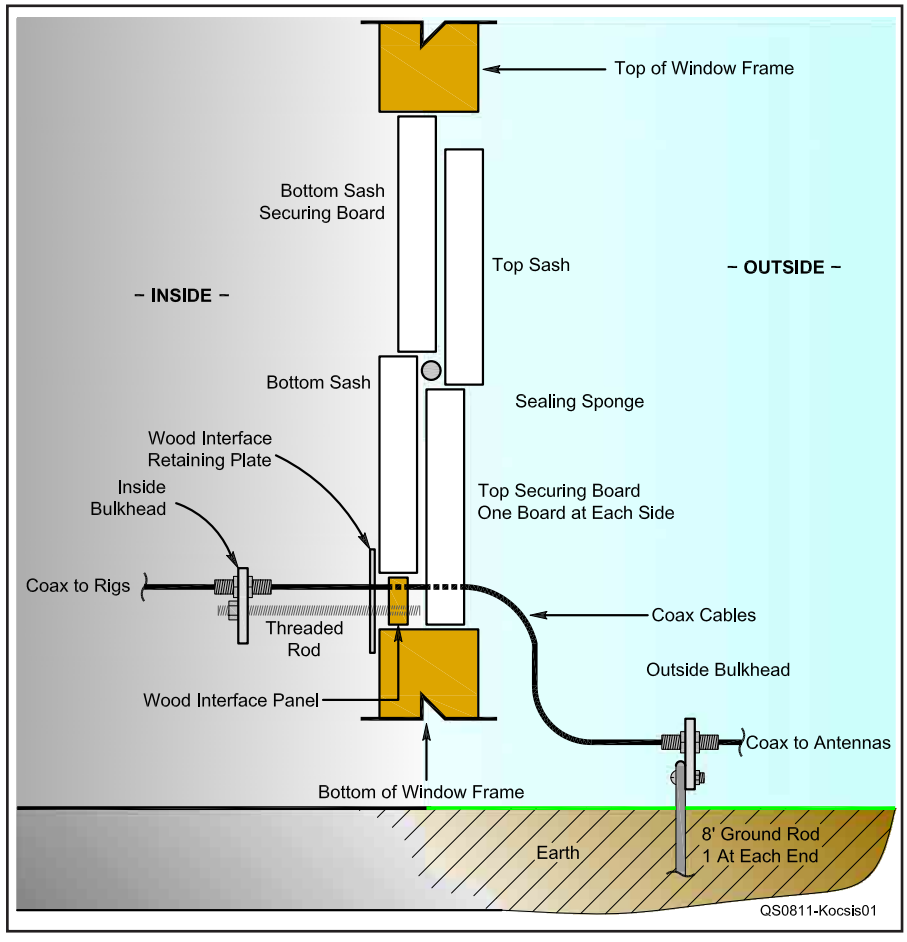


Figure 1 — Overall system diagram.

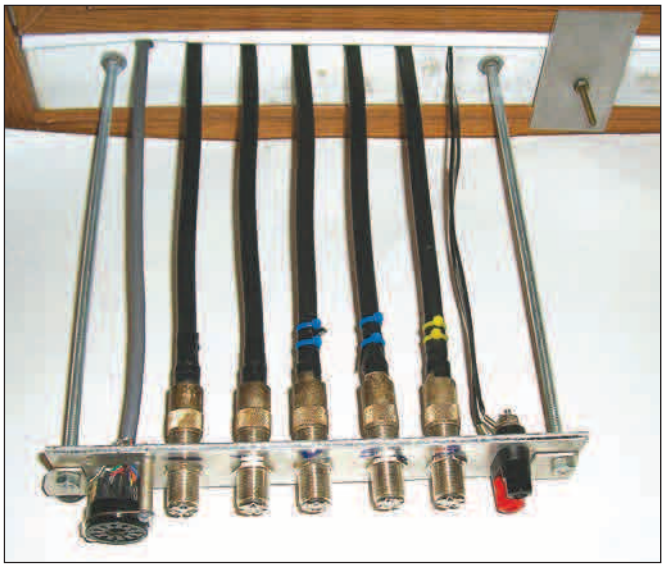


Figure 2 — This is the inside bulkhead. Note one of the wood interface panel retaining plates (upper left).

Figure 3 — The outside grounding bulkhead.

can isolate your equipment. The coax cables that connect the radios to the bulkhead use quick-disconnect type PL-259s at the bulkhead end. The 11 conductor cable goes through a connector that can be pulled out easily. Lastly, the window line uses a dual banana plug that also can be removed easily and quickly.

Construction

Begin by making measurements of the window opening width for the wood interface panel. The board should be free of knots and holes. It should be approximately 3 inches high and exactly ¼ inch shorter in width than the opening in the window frame. Next, drill the holes for the coax. The holes for the coax are made using a 13⁄32 inch (0.406 inch) drill bit. This size is just right for RG-8A/U that measures 0.401 inches in diameter. The holes are drilled near the top edge of the board, then the hole is expanded into a U shape using a wood file so that the coax can be slipped into place. The top edge of the hole should be as close as possible to the edge of the board. This way the sticky backed insulation can form a very tight seal against the coax when the window is closed.

For the window line, I cut a slot using a saber saw. No insulation was needed since the window line fit very tightly. Experiment with blade width on a scrap piece of wood to select a blade that produces a slot width that provides a tight fit.

Drill the two holes for the threaded rods. Drill the two holes for the *wood interface retaining plates* as shown in Figure 2. Add any other holes for cables you need to pass through the wood interface. Sand and paint the board to match the color of your window and windowsill. Put sticky-backed foam insulation around the ends and bottom of the board. The foam on the top will be installed later. The width of the foam should match the thickness of the board and should be ¼ inch thick before compression so there is a good seal all around.

The inside bulkhead at my station consists of a 2 × 10 × ⅛ inch piece of aluminum. There's nothing critical about the dimensions. I suggest leaving at least 1¼ inches between the connectors to allow easy removal. Make sure that the spacing between connectors is the same as on the wood interface so the coax runs don't have any bends in them. Your bulkhead can be larger or smaller as required for the number and type of connectors you need.

The SO-239 bulkhead connectors require a ⅝ inch diameter hole. The ¼-20 threaded rod is approximately 11 inches long, 10 inches from the board to the inside bulkhead and 1 inch in the wood. This will provide a good length of the coax to warm-up to room temperature and not transfer any cold to the bulkhead coax connectors. I added some brackets for support to keep the interface from falling in.

The window line connector on the inside bulkhead is a dual banana female connector. See Figure 2. The mounting holes are ½ inch diameter spaced ¾ inch apart. The mating male connector on the window line to my antenna tuner is an extended length style that provides a place to secure the window line going to my antenna tuner.

Next is the outside grounding bulkhead shown in Figure 3. It is similar to the inside bulkhead except that it is attached to the two ground rods. In my case I elected to use lugs on 0 gauge wire (0.325 inch OD) then secured the ends of the wire to the ground rods. My bulkhead connectors are 1⅝ inches long — this is a minimum length for complete engagement of the connectors on each side.

You will need several lengths of RG8/U coax to connect the two bulkheads together. Make good solid soldered connections inside and cover the coax and connector completely with Scotch +33 electrical tape or Coax Seal. The length of coax needed is determined by the distance between your window and the nearest earth where you can install the outside grounding bulkhead and ground rods.

Small aluminum plates are needed to go on the inside of the wooden interface panel. They are labeled *wood interface retaining plate* in Figure 1. The plates are secured by screws to keep the wood interface panel from falling out or someone from pulling on the coax to gain access to your house. A long bolt is needed to hold the aluminum plates in place. I recommend using a 10-32 × 4 inch brass bolt, 10-32 brass nut and large brass washer outside so they don't rust. My plates measure 2 × 4½ × ⅛ inch. Yours may need to be a different size.

Boards should be wedged inside at the top of the bottom sash and outside at the bottom of the top sash to keep the top and bottom seals tight to keep out rain, bugs and cold air. In Figure 1 they are labeled *sash securing board*. The length of these four boards will

Figure 4 — A view from outside.

have to be determined using the cut-and-try method.

The coax runs that go from the inside bulkhead to the radio equipment have quick-disconnect type PL-259s on the bulkhead end. It is so much easier to just pull them off and push them on rather than using the type that screws on, although screw on plugs can be used.

The 11-pin connectors for my satellite azimuth/elevation rotor system cable are similar to 8-pin octal tube sockets. I found them at a hamfest. The female connector on the inside bulkhead was mounted using metal standoffs. Use star lock washers here so they don't loosen after repeated use. Other types of connectors will certainly work just as well for this type of wiring.

The only special or expensive parts are the dual banana plug and jack. All coaxial connectors came from a hamfest. The aluminum bulkhead plates, ground rods, miscellaneous nuts and bolts, wood, sticky-backed sponge and threaded rod can be bought at a home improvement store.

Figure 4 shows a view of the window from outside. Barely visible is one of the two sash securing boards. It is just to the right of the right-most coax cable.

Installation

Assemble the inside bulkhead by installing all the SO-239 bulkhead connectors, the ¼ inch threaded rod, the dual banana jack connector and any other special connectors you will be mounting. Attach the coax pieces to the bulkhead connectors. Put the coax pieces into the U slots. Put the sticky-backed foam on the top of the wood interface panel.

To install the entire assembly, put one corner into place with the opposite side raised. Line up the raised corner with the window frame then lower it into place — this will compress the sponge at the ends to provide a good seal.

Close the window on the wood interface to compress the sticky-backed sponge. If needed, apply a small amount of RTV around each cable to provide a complete seal. Push the top sash up firmly until it seats. Make the measurements for the four sash securing boards and trim them to fit. Prime and paint them and reinstall. Install the two wood interface retaining plates using brass screws and nuts.

You will need to add sponge between the upper and lower sashes since having the window open the extra 3 inches will create an opening that is normally sealed where the two sashes meet when the window is fully closed. The type of foam seal supplied with window air conditioners is designed for just this application.

Improvements

The window line and rotor cable are ungrounded. I'm working on a way to pass the window line and rotor cable through the outside grounding plate but haven't decided on how to do that. ICE makes surge arrestors for both types of cable, as well as arrestors for coax cable entrance connectors.[1] These may be a good solution, if mounted on the outside ground plate.

Performance

This system provides a low inductance RF ground for your station. This new design works much better than my old design. No ice or water has formed on the connectors during this past very cold winter, no rain has leaked in the window and no cold air can be felt coming in through my north facing window.

[1]Available from Array Solutions in the US at **www.arraysolutions.com**.

Photos by the author.

Jim Kocsis, WA9PYH, is employed as a Test Engineer at Honeywell Aerospace. He has homebrewed small projects his entire ham career. He was first licensed in 1964 as WN9LDB and passed his General class exam in 1965 and his Amateur Extra class exam in 1986. He is a member of the ARRL.

Jim's interests are casual DXing, CW on HF, low power CW, especially during the ARRL Field Day event, weather satellite imagery, cooking, baking, travel, reading (especially travelogs) and non-competitive bicycling. Jim received a degree in physics from Indiana University in 1976. You can reach him at 53180 Flicker Ln, South Bend, IN 46637 or at **wa9pyh@arrl.net**. QST

New Products

LOW FREQUENCY AMPLIFIER AND ANTENNA SYSTEM FROM NATIONAL RF

♢The Type NLF-2 low frequency amplifier and loop antenna system from National RF is designed for operation on the 135 kHz band, the 160 to 190 kHz "Lowfer" band, the 500 kHz experimental band, the AM broadcast band and 160 meter amateur band. It is said to provide the ability to null out interfering noise by rotating the loop antenna, as well as improving the signal-to-noise ratio compared to large antennas such as verticals or dipoles. The hardware incorporates two plug-in ferrite antenna assemblies that interface with a balanced FET front end preamplifier and an adjustable gain post-amplifier. One plug-in unit covers approximately 100 to 350 kHz, and the second unit covers 500 kHz to 2 MHz. In addition, each loop assembly includes a coupling coil for connecting an external sense antenna (not included) to give the loop antenna a unidirectional pattern. The amplifier unit incorporates an output attenuator as well as the adjustable gain amplifier, making it compatible with a wide range of receivers. Price: $370 including one plug-in unit; $90 for additional plug-in. For more information, visit **www.nationalrf.com**.

The Universal Keying Module

Don't be a victim of bad keying reports from your CW contacts. This quick and simple project will allow you to interface any keyer to any transmitter — and then some!

Mike Bryce, WB8VGE

Saturday night provided a mixture of cold rain and snow. It was a perfect evening for a little bit of CW on the lower end of 40 meters. The band seemed to be in good shape, so my trusty Heathkit HW-8 QRP (low power) transceiver was brought on line. A few minutes later, a QSO was in progress and things were looking up. I got the usual 559 report but with an added *QSD* tacked on the end.

QSD — *whoa*! I remember that one from my Novice days. Well, to keep you from having to look that up, QSD means I have defective keying. I thanked the other guy and quickly ended the QSO before any Official Observers trolling the band could copy my call.

On the bench the little HW-8 was fired up into a dummy load. Using a clip lead, the keying sounded just fine to me while listening on a second receiver a few feet away. When I connected the rig up to the keyer I was using, however, the old HW-8 sounded like a tweety bird in a blender. QSD indeed.

I found the problem to be twofold. First, the HW-8 is keyed by grounding the base of one of the transistors used in the break-in delay and relay driver circuit. There's no buffer between the key line and the base of the keying transistor.

The second problem stemmed from the keyer I was using, a Heathkit HD-1410. It appears that the output transistors (two are used, one for positive keying, another for negative keying) used in the '1410 was not pulling the key line completely to ground. This prevented the keying transistor inside the HW-8 from becoming fully saturated, thus producing the defective keying.

Looking around the shack, I found that I had several old keyers that also had a problem pulling the key line to ground. Almost all the problems were related to a switching transistor that would leave the key line a few tenths of a volt above ground. Depending on the radio, the keying could be just fine or the keying would be QSD.

Instead of trying to fix each of the keyers, or modify the radios so the keyers would work, I came up with a simple keying interface.

Enter the Universal Keying Interface

The keying interface solves both problems caused by any keying device and almost any radio. It's not just for the HW-8. You can use this keying interface with any radio that requires the key line to be pulled to ground.

The keying interface takes the output from your keyer or your computer or CW keyboard, optically couples it to a power MOSFET that in turn pulls the key line to ground. The MOSFET now keys the transceiver. The circuit is shown in Figure 1 along with the parts list.

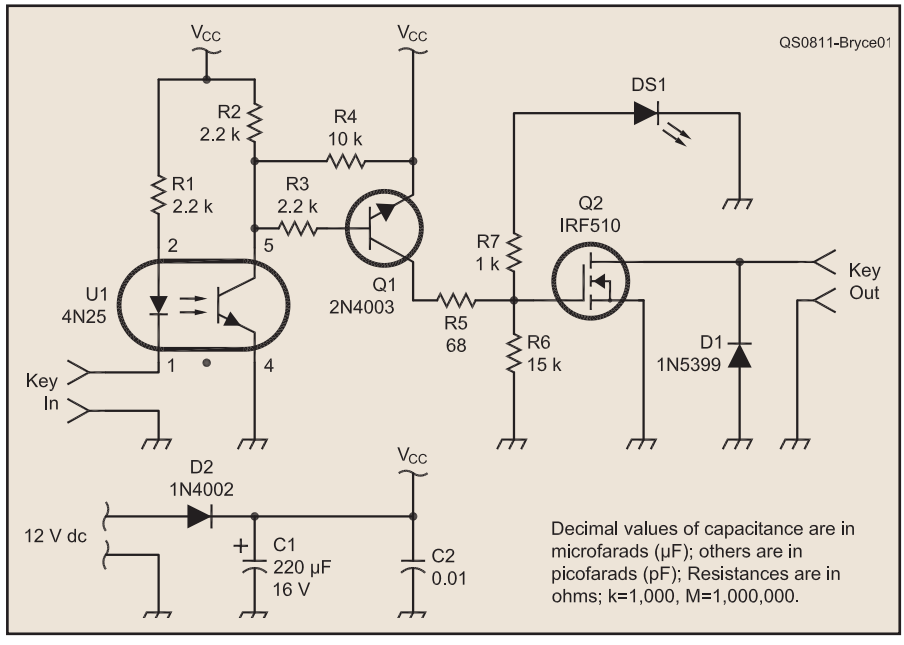


Figure 1 — Schematic diagram and parts list for the universal keying module.

C1 — 220 µF, 16 V electrolytic capacitor.
C2 — 0.01 µF, ceramic capacitor.
D1 — Diode, type 1N5399.
D2 — Diode, general purpose type 1N4002 or equivalent.
DS1 — 3 mm light emitting diode.
Q1 — 2N4403 PNP transistor.
Q2 — IRF510 field effect transistor.
R1-R3 — 2.2 kΩ, ¼ W resistor.
R4 — 10 kΩ, ¼ W resistor.
R5 — 68 Ω, ¼ W resistor.
R6 — 15 kΩ, ¼ W resistor.
R7 — 1 kΩ, ¼ W resistor.
U1 — 4N25 optical isolator.

Here's How it Works

Basically, when you operate your external keyer, the output of your keyer supplies the ground return for the 4N25's internal LED on pin 2. This action turns on the 4N25's output transistor and thus pulls pin 5 low. This low allows Q1 to turn on and send 12 V to the gate of power MOSFET Q2 via R5. The MOSFET is fully enhanced and pulls its drain lead to ground, thus keying your radio.

To ensure the MOSFET is turned off between characters, R6 quickly discharges the gate. Also on the gate lead is resistor R7 that supplies current to light up the LED. The combination of R6, R7 and the LED keep the MOSFET off when it's supposed to be off. Of course, an LED is required for every homebrew project, but it can be left out of the circuit if you so desire.

Diode D2 prevents damage to the circuit in case you hook up the supply backwards while C1 and C2 provide slight decoupling to keep RF out of the circuit.

To prevent damage to the MOSFET in the event you connect the circuit up to a key line that is grid blocked, and thus sets negative in relation to ground, D1 would conduct keying the radio while protecting the MOSFET.

The circuit is designed for pulling to ground most positive key lines. This includes just about every recent transceiver or transmitter. As it is, the universal keying interface even works on the old cathode keyed Novice rigs of the '50s and '60s. You'll have no trouble keying a Heathkit DX-20 with its 160 V key line!

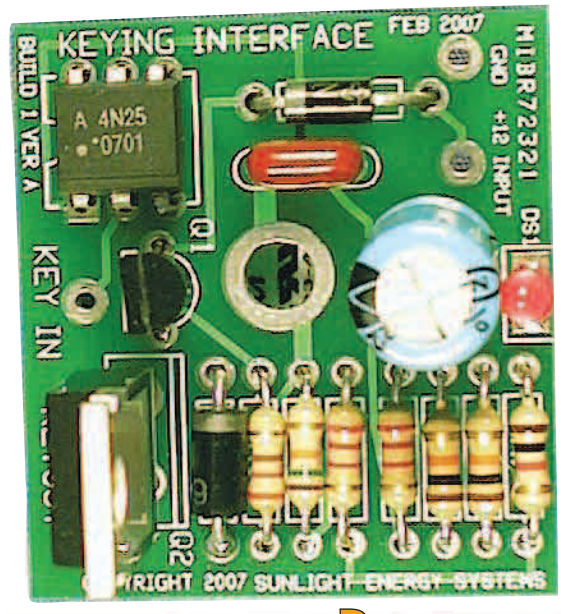


Figure 2 — PCB constructed universal keying circuit ready to go into a radio, keyer or small external box.

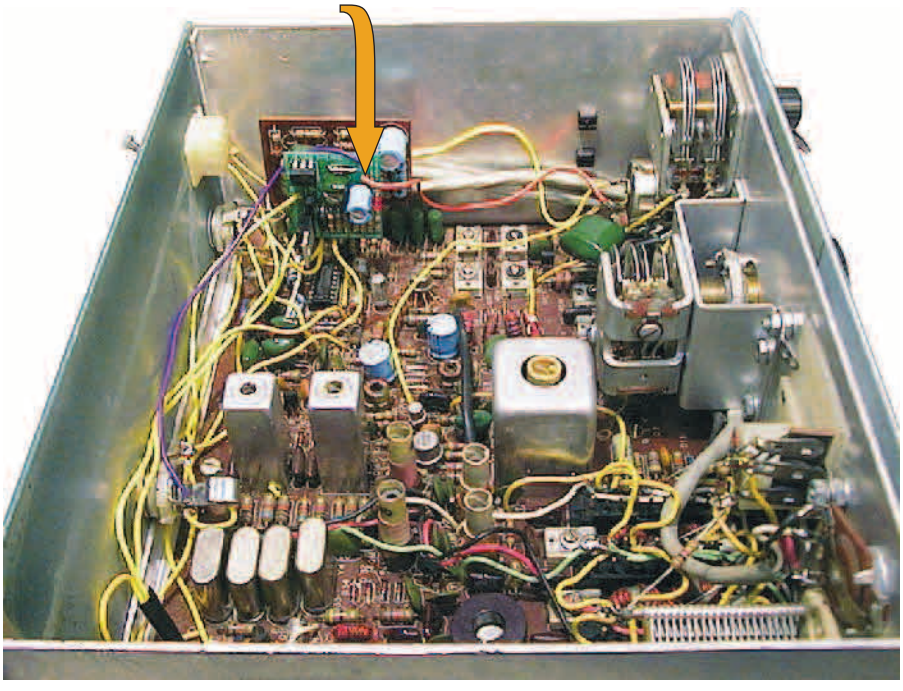


Figure 3 — The universal keying module mounted above the audio amplifier inside the HW-8 is dwarfed by the radio's PCB below it.

Not all the old transmitters used cathode keying, however. Some use a more complex system called *grid blocked* keying. In grid blocked keying, the key line will have a negative 150 V or so when the key is up. As it sits, the universal keying interface won't work with grid blocked keyed rigs — but because it is universal — a few part changes later and you open up the world of grid blocked keying.

Cathode or Grid Blocked Keying

It's best to decide if you want to use the universal keying interface for positive keying line or grid blocked key lines. It's simply easier to do before you start assembly then to remove the parts you don't need after they have been soldered in.

How do you tell? Use your VOM and measure the voltage on the key line. If the key line sits positive, then you have positive keying. If the voltage is positive but rather high in the area of 100 V or more, then you have a cathode key line. You'll likely only see cathode keying in vacuum tube transmitters of the '50s and '60s.

If you measure a high negative voltage, then you have a grid blocked key line. Once again, you will only see this key line in the older tube based transceivers or transmitters.

To change the circuit to accept grid blocked keying, start by changing R5 from 68 Ω to 1 kΩ. Remove Q2 and install D1 with the banded end going to the drain pad of Q2 and the other end in the gate pad of Q2. The last step is to delete R6. Now, when you close the key paddle on your keyer, Q1 conducts and sends +12 V to the grid block keying circuit. This removes the grid block from the tubes and thus keys the radio. I found that my Drake 2NT transmitter would work with R5 at 220 Ω but the Heathkit SB-400 would not key correctly until R5 was at 1 kΩ. The Drake 2NT was happy with either value.

But Wait — There's More

The universal keying interface will also key an external amplifier's key line provided the key line is positive. So now you can key your Heathkit SB-220 linear amplifier with your IC-706 transceiver by using the interface! Sorry, but the SB-200 won't work as its key line sets at –160 V.[1] But just about any amplifier with a positive keyed line will work.

I've installed one of the interfaces inside a Dentron GLA-1000B amplifier and now instead of seeing +28 V at 500 mA on the key line, my Jupiter transceiver now sees +12 V at 4 mA.

Building Your Own

There's certainly nothing special about assembly of this circuit. You can use perforated board, dead bug, printed circuit board or any other method you feel comfortable with. This circuit just oozes a try at surface mount construction. I laid out a small double-sided printed circuit board (PCB) that will fit inside most radios.[2] The board is quite small, about 1.5 inches square (see Figure 2). A single hole mount makes it quite easy to install the assembled PCB inside your rig.

The only caution I can give is to take common sense steps in handling the MOSFET as a static discharge can destroy it. This includes using a wrist strap and avoiding handling the MOSFET until it is installed in the circuit.

If you elect to use the PCB, and with apologies to GEICO, assembly is so simple even a caveman can do it! Simply install U1, resistors, Q1, diodes and capacitors and finally Q2.

Testing the Circuit

All you need is a source of nominal 13.8 V and a few clips leads. Attach the power and ground wires from the PCB to the power source. Turn on the power and nothing should happen. With a clip lead, ground the KEY IN pad. The LED should light. If you connect your VOM set to read resistance between ground and the drain, keying the circuit should produce an indication of nearly 0 Ω resistance. If everything works, disconnect the circuit and install it in your favorite rig.

Since there is only one hole required to mount the PCB, I took out one of the mounting screws holding the audio amplifier PCB to the side of the HW-8. See Figure 3. Using a half inch long male to female threaded aluminum standoff, I mounted the PCB to the stand off and then into the hole that held the screw

[1]Notes appear on page 45.

Keying Schemes Old and New

Sending CW is a simple matter of turning the transmitter on and off. It's how this simple feat is accomplished that determines the waveform that is transmitted. There are two basic keying schemes used.

- *Positive or cathode keying*. As the name implies, the key line rests at a positive voltage. When the key line is closed, the voltage is pulled to ground. This allows the transmitter circuits to turn on. It's not quite that simple in one of our modern transceivers. Inside, the microprocessor must decide if you can transmit on the frequency you have dialed up, all the phase locked loops are locked and then tell all of the other circuits that you want to transmit.

The antenna must be moved from the receiver to the transmitter circuits and the receiver muted. The sidetone must be generated and applied to the audio section of the now muted receiver. And there's even more to it than all of this! The more the keying circuit has to do the longer it takes to produce the first dit. In some radio designs, the first part of the dit is cut off because the radio can't get into transmit fast enough. The reviews in *QST* always show the keying waveform of a radio under test conditions. Simple low power (QRP) transmitters usually only require grounding an emitter of a driver transistor to start up the transmitter. Simple circuits like this are very fast and thus can produce clicks on the CW waveform unless some sort of softening is added to the key line.

Cathode keying was used in the old tube based transmitters used by countless Novices during the '50s and '60s. In practice, it's really quite simple. When you wanted to key the old rig, you simply ground the cathodes of the tubes in the transmitter chain. With the cathodes grounded, the tubes conduct and you make RF. Simple novice rigs at the time keyed the final and the oscillator at the same time. That could cause a chirp in the signal especially on the higher bands. Some simple designs used only one tube. You keyed the oscillator which served as the final, too. With an old crystal, the keying could be just terrible!

The problems with cathode keying were several fold. One, the current in the key line of a cathode keyed rig could be quite high, perhaps 300 mA. The voltage was quite high, too. It could easily be as high as 200 V or perhaps even more! Many a new Novice got quite a surprise by touching the wires going from the rig to the WWII Surplus J-38 key.

- *Grid blocked keying*. Grid blocked keying is a bit more complex to design and therefore you did not see grid blocked keying in most Novice rigs. In a nutshell, a bias supply is used to keep the transmitter stages off. This is normally done by applying a negative voltage to the grids of the oscillator and driver tubes. When the transmitter is keyed, the bias voltage needs to be removed. You can do that by simply grounding the key line or by placing a positive voltage to the key line. Either method removed the bias from the grid and the tubes conduct generating RF in the process.

Once you had the grid block keying circuit installed, you could easily add *differential keying* to start the oscillator a few ms ahead of the rest of the transmitter, allowing for a much more stable CW signal. While this required passing little current, there was generally more than 100 V on the key terminals.

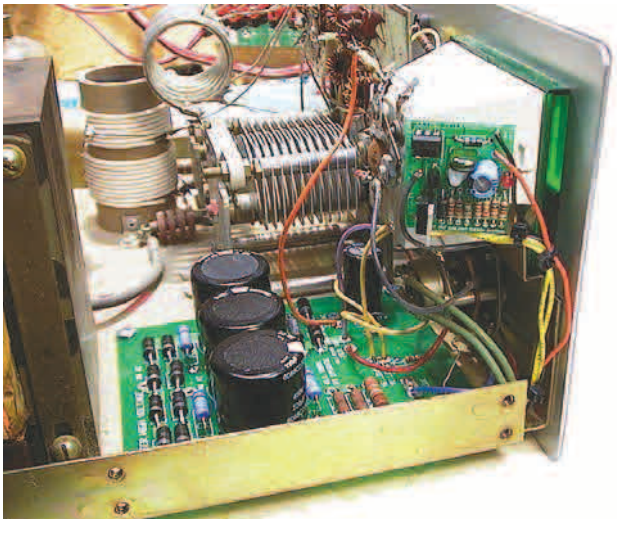


Figure 4 — Universal keying module mounted on the right side of the Dentron GLA-1000 amplifier's meter using a nylon sticky standoff. The tab of the MOSFET is placed to the inside of the amplifier so the top case won't hit it when installed.

Figure 5 — Keying module installed inside a small plastic box. Two LEDs provide status of power and keying output.

I removed. The wire from the key jack was routed to the KEY OUT line and a wire from the KEY IN jack was attached to the KEY IN line. Don't forget to supply power to the circuit and of course a ground connection. The center mounting hole does connect to ground, but a secure ground connection would be better. A module mounted in a linear amplifier is shown in Figure 4.

If your favorite radio doesn't have enough space, then simply drop the PCB into a small plastic or metal box as shown in Figure 5. You can use whatever connectors you need to connect to your radio and keyer.

I built up several of these interfaces and mounted them in small black plastic boxes. I have some for cathode keying for use with the older rigs and my HW-8 or the Jupiter. And there's a few lying around the shack that will key the Drake 2NT and the old Heathkit HW-16 as well. Both of these radios use grid blocked keying.

CW has had a long friendship with ham radio operators. This keying interface will keep your classic radios or the latest microprocessor rig sounding sweet. The keying interface will send QSD back into the past once again.

Notes

[1]The Heathkit SB-200 amplifier is not grid block keyed. The grid block modification won't work for this or any other negative keyed amplifier.

[2]A complete kit of parts for the universal keying interface is available from Mike Bryce, WB8VGE, 955 Manchester Ave SW, North Lawrence, OH 44666. For more information, see **www.theheathkitshop.com** or send an e-mail to **prosolar@sssnet.com**.

Mike Bryce, WB8VGE, an ARRL member, has written many QST *articles and is the author of the ARRL book* Emergency Power for Radio Communications. *You can reach him at 955 Manchester Ave SW, N Lawrence, OH 44666 or at* **prosolar@ssnet.com**. *He also maintains a Web site at* **www.theheathkitshop.com**. QST

Battery Boost Regulators from TG Electronics and MFJ Enterprises

Reviewed by Phil Salas, AD5X
QST Contributing Author

Today's compact 100 W HF transceivers generally are designed to operate from 13.8 V dc, ±15%, or about 12 to 16 V for safe operation. The low end value is critical in that lower values can result in output signal distortion, output power problems or radio shutdown. For example, my IC-706MKIIG works fine down to 12 V. Below that, output power begins to rapidly drop off. At just under 11 V, the radio shuts itself off when I try to transmit.

In the mobile or portable environment there are two common problems that can cause low voltage issues. First, there can be noticeable voltage drop on the dc input power cable because of the high current drawn by your transceiver. The current requirement for the typical rig is about 20 A for 100 W of output power. So just 0.1 Ω resistance in your cable and connectors will result in the loss of 2 V! And second, even a fully charged battery will drop from 13.8 V to close to 12 V after a short time, making battery operation at full power a short term experience in many cases.

Battery Boosters to the Rescue

Battery boosters or boost regulators are designed to alleviate the low input voltage problem. These devices are switching regulators designed to provide a steady output voltage (typically, 13.8 V dc) over a wide range of input voltages as battery voltage decreases.

In October 2005, *QST* reviewed the W4RRY 23 A Battery Booster.[1] Since then, TG Electronics (TGE) and MFJ Enterprises have begun producing battery boosters that have added features and capabilities. This review covers one model from each of these manufacturers. Table 1 compares features of the two units.

Table 1
Battery Booster Feature Comparison

Feature	*TGE N8XJK Super Booster*	*MFJ-4416 Super Booster*
Adjustable output voltage	External, multiturn	Internal, single turn
Maximum input current	40 A	30 A
Cooling fan	Yes	No
Selectable low voltage alarm point	Yes, internal jumper	Yes, internal jumper
Boost disable on low voltage alarm	Yes	Yes, on/off jumper
Low voltage audible alarm	No	Yes, on/off jumper
RF Enable	Yes	Yes
RF Enable off delay adjustment	Yes, ~1 sec max	No, ~5 sec fixed
RF sample port	BNC jack	UHF jack
RF Enable power level	~10 W (1.8-50 MHz)	~ 3 W (1.8-50 MHz)
DC input/output interfaces	Tinned no. 12 wires	Binding posts and Powerpoles
Size (height, width, depth)	2.25 × 3.25 × 7 inches	2.5 × 3.75 × 8 inches
Weight	1.75 pounds	1.5 pounds
Price	$195	$140

Both models have adjustable low input voltage warnings and an output voltage adjustment. Both will pass battery voltage through the unit (less about 0.3 V from a Schottky diode voltage drop) when the units are manually bypassed or the input battery voltage equals or exceeds the set output voltage.

Both units can be enabled by sampling RF from your transmitter so that the boosters are enabled only when you are transmitting. This means that you don't suffer the inefficiencies of the switching regulator during receive. Use of the RF enable port on both units requires a BNC or UHF coaxial T connector mounted to the booster to minimize any transmission line interaction. More on RF enable later on.

Bottom Line

Either of these battery boost regulators will help you get more operating time from your mobile or portable transceiver as battery voltage sags. There are some differences between the units, so take a close look when deciding which is right for your application.

TG ELECTRONICS N8XJK SUPER BOOSTER

The first battery booster on the market from TGE was based on a *QST* construction article by Dan Kemppainen, N8XJK.[2] TGE has worked closely with the designer to enhance the original circuit published in *QST*, and TGE now offers three variations — the original N8XJK Boost Regulator (25 A), a waterproof marine version and the N8XJK Super Booster reviewed here (40 A).

The N8XJK Super Booster comes in a rugged cast aluminum box. Our unit was supplied with 10 inches of 12 gauge wire for the dc power input and output cables, but you can specify different lengths at time of order. The wires have pre-tinned ends so you can add dc connectors of your choice. Figure 1 shows an outside view of the unit after I installed Anderson Powerpole connectors on the input and output dc leads. The TGE unit includes a small fan to provide internal cooling of the unit. It is important that the case be mounted so that airflow to the fan is not obstructed.

[1] J. Hallas, W1ZR, "W4RRY Electronic Battery Booster," Product Review, *QST*, Oct 2005, pp 71-72. *QST* Product reviews are available on the Web at **www.arrl.org/members-only/prodrev/**.

[2] D. Kemppainen, N8XJK, "A 12 V DC Boost Regulator for Battery Operation," *QST*, Nov 2004, pp 37-41. An updated version of this project appears in Chapter 17 of the 2007-2009 editions of *The ARRL Handbook*.

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

Figure 1 — The TGE N8XJK Super Booster has a small cooling fan on top, and all external controls are on the front panel. The author added Anderson Powerpole connectors to match his equipment.

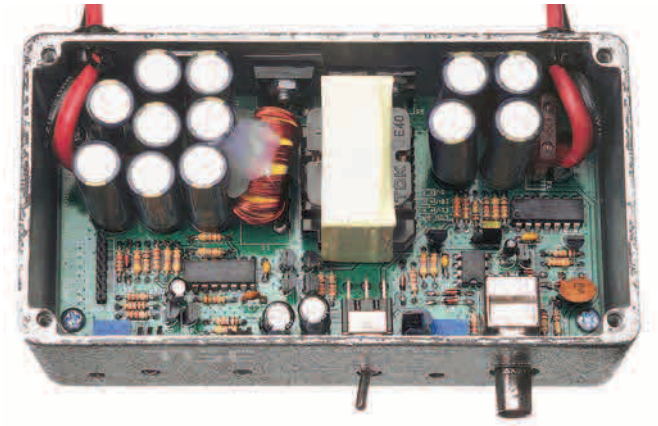


Figure 2 — Inside the N8XJK Super Booster. Internal jumpers allow selection of the low voltage cutoff point and a header provides access for remotely controlling and monitoring the unit.

Going from left to right on the front panel, you will first find the output VOLTAGE ADJUST control. The output voltage is normally set to 13.8 V dc, but you can adjust it from about 9 to 15 V. Reasons for doing this include increased efficiency if you can operate at a lower voltage, or because a higher voltage is necessary to compensate for voltage drops with long output cabling.

The LOW BATTERY LED lights when the input battery voltage drops below the low battery alarm point (internally selectable for 9, 10 or 11 V dc). When this occurs, the N8XJK Super Booster is automatically disabled and it drops into the bypass mode. The ENABLED LED turns on whenever the boost regulator is enabled.

A three position toggle switch selects between three operating modes: FULL TIME in which the boost regulator is always enabled, BYPASS to turn the boost regulator off and pass the input voltage directly through to the output; and RF ENABLE so that the unit senses RF from your transmitted signal and enables the boost regulator only when RF is present. DELAY ADJUST determines the dropout time of the RF ENABLE input, and the BNC ANTENNA connector is the RF sampling point.

Figure 2 is a look inside the unit. The three position strap located in the middle/right of the photo permits you to select the 9, 10 or 11 V low-voltage cutoff point (10 V default). There is also a header on the left side of the photo that can be used for remotely controlling and monitoring the Super Booster, but there is no convenient hole provided for a remote cable. TGE recently introduced the R-1 Remote/Meter Panel ($80) that includes meters for input and output voltage, an ON/OFF switch, and LOW BATTERY and ENABLED LEDs.

The 40 A fuse tucked between the input dc wires and input filter capacitors in the upper right of the photo determines the maximum capability. You're limited to the 40 A rating of this input fuse, so your maximum output current capability is based on your input voltage and the regulator efficiency.

As an example, let's assume an input

Table 2

Output Current vs Input Voltage

Output voltage: +13.8 V dc
Assumed Efficiency: 90%

Input (V dc)	*TGE Max Output (A)*	*MFJ Max Output (A)*
9	23.5	17.6
10	26	19.6
11	28.7	21.5
12	31.3	23.5

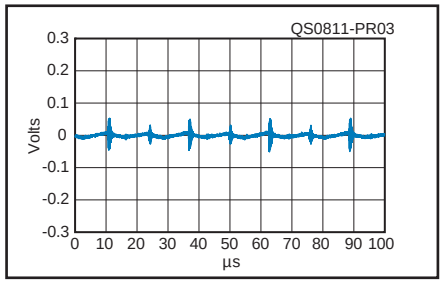


Figure 3 — Oscilloscope trace of the dc output of the TGE N8XJK Super Booster under load. Input voltage is set to 11 V and output voltage is 13.8 V. The level of the dc ripple is low, approximately 20 mV peak-to-peak, with 110 mV_{p-p} spikes due to switching.

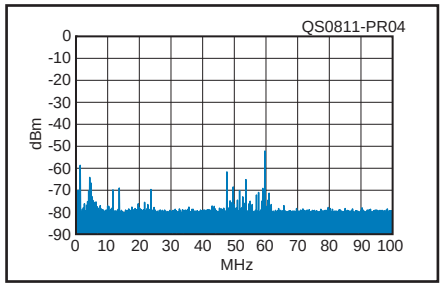


Figure 4 — Spectral plot of the TGE N8XJK Super Booster under a 21 A load. Input voltage is set to 11 V and output voltage is 13.8 V.

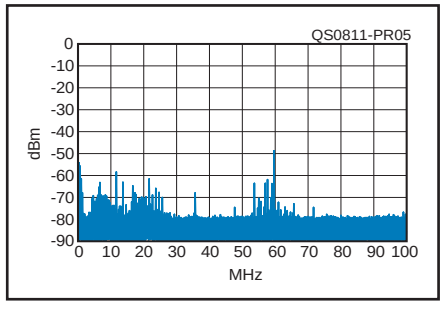


Figure 5 — Spectral plot of the TGE N8XJK Super Booster under a 1 A load. Input voltage is set to 11 V and output voltage is 13.8 V.

Table 3

TGE N8XJK Super Booster Testing

ARRL Lab Measurements
Output set to 13.1 V
Load: 100 W transceiver
Low battery cutoff (9/10/11 V): 8.9/10.3/11.7 V

Input (V)	*Input (A)*	*Output (V)*	*Output (A)*	*Efficiency (%)*
10 V input setting (default)				
14.0	13.6	13.3	13.4	93.6
13.0	15.5	13.1	13.7	89.1
12.0	17.5	13.1	14.2	88.6
11.0	19.3	13.1	14.4	88.9
10.5	20.0	13.1	14.5	90.4
9 V input setting				
10.0	19.9	13.1	14.4	94.7
9.0	22.6	13.1	14.0	90.1

AD5X Measurements
Output set to 13.8 V at no-load

Input (V)	*Input (A)*	*Output (V)*	*Output (A)*	*Efficiency (%)*
12.0	3.8	13.8	3.1	92.5
12.0	21.5	13.6	16.6	87.3
12.0	26.5	13.6	20.3	86.6
11.0	4.2	13.8	3.1	91.1
11.0	24.0	13.6	16.6	85.2
11.0	29.8	13.5	20.3	83.9
10.0	4.8	13.8	3.1	87.7
10.0	26.7	13.6	16.6	84.2
10.0	34.0	13.5	20.3	80.6

voltage of 11 V and an efficiency of 90%. The maximum input power will be 11 V × 40 A = 440 W. At 90% efficiency, the maximum output power will be 396 W. So with an output voltage of 13.8 V dc, the maximum current available will be 396 W / 13.8 V = 28.7 A. As the input voltage drops, the maximum output current will also drop. Conversely, when no boost is needed, you can draw 40 A through the N8XJK Super Booster. Table 2 gives an idea of the maximum output current available versus input voltage, assuming a nominal 90% efficiency.

N8XJK Super Booster Performance Testing

Table 3 shows the performance as measured in the ARRL Lab. As you can see, in most cases the efficiency is about 90%. I supplemented the ARRL measurements by checking the unit at approximately 3, 17 and 21 A loads at +13.8 V dc output to look at the efficiency under some typical applications.

The switching frequency of the N8XJK Booster is approximately 40 kHz. Figure 3 is an ARRL Lab oscilloscope display of the ripple and noise on the unit's dc output. Ripple is approximately 20 mV_{p-p}, with 110 mV_{p-p} spikes.

Figures 4 and 5 show the output spectrum the switching regulator noise with high current (transmit level) and low current (receive level) loads. I listened for switching regulator tones by draping a short clip lead from the antenna input of my IC-706MKIIG across the dc output cable from the N8XJK Super Booster. I could hear low level tones every 40 kHz through 20 meters when listening this way. The tones were loudest on 40 meters, but none of the tones registered on the S-meter. And I could hear no tones with the transceiver connected to any of my external station antennas as the normal band noise exceeded the level of the tones.

Manufacturer: TG Electronics, 54677 Canal Rd, Houghton, MI 49931; tel 906-487-9063; **www.tgelectronics.org**.

MFJ-4416 SUPER BATTERY BOOSTER

The MFJ-4416 Super Battery Booster is housed in a painted aluminum box with Anderson Powerpole and high-current 5-way binding post connectors (Figure 6) for both the dc input and output connections. The MFJ-4416 is a little larger and a little heavier than the TGE unit. No cooling fan is used, which probably explains the maximum input current limitation of 30 A, compared to 40 A for the TGE unit.

A front panel pushbutton switch selects between BOOST ALWAYS ON and BOOST ON TRANSMIT. LEDs indicate BOOSTING and LOW BATTERY. Unless you are using RF sensing, the switch just operates as a BOOST/BYPASS switch. As with the TGE unit, the LOW BATTERY LED comes on when the input voltage drops below the internally selectable low input voltage set point (9, 10 or 11 V). The MFJ-4416 also gives you internal options for enabling/disabling boost when the low voltage alarm occurs, as well as enabling/disabling an audible low voltage alarm. The audible alarm is convenient if you mount the MFJ-4416 out of sight, as you can then hear when the battery voltage is too low. On the rear panel you'll find an SO-239 UHF connector used for RF sensing.

Figure 6 — The MFJ-4416 Super Booster has binding posts and Anderson Powerpole connectors on top, and controls and indicators on the front. An SO-239 connector for RF Enable is on the rear panel.

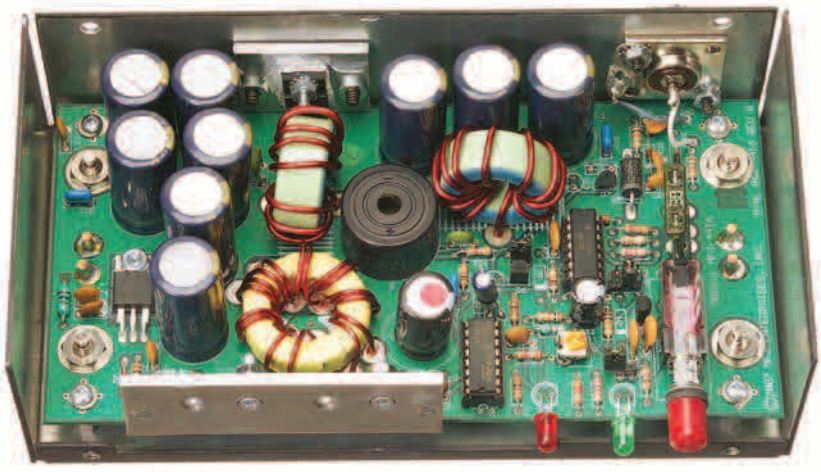


Figure 7 — Inside the MFJ-4416 Super Booster. Internal jumpers allow selection of the low voltage cutoff point and audible alarm enable/disable. The output voltage adjustment is also on the PC board.

Figure 7 is an internal view of the MFJ-4416. A jumper just to the right of the transducer is used to enable or disable the low voltage audible alarm. The multiposition jumper just to the left of the pushbutton switch selects the low voltage cutoff, and the strap just behind the green LED enables or disables the boost below the low voltage cutoff. The single-turn output voltage adjustment is between the two LEDs.

The MFJ-4416 has an input fuse which, along with the input voltage, determines the maximum capability of the booster. The MFJ's input fuse is 30 A, though, so its output current capability is lower (see Table 2).

Table 4

MFJ-4416 Super Battery Booster Testing

ARRL Lab Measurements
Output set to 13.1 V
Load: 100 W transceiver
Low voltage trip (9/10/11 V): 8.8/9.9/11.4 V

Input (V)	*Input (A)*	*Output (V)*	*Output (A)*	*Efficiency (%)*
10 V input setting (default)				
14.0	17.4	13.1	16.9	90.1
13.0	19.6	13.1	18.0	92.5
12.0	22.0	13.1	18.3	90.8
11.0	24.0	13.1	18.6	92.2
10.0*	18.3	13.1	12.7	90.9
9 V input setting				
10.0	25.6	13.1	18.2	93.1
9.0*	17.9	12.6	11.9	93.1

*100 W test limited by 30 A input fuse; tested at 65 W.

AD5X Measurements
Output set to 13.8 V at no-load

Input (V)	*Input (A)*	*Output (V)*	*Output (A)*	*Efficiency (%)*
12.0	3.8	13.8	3.1	92.9
12.0	21.9	13.7	16.8	87.6
12.0	27.6	13.7	20.6	85.1
11.0	4.3	13.8	3.1	89.6
11.0	24.3	13.7	16.8	86.2
11.0	30.5	13.6	20.4	83.1
10.0	4.8	13.8	3.1	88.3
10.0	23.6	12.8	15.7	85.3
10.0	27.8	12.4	18.6	82.1

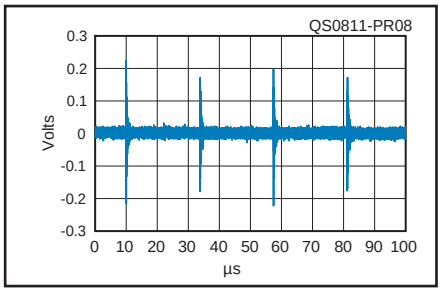


Figure 8 — Oscilloscope trace of the dc output of the MFJ-4416 Super Booster under load. Input voltage is set to 11 V and output voltage is 13.8 V. The level of the dc ripple is low, approximately 40 mV peak-to-peak, with 430 mV p-p spikes due to switching.

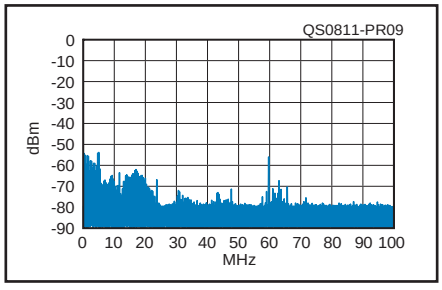


Figure 9 — Spectral plot of the MFJ-4416 Super Booster under a 21 A load. Input voltage is set to 11 V and output voltage is 13.8 V.

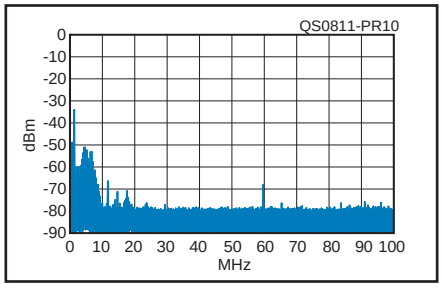


Figure 10 — Spectral plot of the MFJ-4416 Super Booster under a 1 A load. Input voltage is set to 11 V and output voltage is 13.8 V.

MFJ-4416 Booster Performance Testing

Table 4 shows the MFJ-4416's performance as measured in the ARRL Lab. I again supplemented the ARRL measurements by checking the unit at approximately 3, 17 and 21 A loads at +13.8 V dc output to look at the efficiency under some typical applications.

The switching frequency of the MFJ-4416 is also approximately 40 kHz. Figure 8 shows the ripple and noise on the dc output of the unit, 40 mV peak-to-peak, with 400 mV p-p spikes. Figures 9 and 10 show the switching noise spectrum. I again used my clip-lead/IC-706 listening test. I could hear low level tones every 40 kHz through 20 meters when listening this way, though. As with the TGE unit, the MFJ-4416 tones did not register on the S-meter, and I could not hear them with the transceiver connected to any of my external station antennas.

Manufacturer: MFJ Enterprises, Inc, 300 Industrial Park Rd, Starkville, MS 39759; tel 662-323-5869; fax 662-323-6551; **www.mfjenterprises.com**.

Some "On the Air" Testing Using RF Enable

As mentioned earlier, I found the RF ENABLE function interesting as this improves switching regulator efficiency by enabling the booster regulator only when you transmit. For testing purposes, I used a variable power supply as the input power source so that I could check operation under varying conditions.

My IC-706 worked fine with both boosters when the boosters were enabled all the time. I tried input settings as low as 10 V. When using the RF ENABLE feature, however, the input to both boosters had to be set to 11 V dc. This is because the first CW character (first dit) or first voice peak occurs with the transmitter operating at the input voltage — the boosters need to detect some RF before enabling the boost circuitry. (Remember, my IC-706 shuts off if I attempt to transmit below 11 V so the radio won't transmit that first character or voice peak at 10 V input.)

On the bench I used an Array Solutions PowerMaster peak reading wattmeter and found that with both boosters the first dit power reading was about 1 dB below full power. On the air I had no reports of momentary distortion on SSB or chirps on CW. I also listened to my signal on a separate Drake 2B receiver to verify the lack of problems during booster power-up.

TGE Super Booster RF Enable Observations

With the TGE unit, you need cables with BNC connectors and a BNC T adapter. The TGE booster takes about ½ second to ramp up when RF is applied, and just over 1 second maximum to turn off when RF is removed. The booster enable/disable is very graceful, with the output voltage always stopping right at the output voltage set point.

MFJ Booster RF Enable Observations

On the MFJ booster, the RF SENSE jack is a UHF connector, which may be more convenient to many hams. When RF is applied, the MFJ booster turns on virtually immediately, and then doesn't turn off until about 5 seconds after RF has ceased. I encountered a problem when using the RF Enable feature with the MFJ-4416. At turn-on, the output voltage can sometimes overshoot the output voltage set point. This seemed to occur just after the booster had turned off, when I hit it with a new RF signal after the output voltage had just started to drop. When this occurs, the MFJ booster input fuse blows because the overshoot is enough to trigger the overvoltage crowbar protection circuit in the MFJ-4416. I never experienced this on SSB, but did run into it occasionally on CW with just the right timing.

I disconnected the crowbar overvoltage trip circuit and was able to observe the overvoltage condition very clearly on my oscilloscope. I reported this to MFJ and learned that they had received reports of this problem but had been unable to verify it on production units. Once I told them how I was able to repeatedly cause the problem, they were able to verify it. Within about a week, MFJ redesigned the enable circuitry to fix the problem and provided me with a rework procedure. I made the modifications and then verified that the fuse-blowing problem had been resolved. The rework is fairly detailed, requiring two trace cuts, the addition of five jumpers, changing one part, and removing four parts. MFJ says that current production units have been corrected. Should you experience the fuse-blowing problem, contact MFJ customer service to return the unit for repair under warranty.

Conclusion

Battery boosters can be an effective means of compensating for voltage drop in your mobile or portable wiring and to extend operating time with a storage battery that's not being charged continually. Both of the boost regulators reviewed here let you suffer some pretty significant voltage drop while permitting normal operation of your 100 W HF mobile or portable transceiver.

Which one is for you? Good question, as both Super Boosters have their own distinguishing features. I liked the higher current capability of the TGE N8XJK Super Booster, along with its externally accessible voltage control and robust feel. The Powerpole connectors on the MFJ-4416 Super Booster made for a simple installation with my equipment, and I appreciated the low voltage audible alarm. For RF sensing, I preferred the UHF connector on the MFJ unit, as well as the longer "off delay" time, but appreciated the graceful operation of enable/disable on the TGE unit.

DSP Speakers: GAP Hear It Speaker and West Mountain Radio CLRspkr

Reviewed by Howard Robins, W1HSR
ARRL Contributing Author

My home station is in a condominium that has several industrial shops, a couple of manufacturing plants, three schools, a hotel with a water park and a warehouse store all within one mile. There are 267 other units on the property. Condo restrictions limit me to a vertical screwdriver-type antenna on a mast attached to my deck railing for HF work. (Yes, I have permission from the condo board.) Thanks to the noisy neighborhood and my vertically polarized, omnidirectional antenna, I live with varying levels of noise most of the time. That makes hearing weak signals very challenging.

I've made sure that none of the noise on my HF radio comes from within my condo. I have gone through all the normal procedures to find external noise sources without success. Suffice it to say that I'm in a noisy environment and have to live with it.

My transceiver has built-in DSP noise reduction that works to a point, but I often seem to be compromising weak signal reception. Several manufacturers offer external speakers with built-in DSP noise reduction and automatic notch filters in addition to an audio amplifier. I've had mixed results with another DSP speaker, so going into this review I was somewhat skeptical but very interested to see if these units would help.

Bottom Line

Both of these DSP speakers do a good job of reducing noise and notching carriers without distorting or attenuating desired signals. Consider your operating preferences and available space as you review the differences in performance and packaging.

GAP HEAR IT SPEAKER

The Hear It Speaker (Figure 11) is based on noise reduction technology from bhi, a manufacturer from the United Kingdom. In the US, GAP Antenna Products offers a range of bhi DSP noise reduction products under the Hear It name.[3]

GAP's Hear It Speaker is physically small and light weight. There is a slide switch on top to turn the DSP feature on or off. This switch does not shut off power to the speaker and its amplifier, so the GAP unit functions as an amplified external speaker with DSP off. An LED behind the front grill lights red with DSP off and green with it on. On the bottom of the unit is another slide switch that powers off the unit and bypasses the electronics completely, allowing use as an unpowered external speaker.

The fused 4 foot power cord has a standard coaxial power plug on one end and tinned leads on the other. Audio input is via a permanently attached 6 foot length of parallel conductor wire with a ⅛ inch mono phone plug at the far end. There is a ⅛ inch mono headphone jack on the side that could be used to drive headphones. I tried this jack with a 4 inch RadioShack communications speaker, and it produced robust audio.

[3]M. Schatzberg, W2AJI, "The bhi 'Noise Away' Amplified Noise Elimination Module," Short Takes, *QST*, Mar 2007, p 51.

Figure 11 — The GAP Hear It Speaker is smaller and lighter, but controls have been moved to the top, bottom and back of the unit.

The Hear It Speaker offers eight levels of noise reduction. On the back of the cabinet is a matrix of DIP switches that are turned on or off to change settings. Settings are not readily adjusted, especially in a mobile environment, so you need to experiment and pick one that works best for your situation. The ARRL Lab test results (Table 5) show noise reduction of greater than 24 dB at the highest setting.

I found that settings in the range of 4 to 6 provided effective noise reduction with minimal audio distortion or attenuation of weak signals. Higher settings increased the noise reduction but at the price of noticeable audio distortion and attenuation of the weakest signals. For the most part, I did not feel the need to make further adjustments once I found the setting that worked best for me.

On the top of the speaker is an AUDIO GAIN control that is adjusted along with the radio's VOLUME control. This gain control is set to provide comfortable, clean audio from the speaker with the radio set to normal listening levels. Once set, this control would not be adjusted during typical operation.

The Hear It Speaker also automatically notches steady tones such as AM broadcast carriers or tune-up signals. The notch depth depends on the DIP switch settings, and the Lab measured 13 to 20 dB with the range of settings I used. That level of notching significantly reduces tones, but does not totally remove them. Automatic notch filters sometimes react to and attenuate slow speed CW signals. I tried listening to CW signals at different speeds and the Hear It Speaker did not notch any that I heard. If that's a problem, just switch noise cancellation off.

The Lab discovered an interesting behavior: If the audio from the transceiver at the Hear It Speaker input exceeds 1.3 W, tone reduction is limited to 20 dB maximum, regardless of switch setting. Below that threshold, tone reduction is 27 dB at the 7 setting, and then jumps to greater than 80 dB at the highest setting (8). This is something to keep in mind, as it is easily possible to turn up the radio past 1.3 W, especially in a noisy mobile setting or if you are hard of hearing.

Manufacturer: GAP Antenna Products, 99 North Willow St, Fellsmere, FL 33948; tel 772-571-9922; **www.gapantenna.com**.

Table 5
GAP Hear It Speaker

Manufacturer's Specifications	*Measured in ARRL Lab*
Power requirements: 12-28 V dc, 0.4 A.	0.06 A; tested at 13.8 V, medium volume.
Audio output: 2.5 W maximum.	Not tested.
Noise reduction: 9-35 dB (typical 20 dB).	9, 13, 18, >24 dB (set at 2, 4, 6, 8).
Tone reduction: Up to 65 dB.	10, 13, 20, >80 dB (set at 2, 4, 6, 8); tested at 1 kHz.*

Size (height, width, depth): 2.2 × 4.4 × 2.2 inches (without bracket).
Weight: 14 ounces.
Price: $169
*Measurements with audio input less than 1.3 W. See text.

WEST MOUNTAIN RADIO CLRSPKR

The CLRspkr DSP speaker from West Mountain Radio (Figure 12) is based on ClearSpeech noise reduction technology from NCT Group. ClearSpeech noise reduction has shown up in other amateur products we've reviewed over the years, most recently in a DSP speaker from Heil Sound that's now discontinued.[4]

The CLRspkr has a 4 inch speaker that provides robust audio. There's a front-panel POWER switch and LED. Another LED that I rarely saw flashes when input audio is too strong. Power and audio input cables are each 6 feet long and permanently connected. Anderson Powerpoles are used for the power cable, and the shielded audio cable has a ⅛ inch mono phone plug. There is also a ⅛ inch phone jack on the rear panel for an external speaker or headphones.

The level of noise reduction is set by a front panel rotary switch. There are four levels, plus OFF. Table 6 shows ARRL Lab measurements at the various settings. I found the CLRspkr to be quite effective at reducing static and general noise. The audio sounded good at the lower settings, but at MAX I heard some audio distortion (sort of like listening underwater), and the weakest signals were attenuated so much that I could not hear them.

Figure 12 — West Mountain Radio's CLRspkr has all controls on the front panel.

The CLRspkr also includes very effective automatic notch filtering. The ARRL Lab measured a notch depth of 80 dB. It took just over a second to acquire and eliminate an interfering tone. The Lab also determined that the DSP could notch two tones at once, something not mentioned in the instructions. West Mountain's literature indicates that the CLRspkr's auto-notch will not eliminate CW signals, and I found that to be the case. The CLRspkr removed tones from key-down tuning, but I could not find any received CW that was attenuated.

Manufacturer: West Mountain Radio, 34 Smith St, Norwalk, CT 06851; tel 203-853-8080; **www.westmountainradio.com**.

[4]J. Hallas, W1ZR, "Heil ClearSpeech DSP Speaker System," Product Review, *QST*, Jul 2005, pp 67-68.

Table 6
West Mountain Radio CLRspkr

Manufacturer's Specifications	*Measured in ARRL Lab*
Power requirements: 9-18 V dc, <1 A.	0.1 A; tested at 13.8 V, medium volume.
Audio output: 3 W max into 8 Ω.	As specified at EXT SPEAKER jack.
Noise reduction: >15 dB white noise.	6, 9, 12, 16 dB (LO, MID, HI, MAX settings).
Tone reduction: 40-50 dB.	80 dB, tested at 1 kHz.

Size (height, width, depth): 4.3 × 5.5 × 2.5 inches (without bracket).
Weight: 22.6 ounces.
Price: $220

How Did They Work?

Both speakers are high quality communications speakers with similar DSP characteristics, and either could perform well for you. Using my favorite settings (the highest settings before noticeable audio distortion), the Hear It Speaker provided more noise reduction — 18 dB versus 12 dB for the CLRspkr. At these settings, the CLRspkr's auto-notch was much more effective (80 dB versus 20 dB for the Hear It Speaker). Properly adjusted, both speakers did a good job of reducing hiss and pop noises without distorting or attenuating signals.

Using a sound pressure meter, the ARRL Lab measured frequency response (at the –6 dB points) of approximately 320-2950 Hz for the CLRspkr and 440-3900 Hz for the Hear It Speaker. Above 4 kHz, the frequency response of the Hear It Speaker rolled off more quickly than the CLRspkr.

Comparing the sound of speakers is a subjective exercise, and what you hear with your ears and your transceiver will be different from what I hear. Also, we may have different kinds of noise to deal with. I do have a preference, though, after listening to them side by side. To my ears, the larger CLRspkr produced fuller audio, and I was able to hear weaker signals more clearly. With my external RadioShack 4 inch speaker attached to the GAP Hear It Speaker, both units seemed to have similar loudness and clarity.

It's important to remember that these speakers are designed to work in the voice range and improve the intelligibility of communications signals. If you are an audiophile, and are expecting high fidelity responsiveness, these are not for you.

Both speakers produced plenty of audio for comfortable listening in my mobile station. My car produces broadband radiated interference that can be as strong as S5 to S7 on the meter. Both speakers did a good job of reducing that noise along with other noise, improving mobile copy.

The CLRspkr literature indicates that the unit was designed with RFI suppression in mind. With the Hear It Speaker, I could detect a very low level of my transmitted audio in the speaker output. I could not detect any transmitted RF in the CLRspkr's audio output on any HF band.

The CLRspkr could be improved by adding a volume control and moving the external speaker jack to the front panel. The Hear It Speaker could benefit from more conveniently located controls and improved RFI suppression. The GAP Web site offers some suggestions on dealing with RFI. Both speakers are at home in base or mobile applications. Physically smaller and lighter, the Hear It Speaker has an edge for limited space applications.

As with most DSP noise reduction systems, weak signals deep in the noise are often eliminated with higher levels of noise reduction. I find myself switching DSP on and off to find the most readable setting for weak signals, so having either speaker within arm's reach is a good idea. The front panel switch on the CLRspkr also gives the ability to try different levels of filtering on the fly. In any case, remember that noise reduction does not make bad band conditions good. QST

GEAR UP FOR THE 2008 ARRL ON-LINE AUCTION

The 2008 ARRL On-Line Auction will kick off October 23 at 10 AM Eastern time. Bidders will have the opportunity to register to bid and preview auction items starting on October 16 at **www.arrl.org/auction**. There will also be a link to the site from **www.arrl.org**.

Bidders will be treated to a large assortment of new, product review and vintage gear. There will also be a virtual flea market section where bidders can browse through a large assortment of out of print ARRL titles to round out their libraries. And yes, the famous (infamous?) ARRL Junque Boxes will be back this year by popular demand.

Our editor tells me that I have a 150 word limit for this news blurb, so there's no room here to list items up for bid. You'll have to log in and see for yourself. — *Deb Jahnke, K1DAJ, ARRL On-Line Auction Coordinator*

TECHNICAL CORRESPONDENCE

AN AUDIO INTERFACE UNIT FOR FIELD DAY AND CONTESTING (JUNE 2008 *QST*)

That's quite a versatile audio interface unit (June 2008 *QST*, p 39) that John Raydo, KØIZ, designed. My only problem with the design is in the negative feedback circuit for U1A/U1B (see the schematic diagram on p 40 of the original article). He is trying to extract a very high voltage gain of 52 (34.3 dB) from the very modest performing LM358 op amp. The unity-gain-bandwidth product is only 1 MHz, leaving a closed-loop –3 dB frequency response of 29 kHz. It is never a good idea for stability reasons to run the closed-loop gain right up to the gain bandwidth limit line. The usual best-practice is to allow either 10 dB of gain margin or one decade of frequency margin. To do this, an HF feedback pole is required by adding a small capacitor across R4 and R9 to limit the high frequency response.

The problem is that this would only allow a –3 dB upper frequency response of 2.9 kHz, which may in fact be good enough for the modest audio needs of this project. By cheating a bit, he could roll off the HF response to 10 kHz (about ⅓ of a frequency decade margin) by adding 68 pF capacitors across R4 and R9. This would probably allow sufficient phase margin to compensate for any stray input capacitance that would destabilize the op amps.

If 34 dB gain is really required, my own preference would be to use the same 68 pF feedback capacitors, and change to a higher performance dual op amp with at least 3 MHz gain bandwidth product. There are many available that are pin-compatible with the LM358. One choice is the TL072, but with only a 9 V supply you have to watch out for output voltage clipping at high mic input levels. — *Best Regards, Chuck Hansen, 29 Mahoras Dr, Ocean, NJ 07712*; **charles.hansen3@verizon.net**

Dear Chuck,

Thanks for writing about the potential for amplifier oscillation should a sufficient phase difference develop between input and output. To control gain a small part of the output is fed back to the input (negative feedback). Normally the output is 180° out of phase with the input.

If the output phase would shift sufficiently (at some higher frequency), however, this feedback could become positive and cause oscillation. Your suggestion of adding internal frequency compensation in the feedback loop to reduce this possibility (adding capacitors across R4 and R9) would solve that problem.

I have not experienced any instability problems with the LM358 in this application, nor have a number of others who have built units. Adding the 68 pF capacitors would limit upper audio frequency response but still be more than adequate for communication purposes. So, I see no problems in incorporating your suggestion as a precaution.

A handy information source for op amp frequency compensation and other design details is **http://en.wikipedia.org/wiki/Operational_amplifier** and the related pages. — *73, John S. Raydo, KØIZ, 1363 Chalice Dr, Westcliffe, CO 81252*; **kcflyers@yahoo.com**

A SIDE-MOUNT PRECISION ROTATOR DISPLAY CIRCUIT (SEP 2008 *QST* TECHNICAL CORRESPONDENCE)

Hi Harold:

I am interested in your Rotator Display. There seem to be a couple of typos regarding the voltage divider resistors, particularly R3 and R4, however. During testing do you really want R3 open or should this be R4? Is 1 kΩ correct for R3? You presented an interesting circuit. I would appreciate any thoughts that you have. Thanks for all your work. — *73, Bill Kells, K4YMR, 20814 Athenian Ln, Fort Myers, FL 33917*: **onegremlin@embarqmail.com**

Bill:

I am embarrassed at not catching those typos. The correct value for R3 should be 10 kΩ. In the line on page 44, in the third column just above Figure 1, the resistor should be R4, not R3. Now, if you analyze it, it makes sense. If you open R4, the pedestal voltage across R5 drops to zero. Then, when you touch R1 to the 5 V supply you can do the first part of the calibration using R2 to set the digital Panel Meter to 400 mV. Once that is set, reconnect R4 and adjust the pedestal voltage for 20 mV. Thus, the two adjustments can be made permanent and non-interacting. I am sorry for the typo.

I also could have been clearer about R2. I meant to suggest temporarily replacing R2 with a trimmer potentiometer and adjusting it to set the voltage divider in a way to cancel out the tolerances on the resistors and the power supply voltage. Then take out the trimmer potentiometer, measure the resistance and put in a value of R2 that is close to the value measured. If we leave an adjustment in the circuit it is only human nature that someone will want to adjust it. With the fixed resistor in place for R2, check the performance again. If you are slightly off with a high reading or low reading, you can either place a small resistor in series with R2 to lower the Digital Panel Meter reading or parallel a shunt resistor across R2 to raise the meter reading. Paralleling a resistor with one say 100 times larger will lower the combined resistance by about 1%. The circuit may perform well enough just using the nominal values shown, but I like to squeeze all the performance I can from the components. Those little R-ohm brand film resistors are great. The label is 5% but I rarely see one out of tolerance more than 3%, and the tolerance is usually off in the same direction. I hope this helps, and I hope some of you can use this circuit. Radio Amateurs are good people, and I am glad to be able to do something for them. — *Harold C. Hoyt Jr, 404 Attucks Dr, DeSoto, MO 63020;* **hhoytjr@yahoo.com**

MAKING THE GLASS HALF FULL

To the uninitiated, we electronics-oriented folk must sound like a very negative lot. We bandy about such language as *resistance*, *reactance*, and *impedance* with impunity. We tend to describe our circuits solely by how *poorly* they conduct electrical currents! What's wrong with this picture?

Well, I'm sort of an upbeat guy; I hate for my vocabulary to consist entirely of such negative thoughts. Fortunately for people like me, there are some happier terms in our electronics lexicon, which, for some strange reason are almost completely ignored. I'm talking about the inverse functions: *conductance*, *susceptance*, and *admittance*.

Now, other than the fact that these new terms are more optimistic than their more common counterparts, they can do wonders to simplify certain types of complex circuits! Unfortunately, most modern electronics textbooks relegate these wonderful concepts to mere footnotes, or at best, to the later chapters of the book where you aren't likely to learn about them until your brain is already depleted.

I was fortunate enough to have been one of that dying breed who was taught about conductance, susceptance, and admittance at the same time I was taught their more depressing counterparts. If I ruled the world, I would dictate that, once again, these inverse functions were taught simultaneously. Since that's unlikely to happen, the least I can do is let you in on the secret.

So, let us begin. I believe you will learn some powerful new tools as we explore this new vocabulary.

Let's talk a little about *conductance*. Conductance is a term to describe how well an electrical conductor works. More conventionally, we describe conductors by how well they *don't* work. We speak of the *resistance*

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

of a conductor. The unit of resistance is, of course, the mighty ohm. But, doesn't it seem just as reasonable to describe a conductor by how well it conducts? Sure! Why not? And indeed, we have such a beast: conductance. The unit of conductance used to be called the *mho*, which, oddly enough, is *ohm* spelled backwards. The modern name for the unit of conductance, however, is the *siemens*, abbreviated S. The letter *G* designates conductance. I personally happen to prefer the name *mho* rather than *siemens*, because more mho means "Mo'" electricity. Unfortunately, just about the only place any of us sees a mho any more is in connection with tube testers. An old tube tester indicates a tube's mutual conductance in micromhos, generally. Of course, not many of us see tube testers any more, either, so mhos have become about as scarce as wringer washers. So, just how big is a mho (or siemens)? Well it is precisely the inverse of an ohm. $G = 1/R$. A 1 Ω resistor has 1 S of conductance. A 1 MΩ resistor has 1 μS of conductance. That seems simple enough.

Now, you're probably asking, "So what?" I'm glad you asked!

Have you ever had to calculate the value of resistance of a bunch of unequal value parallel resistors? You've probably seen this dreaded formula:

$$R = \frac{1}{\frac{1}{R1}+\frac{1}{R2}+\frac{1}{R3}+\frac{1}{R4}+\frac{1}{R5}} \qquad \text{[Eq 1]}$$

Well, it's not really all that dreadful, but even if you have it tattooed on the inside of your eyelids, you probably still don't have a clue where it comes from. I hate memorization, and have an inherent distrust of people who hand me formulas without telling me why they work.

Well, our multiple-parallel-resistor problem becomes a simple addition problem if we just add conductances! So, let's do a real world example. Let's say we have five resistors in parallel, one each of 1 Ω, 0.5 Ω, .2 Ω, 0.1 Ω, and 0.05 Ω. But, in our happy, optimistic, The-Glass-Is-Half-Full New World, we don't really have resistors, we have "conductance modules." Taking the inverse of the resistance value of each one, we have five conductors of 1 S, 2 S, 5 S, 10 S, and 20 So, respectively. Add them together and we have 38 S!

Now, if you were going to go to your local radio parts store and ask for a 38 S conductance module, you'd get some strange looks. So, for the benefit of our friends at the radio parts store, we will convert our 38 S into a value our negative-minded proprietor can understand: we will convert it back to ohms. 1 / 38 = 0.026 Ω. Now, it's not too likely our local radio parts store is going to have a 0.026 Ω resistor *either*, but at least we'll be talking the same language.

Now, if you've been moderately observant, that "dreaded equation" describes exactly what we've done; we've converted to conductance, added, and converted back to resistance. Well, why not stay entirely in conductance, and forget those two conversions? We only need resistance to communicate with those "nattering nabobs of negativity." Why can't we do everything with conductance and its more jolly associates?

In fact, this is precisely what one does in the microwave world, where our newly appreciated vocabulary is quite commonplace. But, before we delve too far into that, let's peek at our next inverse value, *susceptance*.

Susceptance is the inverse of reactance, and is designated by the letter *B*. Again, don't ask me why. $B = 1 / X$. The unit, just as in conductance, is the *siemens* (S). Like reactance, susceptance is a function of inductance or capacitance, and frequency. But as you might suspect, it works backwards. A capacitor's susceptance increases with increasing frequency, while an inductor's susceptance decreases with increasing frequency. In other words, a capacitor is more susceptible to current at high frequency, while an inductor's susceptibility to current is less at higher frequency.

As you might surmise, the formula for capacitive susceptance is:

$$B_C = 2\pi fC$$

And the formula for inductive susceptance is:

$$B_L = 1 / 2\pi fL$$

Now, if you still aren't convinced of the value of our new inverse friends, allow me to introduce you to Hideous Equation number 2:

$$Z = \frac{RX}{\sqrt{R^2 + X^2}} \qquad \text{[Eq 2]}$$

This is the equation for the impedance of a resistance and a reactance in parallel. Well, again, this isn't *too* hideous, but it's probably not one of those formulas you have embedded in your subconscious like Ohm's Law. It could be made a lot less hideous by simply converting resistance to conductance and reactance to susceptance, which will give us a modified version of a more familiar formula:

$$Y = \sqrt{\left(B^2 + G^2\right)} \qquad \text{[Eq 3]}$$

We have introduced the new term *Y*, which is *admittance*. Now, doesn't *admittance* sound a whole lot more inviting than *impedance*? As I imagine you've guessed by now, $Y = 1 / Z$. You can go back to impedance if you *really* want to.

Now, for the sake of fairness, equal time, and scientific objectivity, I have to introduce one inverse function that is actually *less* joyful than the more popular one.

When we speak of resonant circuits or any circuit for that matter that contains a reactance and a resistance, we speak of *Q* or quality factor. For series circuits, the *Q* is the reactance divided by resistance. Well, astonishingly enough, we have an inverse function of *Q*, expressed in a depressing term:

$$D = 1 / Q \qquad \text{[Eq 4]}$$

What is *D*? It is *dissipation factor*, the exact inverse of *quality factor*. It tells you just how bad your resonant circuit is. It is a dimensionless, unitless number, just like Q. Actually, power transmission engineers and their ilk use *D* quite a bit. In fact, it was used a while before *Q* was "coined."

Well, now we have three, no actually four, new quantities to work with. So, how does one decide whether to use the "happy" formulas as opposed to their darker reciprocals? By the way, I hope I haven't in any way depreciated the value of the traditional "negative" values that you're used to. Like a good poem, there has to be a balance between bliss and deep depression. As a general rule, the "resistive" formulas work best with series circuits, while the "conductive" formulas work best with parallel circuits. By understanding the derivation of both, you can work freely between both modes, and use what works best.

I would like to make a brief mention of how the "optimistic" formulas have become the dominant mode of thinking in the microwave business. One of the predominant instruments of microwave design is the network analyzer, a device that essentially generates a Smith Chart plot from real life components. To grossly oversimplify the matter, the network analyzer treats everything as a transmission line, even components so small as to normally be considered "lumped constants." One characterizes components by how they "admit" waves from one port to another. Devices that have multiple parallel paths, such as microwave transistors, can have some *genuinely* hideous equations, which would be nigh unto impossible to solve using just the "impedance" formulas. Unfortunately, many electronics scholars never learn about the admittance formulas until they actually take a microwave class or two. But they are just as applicable in "everyday" electronics.

I have only scratched the surface of what can be done with the inverse functions. Hopefully, this introduction has encouraged you to look at another way of solving complex electronics problems. I realize the last thing most people want to learn is even more formulas, but knowing how to approach a problem from both ends can yield some marvelous insights. Perhaps we can discuss these at a later date. Until then:

Conduct; don't resist!

Suscept; don't react!

Admit; don't impede! — *73, Eric Nichols, KL7AJ, PO Box 56235, North Pole, AK 99705*; **kl7aj@arrl.net**

Overcoming Antenna Restrictions

How two hams met the challenges posed by private and public antenna restrictions.

FROM CC&R TO ROOFTOP ANTENNAS — HOW IT WAS DONE

Steve Rudin, W1WSN

I watched with not just a little sadness as the crane gently lowered my 55 feet of Rohn 25 to the ground.

This transition marked our relocation to our "retirement" condominium in south Florida. The quotes on "retirement" remind me that I'm still working ("professoring" at a major university here in Florida) and that I intended to vigorously continue the enjoyment of ham radio — having been first licensed in 1952 and active since that time without interruption.

Our home is on the second floor of a two-story building. There is a balcony outside and I promptly devised a mounting bracket for the railing, which permitted me to use my Hamstick mobile antennas. I even ran a length of RG-8X coax from my den to a sheltered SO-239 connector mounted on the door jamb. I could be on the air quickly, but unfortunately, mostly at night. Antennas were not permitted on our condominium according to the condominium documents.

The Origin of Antenna Restrictions

As mentioned by Dan Henderson, N1ND, in his fine article,[1] CC&Rs (Covenants, Conditions and Restrictions) are written into the documents of not only condominium associations, but those of many homeowner associations as well. The intent is to keep the property "desirable" by eliminating unsightly building attachments, which would "spoil" the street appeal of the property.

During the '50s and '60s, forests of TV antennas sprouted from rooftops; power and telephone lines ran from already densely populated wooden poles at curbside and, in retrospect, I must admit that everything looked awful! Progress gave rise to underground power and phone lines, and cable TV soon replaced external antennas. But the fears of residential buildings sprouting these devices, as well as liability issues related to damage caused by installations, have kept CC&Rs very much alive. Dwellings in high-wind areas are scrutinized even more closely.

Getting Approval — Step-by-Step

I had no intention of letting 55 years of ham radio come to an end without at least an attempt to get an antenna on the roof. The balcony antennas were good for local QSOs only, as the steel of home construction is just too much for Hamsticks on the balcony. It was time to do some research.

Step 1: I became affiliated with an active repeater group in my area. I learned about their experiences with CC&Rs, zoning laws, state, county and municipal codes and most importantly, how they interfaced with emergency agencies for communications, particularly during our hurricane season. It was very enlightening.

> ***"As the once common TV aerial has disappeared, the ham Yagi has become more obvious and, to many non-hams, presents an "unsightly" blemish on the neighborhood. Increasingly, zoning regulations and real estate contracts are prohibiting the erection of outdoor antennas. Steve Rudin, W1WSN, and Kris Merschrod, KA2OIG, found themselves facing such restrictions. If you're facing a challenge dealing with antenna restrictions, their two success stories might provide some practical advice. — Ed."***

Step 2: The ARRL Web site has some very helpful information. I downloaded the FCC's PRB-1, which in essence preempts unreasonable restriction of Amateur Radio antennas (zoning laws and CC&Rs are not affected). Of particular interest was a list of states (Florida among them) that have amended their laws to include the directives of PRB-1. Florida has two such section revisions — one for counties and one for municipalities. Copies of the revised laws were downloaded from the state Web site.

Step 3: I needed to select an antenna that would meet several criteria. It would cover 80-10 meters, have low wind resistance, be physically short, practically invisible from the street and allow automatic or remote band selection. Radials were excluded as rooftop wires present a hazard to those doing maintenance. I also wanted a dual-band antenna for 144 and 440 MHz with similar attributes. I finally chose the ame antenna I had used for HF mobile, the Tarheel II "screwdriver" antenna. I selected a standard dual-band whip for VHF/UHF. It didn't have much gain, but it had a low profile and was mechanically strong. The antennas were photographed and dimensions added to the photos.

Step 4: I prepared a written proposal to the board of directors of the condominium association. It began with information about Amateur Radio, briefly discussed the benefits of Amateur Radio during emergencies. I clearly stated that the antenna would be installed by professionals, virtually invisible and be in keeping with municipal and county zoning requirements. Copies of my amateur license, photos of the proposed antennas and a brief summary of my emergency communications history were included with the proposal.

Step 5: I made an appointment with the board and arrived with the antennas. I had a complete document package for each director and the property manager, except for copies of the Florida statutes.

Show Time

I began by handing each person a package of documents and stated that I would like to briefly explain my proposal. They were invited to ask questions. After a brief showing of the Tarheel, the board members couldn't believe that such a small antenna could carry signals as far as I had described. Another member wanted to be certain that I, and not the association, was paying for the installation. One member stated that he believed that the city ordinances precluded antennas, at which time I handed out copies of the Florida law requiring accommodation for licensed amateurs.

Surprisingly, the property manager spoke up and stated that the proposal had merit, as it could benefit the community. He recommended to the board that I get a written proposal from a licensed electrician and report back to the board. I asked him which electrical contractor the association used and soon

[1]Notes appear on page 57.

had an appointment scheduled. The only problem that the manager could foresee was how the feed lines would enter my room. He did not want unsightly cables hanging down the front of the building and suggested that they be run in conduit directly through the concrete wall, so they would appear as a permanent part of the building. At this point, I began to feel much more confident, but still cautious.

The electrician had worked with radio installations before. He went up on the roof and photographed the air conditioning units, both sharing a large aluminum I-beam mounting frame — just what is needed for an RF ground. I made a model of the proposed mounting bracket from some cardboard, took my quote and the photo and returned to the board.

The quote, model and electrician's sketches showed how the antennas would be mounted and the feed lines would be run. The sketches also showed an extension of the conduit to ground, where a ground rod would be installed. It looked good, but again, the board relied upon the property manager, who noted that all his suggestions had been followed. No permits were required because there was no voltage in the conduit other than the 12 V dc for the control motor in the Tarheel. He recommended approval and the board so voted!

The board of directors asked that I sign an affidavit indicating that in the event that I sold the property or otherwise no longer had use for the antennas, removal would be accomplished by a licensed, insured electrician and that the hole in the concrete wall be plugged. I gladly agreed.

On the Air

Installation went without a hitch (Figures 1 and 2). The electrician was so excited about the installation that he came to the shack as soon as the cables were fed through the wall and waited until I quickly attached some temporary PL-259 connectors. A test on our local UHF repeater got me a quick report saying that I was very readable direct on the input frequency. A switch to VHF gave me excellent 2 meter readings on even distant repeaters. We then switched to HF. The Tarheel yielded better than 1.5:1 SWR on all bands from 3.5 to 10 MHz and below 1.7:1 above 10 MHz. I was a very "happy camper."

A grounding panel was installed in the shack (Figure 3), and when the station is not in use, all cables are disconnected. I've worked more than 40 countries on CW and almost as many on phone — mostly on 20 meters. Not a 4-element Yagi at 55 feet, but very nice!

A Positive Approach Yields a Positive Result

You can work with condominium associations if you do your homework, talk about Amateur Radio to board members and neighbors and demonstrate it when possible. Get to know the board and the property manager(s) and attend some board meetings so that you are not a stranger. Read your condominium or homeowners association documents carefully and obtain copies of city or town regulations. Join groups of local amateurs and listen to their antenna stories. Meet with the local authorities. Get involved in ARES® and/or Community Emergency Response Teams (CERT) programs. Don't try to "sneak" rooftop or major antenna installations. I was reminded twice by the property manager that he didn't like surprises. If your property is such that stealth antennas are easily installed, that's not a bad way to go. I wasn't that lucky!

The board members are all nice people who serve without pay and when requests are presented that educate and inform, offer benefit to the condominium or homeowner community and cost the association nothing, it shouldn't be surprising that they may vote favorably. Good luck!

A NEW ZONING ORDINANCE WAS NEEDED!

Kris Merschrod, KA2OIG

No provision for Amateur Radio towers in your neighborhood? Write your own. Well, it is not that easy, but here is a useful example.

A friend had given me a self-standing 40 foot tower. In October of 2006 I decided that I'd either put it up or give it away. I called the local building department, and spoke with the town planner. I explained what I had and where I lived and the immediate response was, "you are in a high density residential area and towers are not permitted." I explained politely that I thought that the Federal government had rulings that suggested local authorities do their best to accommodate Amateur Radio operators.

The response was that a variance would be needed, that the application would be $100 and that the following supporting material would be required:

STEPHEN RUDIN, W1WSN

Figure 1 — The aluminum angle extension from the air conditioning mount, holding the antennas and weatherproof box for conduit entry. The view from the roof can also be seen in the background.

STEPHEN RUDIN, W1WSN

Figure 2 — Close-up of the antenna mounts, cables and the ferrite choke on the antenna control cable.

STEPHEN RUDIN, W1WSN

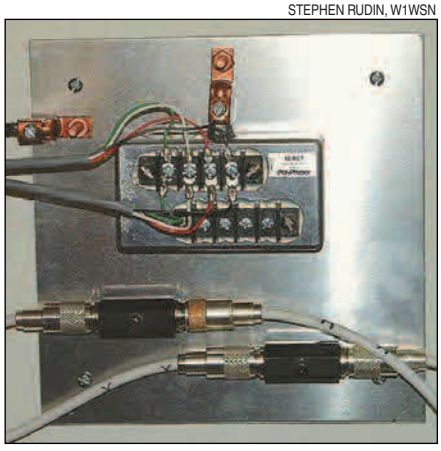


Figure 3 — View of the common grounding panel. Copper strap connects the components on the rear of the panel. The ground lead is to the left and runs within conduit from a ground rod.

- Engineering drawings and structural specifications
- A map with the fall zone
- An environmental impact assessment
- A special obstacle was that my house was probably in a historic district.

I explored each point with the planner so that I would know exactly what the concern was and also where I could find the forms.

Researching the Facts

The building permit and zoning regulations are all on the town Web site so I studied them in relation to the issues raised and the antenna project that I had in mind — a tower supporting a 14 MHz antenna at half-wavelength above the ground, installed next to the house that would not fall on a neighbor's property.

I ordered *Antenna Zoning for the Radio Amateur*[2] by Fred Hopengarten, K1VR, and studied it thoroughly.

The engineering drawings were a snap; the tower company had them on their Web site plus a nice map of wind zones. The fall zone was also a "no brainer." I had a plot of the property, a measuring tape and a tower location — copy and paste and add some lines and a circle. The historic district was also on a Web site; it was limited to certain buildings — all non-adjacent and not in sight of my house; that map was downloaded. The environmental impact forms were reviewed. Toxicity? No. Deforestation? No. Change in topography? No. Change in water course? No…. etc.

I talked with the building inspector to explain my project and to see if anyone else had made a similar application. She gave me her ideas and noted that she had a ham neighbor and knew what Amateur Radio was all about. No other hams had made application.

In the meanwhile, importantly, I brought the subject up at the Tompkins County Amateur Radio Club meeting for ideas on how to proceed and for information on permitting in other towns. The other towns are more rural and less zoning intensive. Most hams were able to simply put up their towers. Of course, everyone pointed out that PRB-1 preempts local zoning, but not as extensively as one might hope. PRB-1 basically says that there should be accommodation. How "accommodated" is the subject of negotiations.

The Proposal

In about 20 pages I wrote a letter to the town planner explaining first, perhaps I had not explained the idea well on the phone and second, asked for a "pre-submission consultation." The letter included the following:

My personal history as an FCC licensed ham, my work overseas, involvement in natural disasters, participation in community events such as marathons and Scout Hamborees and the use of radios on research and community development projects overseas. The point being that ours is a hobby with a community service aspect.

The details of the tower were described using the specifications and references to the company's Web sites. I included the wind load specifications for the rotator and sample antenna along with the wind zone map.

One concern in the Town's regulations for commercial towers was to keep out intruders. I discussed the anti-climbing shields found in *The ARRL Handbook*[3] to answer this concern.

Next I described the proposed location in reference to the property lines and also the nearest power lines. This paragraph included a description of the trees that would shield the tower from public view and the fall zone.

The map of the historic district came next with added arrows to point out the location of the proposed tower. With that came the explanation that the district was set up house by house and not a blanket neighborhood. The approximate distances to the nearest historic houses and the types and heights of trees in between were provided.

Reference to the FCC's PRB-1 was made and attached along with the Web sites where they could be found. This brief paragraph closed with a summary: "The sense of the recommendation from the FCC is that local regulations should accommodate reasonable amateur operations while still accomplishing the purpose of local zoning."

The closing paragraph on the environmental assessment explained that none applied except that applicable permits needed to be obtained.

A New Ordinance, Not Just a Variance

Soon, I was notified that the Building and Planning staffs would like to meet and go over the proposal. The meeting included the town planner, the head of the zoning board, the town lawyer and the

STELLA MERSCHROD, KA2OXG

Figure 4 — Kris's "legal" tower was finally raised on April 8, 2007. From the left: Kevin, WB2EMS; Kris, KA2OIG; Karl, KB2KDV; Doug, KB2BON; Jerry, N2FSD; Terry, KC2QMG, and Kevin, KC2MLC.

building inspector.

They began the meeting explaining to me that the zoning ordinances did not provide for such a tower. At the end of our 2 hour meeting, the staff was convinced that it was appropriate to change the zoning ordinance to provide for Amateur Radio "facilities." They offered that they would put the concept on the agenda at a future zoning meeting. They were genuinely interested in my situation as well as having zoning that met the PRB-1 recommendation. They estimated that it would take about 9 months for it to go before the town board for approval. The delay was worth it because it would be a change applicable to all hams in the town and not a variance.

In February 2007 there was a Codes and Ordinance Committee meeting to review the preliminary draft. I was not able to attend, but Kevin, WB2EMS, and Carl, W2SGX, were present. They more than satisfied the committee and, importantly, made the case that the height allowance be a full wavelength on 20 meters.

At the end of March 2007 the Codes and Ordinance Committee met to review the draft. I attended with Kevin, WB2EMS, and Carl, W2SGX. The draft accommodated the recommendations made at the previous meeting. Some of the language seemed to be more encompassing or intrusive because the ordinance was for "radio facilities," which included all Amateur Radio equipment. We thought that it might apply to antennas on cars in the driveway. The draft also wanted to limit the "facilities" to side and back yards only. That brought up three issues: first, the definition of those yards; second, would they be primary or secondary facilities and third, feed lines exiting a front window connecting to a side yard tower.

The first issue was taken up by the town planner, who prepared sketches and these new definitions for the ordinances. The second issue really boiled down to vacant, adjacent lots that a ham might own. If primary use were allowed, then a lot could just have a tower, but if limited to secondary status, then the tower would have to be accompanied by a residence. The third point was resolved to allow for feed lines in any yard.

At the April 2007 meeting the committee again reviewed the modifications in the preliminary draft, plus the front, side and rear yard definitions. We attended to answer any further questions.

Results

By August 2007 the draft ordinance was ready, presented to the town board and approved.

The provisions being that an Amateur Radio operator may apply for a building permit for up to two radio towers, up to 65 feet tall (including the antennas mounted on them) as long as they are not in the front yard and will not fall onto a neighbor's property. The last provision may be waived if the neighbor grants permission.

Brief Reminder of Steps and Strategies

- Explore the issues and experiences with other area hams.
- Read *ARRL's Antenna Zoning for the Radio Amateur*.[4]
- Read PRB-1 and Part 97 and take note of the phrase: "should try to accommodate."
- Read the local building code — note their concerns for commercial towers.
- Call the building department and explore the possibilities.
- Don't debate the issues; just take careful notes of each and every objection, issue or requirement.
- Reconsider the building department's issues and examine the building code again.
- Carefully respond to those issues and submit them according to the local zoning and building department procedures. Be sure to explain the role of the local amateur community in community affairs and emergency preparedness.
- Meet with the local authorities to see how they can accommodate you.

The collective goal for the ham community should be zoning that makes sense and not just provision to seek a variance.

All Situations are Different

In these cases Steve and Kris employed a process of education and cooperation to accomplish their goals. In all fairness, we should note that the boards that they dealt with were willing to consider the issue. Sadly, this is not always the case and others finding themselves in this situation may meet strong opposition. Steve and Kris made the effort, invested the time and came away with the antenna systems they sought. — *Ed.*

Notes

[1]D. Henderson, N1ND, "PRB-1 and CC&Rs — What Should I Do Now?" *QST*, May 2007, pp 44-46.

[2]Available from your local ARRL dealer, or from the ARRL Bookstore. Telephone toll-free in the US 888-277-5289, or 860-594-0355, fax 860-594-0303; **www.arrl.org/shop/**; **pubsales@arrl.org**.

[3]See Note 2.

[4]See Note 2.

[5]See Note 2.

[6]No longer in print.

Stephen Rudin, W1WSN, has been an active amateur since 1952 and is a 50 year-plus member of ARRL. He is a retired psychologist and now adjunct professor at Nova Southeastern University. More biographical information can be found at ***QRZ.com****. He can be reached at* **sgrudin@bellsouth.net**.

ARRL member Kris Merschrod, KA2OIG, was introduced to Amateur Radio in the late 1970s when he became involved with making phone patches to Honduras and was licensed in 1982. As a Development Sociologist, he has worked overseas on social and economic development projects. During life overseas he has provided emergency radio communications in natural disasters (earthquakes and floods) and rescues (abandoned teams and public officials), as well as for the Scout Hamboree. Antennas have been a passion resulting in contributions to the ARRL Antenna Compendium[5] *and the* ARRL Antenna Anthology.[6] *When not working on overseas assignments, KA2OIG antenna farms in Ithaca, New York. His current crop can be seen at* **www.merschrod.net/antfarm.htm**. He can be reached at **kris@merschrod.net**. QST

New Products

BUCKMASTER GREAT CIRCLE MAPS

♢Buckmaster Publishing offers great circle (azimuthal equidistant) maps that are custom generated and centered on your location based on latitude/longitude data in their *HamCall* call sign database. The maps are printed on 8.5 × 11 inch paper and laminated for protection. Price: $12. For more information, or to order, visit **hamcall.net/greatcircle.html**.

Zero to 60 (Meters) in Five Seconds

That's about how long it takes to discover a "new" band.

Steve Ford, WB8IMY

Five seconds. That's how long it takes for me to fire up my HF transceiver, switch from VFO to MEMORY mode and select my 60 meter frequency.

Sixty meters?

Yes. Remember those five discrete frequencies the FCC gave us back in 2003? The ones we occupy on a shared secondary basis? Oh, *those* frequencies!

Sixty meters is a fascinating bit of real estate in the HF spectrum. The propagation has flavors of both 40 and 80 meters, which is to say that the band is "short" during daylight hours and "long" at night. When the sun goes down 60 meters is potentially open to the world, particularly during the winter months when noise levels are low.

I recently heard a ham in Denmark working through a pile of US stations on 60. A few days later I was tuning through the channels and heard W8GEX calling CQ from VP5 — the Turks and Caicos Islands. Could I snag him from New England with a mere 50 W to a low dipole? You bet!

Most modern HF transceivers will operate on 60 meters, and many more can be modified to do so. For my transceiver I set up five memory channels, one for each 60 meter frequency shown in Table 1.

If your radio doesn't offer memory channels, just tune your VFO to one of the frequencies shown. Either way, make sure you are operating in upper sideband (USB). The FCC has restricted our operation to upper sideband voice on these channels. Nothing else. *Period.*

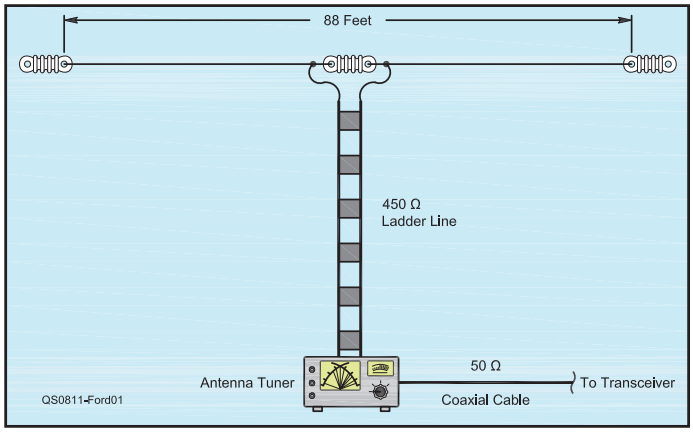


Figure 1—You've seen this antenna configuration before. I call it the *bonus band* dipole. Just feed it in the center with 450 Ω windowed ladder line and use the antenna tuner to operate not only 60 meters, but also 40, 30, 20, 17, 15, 12 and 10 meters.

I worked W8GEX/VP5 on 60 meters when he was in "paradise," better known as the Turks and Caicos Islands.

Table 1

60 Meter Amateur Frequencies

Channel Center	*USB VFO Display Frequency*
5332 kHz	5330.5 kHz
5348 kHz	5346.5 kHz
5368 kHz	5366.5 kHz
5373 kHz	5371.5 kHz
5405 kHz	5403.5 kHz

60 Meter Power

US hams are limited to a maximum output of 50 W PEP on 60 meters, assuming you are using an antenna with 0 dB gain referenced to a dipole, or 0 *dBd*. Here is where it gets a little tricky. According to the FCC…

"For the purpose of computing ERP, the transmitter PEP (peak envelope power) will be multiplied by the antenna gain relative to a dipole or the equivalent calculation in decibels. A half-wave dipole antenna will be presumed to have a gain of 0 dBd."

This doesn't mean that you can't use a directional gain antenna on 60 meters. If you do, however, you must *reduce* your output power accordingly.

Let's say you fashioned a 60 meter beam antenna with 3 dB forward gain. When using this antenna, you would need to reduce your transceiver output by 3 dB, from 50 to 25 W PEP. The FCC also requires you to keep a record of how you made the antenna gain calculation. (If it is a commercial antenna, the manufacturer's gain spec will suffice.)

Regardless of the antenna type, you have the option to take transmission line and tuner loss into account when setting your output power. For instance, depending on how you are feeding RF to your antenna, you may be losing a few dB along the way. If you can measure or calculate the loss, you can *add* a few dB of RF at the transceiver to compensate. Again, however, you have to keep a record of how you made this determination.

But rather than go through all the mathematical machinations, most 60 meter operators use simple dipole antennas. For one example, see my "bonus band" antenna in Figure 1.

Cooperation is Key

Since we only have five frequencies at our disposal, we have to share and share alike. This means that most 60 meter operators keep their conversations relatively short. The longest ragchews I've heard so far have been in the neighborhood of 15 minutes.

Speaking of sharing, if a non-ham station tells you to leave the channel, you must do so immediately. Government stations have the right of way. Fortunately, being shooed off a channel is *not* a common occurrence.

If you have a General class or higher ticket and you're stuck in the HF same-old same-old, it's time to break free. For more information go to **http://60meters.net/**.

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

Pizza, Macaroni, Contest

An American visitor takes in the best of Italian radio — clubs, contests, cuisine, and a trip back in time.

Norm Fusaro, W3IZ

Recently my spouse Debbie, N3ZXF, and I had the pleasure of traveling to Italy and representing ARRL at several Amateur Radio conventions. We met with radio operators from several sections of the Associazione Radioamatori Italiani (ARI), the IARU member-society for Italian radio amateurs and discovered that DXing, contesting and friendship are the ingredients that make Amateur Radio in Italy *tutto bene*.

Amateur Radio operators around the world participate in the ARRL DXCC program by making radio contacts and exchanging QSL cards. Italian radio amateurs enjoy DXing so much so that Italy has become the number one confirmed country among the current 338 DXCC entities in the DXCC program. It is this enthusiasm for DXCC that explains the long lines of hams waiting to have their DXCC applications processed at the conventions.

The Art of DXing

Florence has long been recognized for art and culture. In addition to being the home of the Duomo and great masterpieces such as Michelangelo's *David*, Florence is also the home of a spirited Amateur Radio community.

We met with Roberto Rossi, I5RRE, president of the ARI club of Florence, who showed us the club station and introduced many of the club members. The radio club of ARI Firenze is like many other clubhouses throughout Italy where they proudly display trophies and awards earned by the members. The clubs also serve as the QSL bureau for the section with dozens of mail slots for members' incoming QSL cards.

More than a dozen club members brought their QSL cards to be checked for DXCC credit. I was happy to inspect the hundreds of QSL cards and take the award applications back to ARRL Headquarters. DXing from Florence is an art because the city is surrounded by hills. In spite of this perceived geographic disadvantage, these operators showed off some very nice QSLs from rare DX locations.

The radio amateurs of Florence are extremely friendly. We walked with Roberto and Franco who showed us many interesting parts of the city before we enjoyed some of the fine culinary masterpieces of the region.

Pordenone, the Big Show

Pordenone Province is part of the Friuli-Venezia Giulia region in the northeast. Not far from Venice is the small commune of Pordenone. The members of ARI Pordenone like to think of themselves as a small club with huge accomplishments. Club President Pietro Cogo, IV3EHH, leads his members as they produce the largest ham radio event in Italy. The Pordenone Amateur Radio Fair is an eclectic mix of electronic gadgets and radios that attracts visitors of all ages from a wide European area. Other attractions at the fair include computers, electronics and hi-fi audio components for automobiles. The Amateur Radio portion of the event occupies one of seven buildings where 35,000 visitors walk through the 3 day event.

In addition to the usual mix of vendors and manufacturers that one would expect to find at a convention, the Amateur Radio side of the fair also has representatives of many ARI sections. Much like ARRL sections, ARI has sections throughout the country. Each has a club that supports the activities of the members. The clubs function as social organizations and provide training and support for emergency communications, contesting and other on-air activities.

The ARI club booths at the convention are mostly informational and have representatives on hand to answer any questions from interested fairgoers. Besides dispensing information, the friendly people there are quick to offer distinctive regional delicacies of ham, salami, cheese and cookies. Of

Inside IQ5FI, the ARI Firenze club station: Stafano Chieffi, IK8LSR; ARI Firenze President Roberto Rossi, I5RRE, and Roberto Seravalli, I5CRL.

MATHIAS KOLPE, DL4MM

ARI President Luigi Belvederi, I4AWX, and ARI Pordenone President Pietro Cogo, IV3EHH.

course, wine and espresso are always available. No matter which booth we visited we were told that what was being offered on the plate or in the glass was the best in all of Italy. I can assure you that it was all very good.

This year the Amateur Radio Fair at Pordenone was also the site of the 2008 High Speed Telegraph Championship (**www.hst2008.org**) where dozens of participants representing 16 countries competed in sending and receiving Morse code events.

It was refreshing to see so many young people competing in HST copying CW at speeds up to 100 WPM.

Teams dressed in uniforms representing their countries similar to those seen at the Olympics. Each night medals and certificates were awarded for the winners in the daily competitions. On the final evening, at the gala dinner, medals and trophies were presented to the overall winners. First place winners in each category were awarded a precision telegraph key presented by Piero Begali, I2RTF, of Begali Keys.

Honored guest, ARI National President Luigi Belvederi, I4AWX, congratulated all of the competitors for their performance and praised the event organizers for their extraordinary effort in making the combined events successful. After the presentations, speeches and applause, the celebration turned loose and everyone danced and partied into the night.

As part of the HST event ARI Pordenone organized a sightseeing trip to Venice. In spite of a dozen languages and various modes of transportation, Andrea Polesel, IV3BTY, Matteo Copetti, IV3RZW, and their team managed to shuttle over 100 guests to and from the City of Bridges. We were fortunate to be a part of this excursion and thoroughly enjoyed being shown the city by those who live there.

Irina Teterskaya, EU1YI; Elena Elchenko, RV9CPW, and Donata Gierczycka, SP5HNK, display their medals and awards for their outstanding performances in High Speed Telegraph events at Pordenone.

CHRISTINE RENAUD, I0OCD

Oreste D'Anzilio, IZ8EDJ, shows off a plaque presented to SRT for their work in promoting on-air activity and friendship through Amateur Radio. The author is at the left.

Salerno, Home of the Strange Radio Team

The Strange Radio Team (SRT) supports activity by sponsoring portable operating events that activate islands for the IOTA program and the Italian Islands Award or castle sites for the Italian Castle Award. All SRT members encourage participation in contests and many participate as part of multioperator teams. Pizza, macaroni, contest is the way Simone Bizzarri, IZØBTV, describes a typical SRT operating event. According to Simone, "A contest always begins with a good bottle of wine."

The SRT was formed in August 2003 by a group of radio amateurs whose goal is to promote on-air activity and have fun doing it. It was winter and the founding members of SRT, all in their 20s at the time, were making plans for summer when, according to legend, the club was set in motion by a bolt of lightning and a vision of signals being transmitted from islands, castles and other locations by enthusiastic radio amateurs. This vision quickly expanded beyond the Italian borders and today the SRT has over 320 members from more than 30 countries around the world.

At the helm of the SRT is Oreste D'Anzillio, IZ8EDJ, a charismatic young man with a warm heart and an enormous appetite for life. In his professional life Oreste performs opera, and SRT DX Convention attendees were treated to several arias performed by the tenor and a young soprano, Annalisa D'Agosto. Paolo Galdi accompanied the two artists on piano as they took turns charming the audience with dramatic solo performances of classic themes. They concluded the recital with a beautiful duet. The audience was visibly moved as their eloquent voices filled the air with the romantic ballad "O Solo Mio." Sophisticated entertainment like this is not common at Amateur Radio conventions.

Encouraging on-air activity within the club is only part of the SRT mission. The Strange Radio Team supports DXpeditioners, those hearty souls who travel to remote locations so radio amateurs around the world can add a new DXCC entity to their list. In 2006 SRT began awarding a handsome World Wide DXpedition Trophy to the DXpedition of the Year as voted on by visitors to the SRT Web page (**www.strangeradioteam.com**).

The first trophy was awarded to the Peter I DXpedition, 3YØX. The DXpedition to Swains Island, N8S, took home the 2007 award.

After the awards, presentations and matinee the convention shifted gears and moved to the grand ballroom for an extravagant dinner party. Guests were entertained with live music and dancing as course after course of delightful regional dishes was served. A large cake decorated for the event was served for dessert. At 1 AM the party had shifted again as everyone went outside to view a spectacular fireworks display in the night sky.

Salerno is not only home to an active Amateur Radio club but it is also the region where my family originates. In 1901, like many Italians at the time, my great-grandfather, at the age of 18, left a small town in the Salerno region and boarded a ship in Naples in search of a better life in America.

Back to My Past

Oreste had arranged to take us to Sant' Agata dei Goti, the town of my ancestors. This was a very special trip for me. We met with the mayor of the town and I saw the birth record of my great-grandfather. As a young boy I knew my great-grandfather and remember the old neighborhood where he lived in Philadelphia. I was quick to notice the resemblance the old Philadelphia neighborhood had to this town in Italy.

Oreste also told us that the folk dancing that we participated in at the SRT dinner was part of my heritage and that we had danced the same dances that my family danced at weddings and other celebrations over a hundred years ago.

For many hams Amateur Radio is part of an individual's identity. To some it is a lifestyle where radio integrates with other activities. The Italian Amateur Radio societies are more than clubs, as they exemplify the Italian passion for life, family and Amateur Radio. We were delighted to be a part of the Italian Amateur Radio family and it was through my Amateur Radio relationships that I was able to connect with my own family's heritage. *Saluto*!

All photos courtesy of the author unless otherwise noted.

Norm Fusaro, W3IZ, is Assistant Manager, ARRL Membership and Volunteer Programs. He can be reached at **nfusaro@arrl.org**. QST

Frequency Measuring Test 2008

Can you tell your mark from your space?

H. Ward Silver, NØAX

The format of the November 12, 2008 FMT will feature not just one signal, but two! Activity on the digital modes has skyrocketed with the advent of inexpensive radio interfaces and easy-to-use software. RTTY (radioteletype) remains the most popular data mode using simple FSK modulation. Critical to good performance on RTTY is using the proper "shift" or difference between the *mark* and *space* tones encoding the 1s and 0s that make up the Baudot code.

Thus, the November FMT will take a step toward the measurement of shifts of FSK signals. There will be two tones transmitted, one after the other, each with a 10-second duration. Stations will measure the frequency of each tone; then find frequency shift $f_{SHIFT} = f_{TONE\ 1} - f_{TONE\ 2}$.

How to Measure Tones

It doesn't take a rack of expensive test equipment to measure audio tones. Modern transceivers already have excellent frequency stability and accuracy. With your rig warmed up and its display frequency calibrated against WWV or WWVH (**http://tf.nist.gov/timefreq/index.html**), you are ready to start. Measuring the audio tone frequencies can be done with a frequency counter, spectrum analysis software or even tuning forks!

Previous FMT announcements have presented techniques for calibrating a transceiver's displayed frequency, measuring a carrier frequency and measuring audio tones of a modulated carrier. All of these articles are available for download at **www.arrl.org/w1aw/fmt**.

You may think of other ways to make the measurement. That's what the FMT is for—experimentation and practice! If you do try something new or unusual, be sure to tell your story in the FMT Soapbox (see below).

FMT Schedule

The 2008 ARRL FMT will run on the evening of Wednesday, November 13, 2008 at 0245Z (November 12, 2008 at 9:45 PM EST). It will replace the W1AW Phone Bulletin normally scheduled at that time. It is recommended that participants listen to W1AW transmissions prior to the event to get an idea of conditions to see which band (or bands) will be best for measurement purposes. (The 2005 FMT announcement contains a sidebar on the effects of Doppler shift on sky wave signals.)

There will be a West Coast FMT station again this year, courtesy of Mike Fahmie, WA6ZTY. The West Coast transmissions will follow the W1AW transmissions as described below.

FMT Format

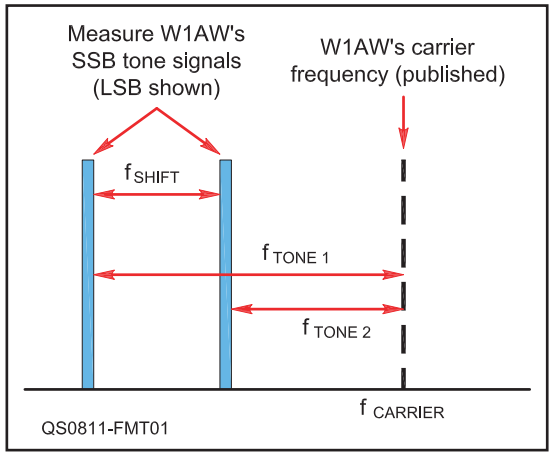
The FMT will begin with a general call to all amateurs (QST) from W1AW beginning exactly at 0245Z sent simultaneously on the two amateur frequencies below. All identification and instructions will be transmitted in CW. The test will begin with an identification of the band on which the tones are to be transmitted (NOW 80 METERS). The tones to be used will be between 500 Hz and 2 kHz.

The two tones will be transmitted in an alternating sequence of 10 seconds of each tone. Each tone will be transmitted three times for a total of 1 minute of continuous transmission on each band. W1AW will then ID and identify the next band (QST DE W1AW 40 METERS) and the tone sequence will be repeated on the next band. The test will last for a period of approximately 5 minutes total.

The test will end with a series of **V**s, followed by station identification. Following the W1AW transmissions, W1AW will stand by and WA6ZTY will begin transmissions (with different tone frequencies) at approximately 0250Z on 80 meters, followed by 40 meters approximately 5 minutes later on the following frequencies:

80 meters: 3597.5 kHz, LSB
40 meters: 7095.0 kHz, LSB

H. WARD SILVER, NØAX



FMT stations W1AW and WA6ZTY will transmit SSB signals modulated by two tones. Measure the audio frequency of the tones (not the carrier frequency) and calculate the shift between them.

Take a Collaborative Tone!

Making a club effort out of the FMT is an opportunity for technically skilled hams to teach frequency measurement techniques to beginners and other interested hams alike. Check out the W1AW FMT Web page for great club FMT stories and submit your own!

Reporting and Results

Your report should be submitted via the FMT Report form on the FMT Reporting and Results Web site, **www.b4h.net/fmt/index.php**. Along with your call sign and e-mail address, enter your most accurate tone measurements on each band and indicate whether you measured the W1AW or WA6TZY signal. There will be a window to list your equipment, describe the method you used to make the measurements and enter any Soapbox comments. W1AW will quickly post the tone frequencies following the test to help participants to assess the accuracy of their equipment and methods.

If you'd like more information about the equipment that will be in use at W1AW to generate the test signals, take a look at **www.arrl.org/w1aw.html**. Keep an eye on the FMT Web page for more information about the exercise and its results. Another FMT in the spring will be announced via the ARRL Web page. QST

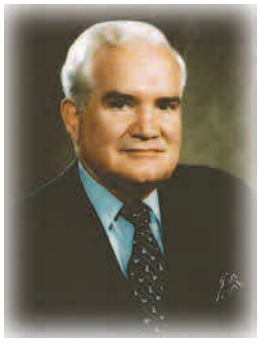
Say Thanks to a Reporter with a Nomination for the Leonard Award

Let's say thanks to those reporters who brought Amateur Radio into the public eye this year.

Allen Pitts, W1AGP

2008 has been a great year for Public Relations in Amateur Radio. Now here's your chance to say *thank you* to the reporter in your area who released the best stories about us between December 3, 2007 and December 8, 2008. Nominate him or her for the Leonard Award!

The annual award honors a professional journalist whose outstanding coverage in TV, radio, print or multimedia best reflects the enjoyment, importance and public service value of Amateur Radio. The award was created as a tribute to the late CBS News President Bill Leonard, W2SKE. He was an avid Amateur Radio operator and most active on the air during the 1960s and 1970s.



Bill Leonard, W2SKE

Nominations are judged by members of the League's national Public Relations Committee and the final decision is made by the ARRL Board of Directors at their meeting in January. The winner receives an engraved plaque and a cash award of $500. Please note that some news organizations prohibit journalists from entering contests that offer monetary awards, so checking with your potential nominee ahead of time is a good idea. The deadline for nominations is December 8, 2008.

Recent past winners included Alyssa Ivanson of WANE-TV in Fort Wayne, Indiana; Richard Harris, W3HP, of Mechanicsburg, Pennsylvania; Marilu Lozada of WPBT-TV in Miami, Florida, and Randall D. Larson of *9-1-1* Magazine.

Rules for Entry

The award is called the Bill Leonard, W2SKE, Professional Media Award.

- The recipient must be a professional journalist in print, electronic media or multimedia. The term "professional" refers to full time, part time, stringers, freelancers and contract journalists. In the case of a group project, the recipient may be the group, but only one prize will be awarded.
- The recipient will receive the award based on a print story, photo essay, audio, video (including broadcast) or multimedia in the English language that covers the topic of Amateur Radio. The scope of the work nominated may be a single story or series. The work must have appeared between December 3, 2007 and December 8, 2008 in a commercially published book, recognized general circulation (non-trade) daily or weekly newspaper, general or special interest magazine (except publications predominantly about Amateur Radio), commercial or public radio or television broadcast (including services delivered via cable), Internet World Wide Web site operated by a generally recognized journalistic organization (for example: newspaper, magazine, broadcast station or network), or multimedia format (such as CD-ROM), intended for and readily accessible to the general public within the United States.
- "Amateur Radio" means the activities of licensees, clubs and other organized groups participating in the activity of licensed Amateur Radio or "ham radio," as governed by Part 97 of the *Code of Federal Regulations*.
- The story must be truthful, clear and accurate, reflecting high journalistic standards. The award will be granted to the work deemed the best reflection of the enjoyment, importance and public service value of Amateur Radio. Submission may be by the author of the work or on his or her behalf by another individual who believes the work merits the award.
- The winner will be selected by the Public Relations Committee of the American Radio Relay League. The award will be approved by the ARRL Board of Directors at its January meeting. Individuals on the committee who may be related to or have a professional relationship with any applicant will excuse themselves from the deliberations.

How to Enter

Only one submission per entrant will be accepted. A group award will count as a single entry. Submit a completed application and appropriate work sample as follows:

Print article: Submit original tear sheets plus one photocopy on 8.5 × 11 paper. If there are multiple pages, write the author's name on the back of each sheet.

Radio: Submit one copy of the script on 8.5 × 11 paper plus one standard audio CD or MP3 file.

Television: Submit one copy of the script on 8.5 × 11 paper plus one DVD or MP4 file.

Multimedia: Submit a photocopy of each screen or Web page and/or CD ROM or DVD disk(s) as appropriate.

The ARRL reserves the right to withhold the award for any reason, to grant duplicate awards or to disqualify any entry. All decisions are final. The award winner will receive a plaque and a check for $500. A winning group entry will receive a single plaque and check.

Submit entries to: ARRL PR Committee, c/o Manager of Media Relations, American Radio Relay League, 225 Main St, Newington, CT 06111.

Entries may be submitted at any time up to a postmark deadline of December 8, 2008.

For more information about the award or to obtain a nomination form and the official rules for entry, contact ARRL's Media and Public Relations Department, **apitts@arrl.org** or call 860-594-0328. QST

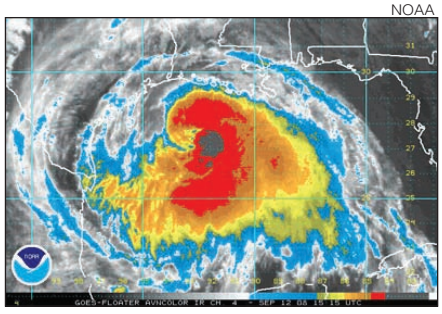
As Fierce Storms Pound Gulf Coast, Eastern Seaboard, Hams Respond to Help

Almost each weekend in September, hams in the Southeastern United States faced either a tropical storm or a hurricane as Hurricane Gustav, Tropical Storm Hanna and Hurricane Ike came through the region. While these storms were not as strong or destructive as 2005's Hurricane Katrina, hams on the ground and ARRL staff in Newington alike utilized the lessons learned from that storm to ensure that Amateur Radio would be able to help when called upon.

Daily conference calls were initiated by ARRL HQ between key emergency communications volunteers, Division and Section leadership and ARRL Headquarters during each of the storms. According to ARRL Emergency Preparedness and Response Manager Dennis Dura, K2DCD, the purpose of the series of conference calls was to facilitate communications among the participants and to respond to any requests for assistance. "The first 24 to 48 hours [of an event] is really going to dictate what kind of response we at HQ are going to have, and give us a clear idea of what the needs are," he said. "Once those on the scene tell us what they need, we will support them. Requests for emergency communications personnel will come from Section Managers or their designees, and we as an organization will meet those requests."

Each ARRL Section Manager whose Section was affected by the three storms commented on how well ARES® members in their Section operated with RACES members. ARRL South Texas Section Emergency Coordinator Mike Schwartz, KG5TL, reported that "ARES groups [in South Texas] have been working hand-in-hand with RACES. We've been working very well together, and we are handling all their message traffic." ARRL North Texas Emergency Coordinator Bill Swan, K5MWC, echoed Schwartz's remarks: "We here in the North Texas Section have seen a great level of cooperation between our folks and the RACES folks. It's excellent to see this level of cooperation." In Louisiana, Section Manager Gary Stratton, K5GLS, concurred: "We've been sharing operating with RACES since Day One. We've even had an Army MARS unit from Savannah, Georgia deploy here to assist the Transportation Security Administration (TSA) at the airport in Lake Charles."

NOAA



Hurricane Ike, just before landfall on Galveston Island.

Hurricane Gustav

After several days of harrowing watching and waiting for Hurricane Gustav to make landfall, the storm slammed into Southeast Louisiana on September 1, Labor Day af-

RETHA GADUS

Amateur Radio operators in the Greater Houston area assisted personnel from Army Corps of Engineers, the Texas National Guard and local fire departments with the distribution of ice, water and food for residents affected by Hurricane Ike. Here, Joseph Gadus III, KE5BVQ (left), assists with logistical support at one of 26 Points of Distribution in the area.

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

ternoon, leaving flooding, wind damage and power outages in its wake and evacuees eager to go home. As Amateur Radio operators across the area moved from an emergency response stance to clean-up, evaluation and repair, the need for some changes to operations and equipment became clear, as did the vastly improved response as compared to Hurricane Katrina.

At Poplarville, Mississippi — county seat of Pearl River County — Emergency Operations Center Communications Officer David Moore, N5ELI, said, "We have some stuff to do, but it's not bad." He noted a defective antenna that was discovered during operations for Gustav, as well as a few operational details that need to be worked out before future events. But, noted ARRL Mississippi Section Public Information Coordinator Larry Wagoner, N5WLW, who manned the Emergency Operations Center in Picayune, Mississippi, essential services were available in spite of the problems; contact was maintained with the shelters in the area, as well as with other individuals and agencies needing assistance.

Harrison County EC and DEC for the Gulf Coast District Tom Hammack, W4WLF, echoed that reaction, noting the heavier damage to his coastal community: "The harbors are torn up," he observed, saying that a small tornado had been sighted near the port, reportedly damaging a few buildings in the area and knocking out power for a time.

"We had communications with the Coast Guard on 2 meters, as well as marine VHF," Hammack said. "We had hams at other locations as well." He noted that Ed Byrd, KA5VFU, had the radio links to the area hospitals working, too. "This was a cakewalk for us compared to Katrina," Hammack noted, adding, "But the farther west went you go, it wasn't any cakewalk at all. Hancock County (located due west of Harrison County) got hit pretty hard."

Local hams were not the only ones learning lessons from the storm. Purvis noted that while the Mississippi Emergency Management Agency official at the Stone County Emergency Operations Center was familiar with Amateur Radio, the Federal Emergency Management Agency (FEMA) representative did not know anything about it or the service that hams provide before the storm. "By the end of operations Tuesday," Purvis said, "she had quite an education. She was not only very impressed with what hams can do, but now wants to become licensed herself and is very interested in SKYWARN operations."

Local officials said the area fared much better in Gustav than with Hurricane Katrina. "We didn't lose any local communications, phone or Internet. In Katrina, we lost everything," said Purvis. "Our major function was communications with the shelters, storm spotting and being on standby for other services."

JOEL KLEINMAN, N1BKE

ARRL Emergency and Preparedness Response Manager Dennis Dura, K2DCD (black shirt), who served as Incident Commander for each of the storms, led a series of conference calls between ARRL staff and Section and Division leadership in the affected areas.

RICHARD HAWKINS, W5DWI

Due to Tropical Storm Lowell, the Rio Grande was in danger of flooding its banks near the town of Presidio, Texas.

In Georgia, Amateur Radio operators were actively participating in the coordination and operations of shelters housing people displaced by Hurricane Gustav. According to ARRL Georgia Section Public Information Coordinator Norm Schklar, WA4ZXV, more than 500 people fleeing Hurricane Gustav and its aftermath made their way to Carroll, Gwinnett and Troup Counties in that state.

"We also provided communications for Red Cross Information Centers located at the inbound Welcome Centers located on Interstates 20, 85 and 185," Schklar said. "Some of these locations were manned throughout the night, while some shut down for the evening." When hams crossed over into Georgia, Schklar said that hams at the Information Centers assessed the needs of each group, radioing ahead to make shelter arrangements. This provided a smoother intake process at the shelter, assuring each group that space was available for them at the shelter.

Schklar said that Net Control operated out Red Cross Headquarters in Atlanta: "This operation was manned 24 hours a day. Net support is accomplished through the ARES SKYWARN Team operating out of Peachtree City. These hams utilized the SKYWARN linked repeater system, providing links between Net Control, shelters and Information Stations."

Tropical Storm Hanna

Just five days later, Tropical Storm Hanna made its way up the East Coast of the United States, making landfall on the North/South Carolina border at 3:15 AM (EDT) September 6. The storm produced tropical storm-force winds gusts, with some locations experiencing sustained tropical storm-force winds. Amateur Radio operators in the Carolinas and northward were prepared for the storm.

According to ARRL North Carolina Section Manager Tim Slay, N4IB, hams in his state were ready for Hanna, with personnel in place at the Amateur Radio Station at the State Emergency Operations Center. Slay said plans called for the hams to start operating from there beginning the evening of September 5, going until about mid-day on Saturday "or for however long is needed." The EOC was secured at 12:30 PM on Saturday, September 6.

The Tarheel Emergency Net, North Carolina's HF ARES Net that meets on 3.923 MHz, was on standby status Friday, September 5, going active at 6 AM the next day. North Carolina Section Emergency Coordinator Bernard Nobles, WA4MOK, said the Net would remain active "until Emergency Management [officials] release Amateur Radio. We received reports from across the state, mostly about the amounts of rainfall, which were anywhere from 1 to 5 inches."

Nobles said that the Amateur Radio station at the North Carolina Eastern Branch Emergency Operations Center in Kinston began operations at 6 AM Saturday. Later that morning, the EOC lost commercial power and the amateur station went on battery power until power was restored, about an hour later. Operations at the Eastern Branch were secured around noon.

ARRL South Carolina Section Emergency Coordinator Charlie Miller, AE4UX, reported that on Friday evening, the South Carolina Emergency Management Division had the State Emergency Operations Center at Operations Condition 1 (OPCON 1) — the highest level of alert — with the SEOC manned 24 hours a day. "All normal communications modes were functioning," he said. At 9:30 AM on Saturday, the SEOC closed and all county EOCs returned to normal operations. "During Hanna, no communications outages — beyond normal day-to-day outages — were reported. A total of 22 Red Cross shelters received 650 people, and eight people sought shelter in a 'special medical needs' shelters," he said.

Dura notified ARRL Sections up the coast to Maine on Friday regarding reporting protocols if ARES was activated in response to Hanna. "From Friday evening throughout Saturday," he said, "we received status reports from the Eastern Massachusetts, Eastern New York, New York-Long Island, Northern New Jersey, Southern New Jersey and Virginia Sections. We also began coordination efforts with the individual Sections that we expect to be on the receiving end of what is becoming an active storm season for the United States mainland. We have learned a lot from the Gustav and Hanna storms, and will take that knowledge and focus on Ike while continuing to support efforts in the northern Gulf that were impacted by Gustav."

Hurricane Ike

Hurricane Ike, the biggest of the three storm systems, made landfall near Galveston Island early Saturday morning, September 13. As this is written, the complete story has yet to be played out. Even though hams in Texas and Louisiana have had only a bit of a breather since Hurricane Gustav came through two weeks before, ARRL Section leadership in Texas, Louisiana, Oklahoma, Mississippi and Arkansas reported in ongoing conference calls with ARRL HQ that they were ready for Ike.

In South Texas, many counties including parts of Harris County — home of Houston, the nation's fourth largest city — received mandatory evacuation orders in preparation for Ike.

While not called on to help out before Ike came, hams in Harris County and the surrounding area responded to calls to assist served agencies with Points of Distribution (POD) around the Greater Houston area on September 16. These PODs were set up to distribute water, ice and food to area residents dealing with Ike and that storm's aftermath.

According to Joe Gadus, KD5KTX, an ARRL Public Information Officer in the South Texas Section, members of ARES South Texas District 14 — under the leadership of District Emergency Coordinator Jeff Walter, KE5FGA — manned at least 26 PODs in Harris County. "These hams provided communications between the National Guard units at the PODs and the Harris County Office of Emergency Management, coordinating the delivery and resupply of food, water and MREs (meals ready to eat) to the victims of Hurricane Ike," he said. "Most of these hams are also victims [of the storm], having suffered property losses and power outages expected to last approximately three weeks."

ROGER WINES, W5WIA

ARRL South Texas Section Public Information Coordinator Lee Cooper, W5LHC (right), confers with Travis County ARES Public Information Officer Steven Polunsky, KE5GDR, at the Austin-Travis EOC.

Bill Rimmer, N5LYG, who is assisting with the deployment, said those assisting with the PODs were required to have a mobile VHF radio with a mag mount antenna and 50 W of power. "[Hams] will most likely be transmitting from [their] car using the car battery for power."

According to ARRL South Texas Public Information Coordinator Lee Cooper, W5LHC, Texas State RACES were manning the station at the State EOC from 7 AM-10 PM until further notice and the Saltgrass/SWLynx linked repeater system is running a linked UHF/VHF Net at the request of State EOC. "They mostly handled reports of where there is and is not power and gas," he said. "All of us up and down I-35 corridor are all standing by awaiting requests [to assist]. We've received lots of damage reports. I suspect that the areas where we may be needed are either still blocked from access due to road debris or flooding, or possibly so much of the towns are just gone that communication [assistance] is not going to make a difference."

Amateur Radio operators in ARRL's North Texas Section provided support to FEMA Region VI during Ike, said North Texas Section Emergency Coordinator Bill Swan, K5MWC: "Through the establishment of a coordination communications link, state agencies can request FEMA support, as well as respond to requests from FEMA for information that can be used in their response to those impacted by Hurricane Ike." FEMA Region VI covers the states of Texas, Arkansas, Oklahoma, New Mexico and Louisiana. "FEMA has been very pleased with the activity and support of Amateur Radio here in the North Texas Section," Swan said.

In West Texas, SEC J. T. Caldwell, WA5ZFH, reported that the town of Presidio was "more than 11 feet above flood stage after persistent rains from the remnants of what was Tropical Storm Lowell [in the Pacific]. Reservoirs in Mexico are 106 percent full, and authorities there are dumping water from their reservoirs that feed into the Rio Grande, causing major flooding. The ground here is completely saturated. Water has virtually no place to go."

Caldwell said that additional water was being released from Luis Leon dam in Mexico, and a portion of the levee broke on the Ojinaga, Mexico side late on the evening of September 16. "No one currently expects the levees to hold," he said, "and residents have been advised that if they hear sirens, to immediately leave and seek higher ground — hundreds of residents have [already] been evacuated. The shelters here were combined into one shelter at the elementary school with about 120 people in it," with more expected as the levees breech or overtop.

Presidio's lowest areas have been evacuated. Emergency workers also shut down the Presidio-Ojinaga International Bridge connecting the city to Ojinaga, Chihuahua, Mexico, which was in danger of flooding as the Rio Grande continued to rise Tuesday. Presidio City Administrator Cynthia Clarke warned travelers "Not [to] travel down here if your intent is to get to Ojinaga," adding that there had been three breaks in a levee. "There's no way to get across," she said.

Hams in Texas's surrounding states were

prepared as well. ARRL Louisiana Section Manager Gary Stratton, K5GLS, reported that some parishes in that state were "completely underwater," while other parishes were issued mandatory evacuation orders in advance of Ike. "Eighteen shelters, including a special needs shelter in Shreveport, were opened," he said. "ARES provided communications support in each of these shelters."

In Arkansas, Section Manager Dave Norris, K5UZ, said his main concern was flooding. "The ground here is over saturated from Hurricane Gustav," he said. "Tornados are a big concern, so SKYWARN was in a 'wait and see' mode and doing what we could do to get everything prepared." Amateurs in the Arkansas Section were on standby, waiting to see if their assistance was needed in the Louisiana and South Texas Sections, Norris said.

Mississippi Section Manager Malcolm Keown, W5XX, reported that there was one shelter open on the coast, but he had not received a request for Amateur Radio support for that shelter. "Hancock County — the county closest to Louisiana on the coast — was been issued mandatory evacuation orders, and the National Guard was deployed to assist with anything needed down there," Keown said. "Highway 90, which runs parallel to the coast, was closed."

As this issue went to press, the ARRL was still receiving reports from the field about recovery efforts from these three storms. To catch up on the latest information, please visit **www.arrl.org**.

W1AW Supports EchoLink Operations During Ike

Throughout the course of Hurricane Ike, operators at W1AW, the Hiram Percy Maxim Memorial Station, hooked into the HF radio of ARRL West Gulf Vice Director David Woolweaver, K5RAV, via EchoLink. According to W1AW Station Manager Joe Carcia, NJ1Q, this enabled hams in Newington to monitor the Texas Emergency Net. "Through Dr Woolweaver's initiative, we could use EchoLink in this fashion to assist ARRL HQ staff monitor critical Net operations using HF — a capability we have never taken advantage of before."

Carcia said that the HF/EchoLink connection was used because the Net was on 75 meters, "and propagation did not favor us here in New England to be able to hear the transmissions. By using Dr Woolweaver's link, we could hear everything on the Net."

During the monitoring sequence, Woolweaver changed the frequencies on EchoLink to enable ARRL HQ to stay on top of and monitor conversations related to message relays, Coast Guard contacts and Health and Welfare traffic from across Texas and the surrounding states. According to ARRL Emergency Preparedness and Response Manager Dennis Dura, K2DCD, this capability will be critical to future emergency communication response at ARRL Headquarters: "Without the EchoLink/HF connection, we here at ARRL would not have able to be in contact with ARRL South Texas Section Leadership."

Woolweaver is working on getting more Texas stations involved in the EchoLink network to help out with future emergencies. He said that EchoLink can be successfully utilized to monitor and to engage stations on VHF and HF. "Using stations with EchoLink node capabilities and access to VHF and HF equipment, W1AW and other personnel at HQ will be able to become active participants and consultants in local and regional operations," he said. "You cannot underestimate the value of first hand information. The EchoLink to remote HF connection allows W1AW and ARRL staff to monitor and participate in local and regional operations any where any time. It does not get much better than that!"

JOEL KLEINMAN, N1BKE

At W1AW, ARRL Contest Branch Manager Sean Kutzko, KX9X, monitors the Texas Emergency Net on HF via EchoLink.

BRENNAN PRICE, N4QX, RETURNS TO ARRL STAFF

Brennan Price, N4QX, returned to the ARRL Staff as the League's Technical Relations Manager on September 15, filling the vacancy created by the retirement of Paul Rinaldo, W4RI, earlier this summer. From 2000-2004, Price served as Field and Regulatory Correspondent and Assistant Technical Editor at ARRL Headquarters. As Technical Relations Manager, he will be responsible for representing the ARRL's interests to federal government agencies, the International Telecommunication Union (ITU) and other international organizations, and regional telecommunications organizations, personally and through the supervision of other Technical Relations Office staff. Price said his goal as Technical Relations Manager is to "defend Amateur Radio spectrum, and if the opportunity presents itself, help gain some."

Price holds a BA in chemistry from Vanderbilt University, an MS in chemistry from Georgia Institute of Technology (Georgia Tech), and a JD with honors from the University of Connecticut School of Law, where he was appointed Executive Editor of the *Connecticut Law Review*. Admitted to the Connecticut bar in 2005, he had been in private practice with a firm in Hartford. Price was first licensed in 1997 as KF4UZB, earning his Amateur Extra class license by 1999, acquiring the call signs KU4WJ and N4QX in the process. He is an ARRL Volunteer Counsel and has stayed current with regulatory issues affecting the ARRL and Amateur Radio.

While at the *Law Review*, Price was invited to publish a scholarly summary of case and statutory law related to PRB-1, the FCC's limited preemption of Amateur Radio antenna and antenna support zoning restrictions (**www.arrl.org/FandES/field/regulations/PRB-1_Pkg/Price.pdf**). This 29 page summary is designed to inform amateurs and their counsel, as well as and municipal counsel, of the state of the law before any party adopts an unwise strategy.

"We are fortunate to have filled this key position with someone with Brennan's experience, training and passion for Amateur Radio," said ARRL Chief Executive Officer David Sumner, K1ZZ. "His strong regulatory background and knowledge of the ARRL as a former staff member and active volunteer will help him come up to full speed very quickly. He jumped into preparations for the 2011 World Radiocommunication Conference (WRC-11) on his first day back."

Price said he welcomes the chance to return to ARRL and join its Technical Relations staff: "The League's Technical Relations efforts have paid tangible dividends to Amateur Radio operators over the years: Our allotment at 60 meters and more broadcaster-free space on 40 meters are but two examples. I am pleased to have the chance to advocate

S. KHRYSTYNE KEANE, K1SFA

ARRL Technical Relations Manager Brennan Price, N4QX

for Amateur Radio on the national and international stage. Although WRC-11 is three years away, preparatory work is well underway, with Technical Relations Specialist Jon Siverling, WB3ERA, representing the ARRL at a meeting of a Permanent Consultative Committee of the Inter-American Telecommunication Commission (CITEL) in Argentina in September."

When not at work or on the air, Price enjoys officiating football and playing chess.

ARRL INVITES NOMINATIONS FOR 2008 INTERNATIONAL HUMANITARIAN AWARD

Nominations are open for the 2008 ARRL International Humanitarian Award (**www.arrl.org/FandES/field/awards/humanitarian.html**). The award is conferred upon an amateur or amateurs who demonstrate devotion to human welfare, peace and international understanding through Amateur Radio. The League established the annual prize to recognize Amateur Radio operators who have used ham radio to provide extraordinary service to others in times of crisis or disaster.

A committee appointed by the League's President recommends the award recipient(s) to the ARRL Board, which makes the final decision. The committee is now accepting nominations from Amateur Radio, governmental or other organizations that have benefited from extraordinary service rendered by an Amateur Radio operator or group.

Amateur Radio is one of the few telecommunication services that allow people throughout the world from all walks of life to meet and talk with each other, thereby spreading goodwill across political boundaries. The ARRL International Humanitarian Award recognizes Amateur Radio's unique role in international communication and the assistance amateurs regularly provide to people in need.

Nominations should include a summary of the nominee's actions that qualify the individual (or individuals) for this award, plus verifying statements from at least two people having first-hand knowledge of the events warranting the nomination. These statements may be from an official of a group (for example, the American Red Cross, The Salvation Army or a local or state emergency management official) that benefited from the nominee's particular Amateur Radio contribution. Nominations should include the names and addresses of all references.

All nominations and supporting materials for the 2008 ARRL International Humanitarian Award must be submitted in writing in English to ARRL International Humanitarian Award, 225 Main St, Newington, CT 06111 USA. Nomination submissions are due by December 31, 2008. In the event that no nominations are received, the committee itself may determine a recipient or decide to make no award.

The winner of the ARRL International Humanitarian Award receives an engraved plaque and a profile in *QST* and other ARRL venues.

In Brief

- **ARRL Emergency Communications Level 3 Course to be Revised**: The ARRL Continuing Education Program offers Emergency Communications training courses to prepare radio amateurs to serve our communities in time of crisis when other communications systems fail. The ARRL Emergency Communications training program includes three levels of courses. In order to keep the material in the Level 3 course accurate and up to date, ARRL Emergency Preparedness and Response Manager Dennis Dura, K2DCD, will develop new content, revising the Level 3 curriculum. The fully updated course is expected to be available in the first quarter of 2009. For information on the status of the revised Level 3 Emergency Communications course, check the Continuing Education Program Web site (**www.arrl.org/cep/student**) or via e-mail at **cep@arrl.org**.

- **Tom Kneitel, W4XAA (SK)**: Tom Kneitel, W4XAA, better known to hams by his previous call sign K2AES, died August 22 at age 75. At the time of his death, he was editor emeritus of *Popular Communications*. Aside from serving as editor of *Popular Communications*, he had written for *CB Horizons*, *S9* and *Popular Electronics*, and was the author of a number of radio hobbyist books on such subjects as scanning, CB radio and building electronics projects. Born in Brooklyn, New York in 1933, Kneitel first started writing about the radio hobby in the 1950s, and continued writing until recently. He was a 2004 inductee into the CQ Amateur Radio Hall of Fame. He was the grandson of cartoon pioneer Max Fleischer, whose studio created the Popeye and Betty Boop cartoons.

Tom Kneitel, W4XAA (SK)

SECTION MANAGER NOMINATION NOTICE

To all ARRL members in the Arizona, Arkansas, Iowa, Kentucky, Mississippi, Montana, North Texas, Orange and Wyoming Sections: You are hereby solicited for nominating petitions pursuant to an election for Section Manager (SM). Incumbents are listed on page 16 of this issue.

To be valid, a petition must contain the signatures of five or more full ARRL members residing in the Section concerned. Photocopied signatures are not acceptable. No petition is valid without at least five signatures, and it is advisable to have a few more than five signatures on each petition. Petition forms (FSD-129) are available on request from ARRL Headquarters but are not required. A sample nomination form is available on the ARRL Web site, **www.arrl.org/FandES/field/org/smterms.html#sample**.

We suggest the following format:

(Place and Date)

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

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

(Signature___ Call Sign___ City___ ZIP__)

Any candidate for the office of Section Manager must be a resident of the Section, an Amateur Radio licensee of Technician class or higher and a full member of the League for a continuous term of at least two years immediately preceding receipt of a nominating petition. Petitions must be received at Headquarters by 4 PM Eastern Time on December 5, 2008. If more than one member is nominated in a single Section, ballots will be mailed from Headquarters on or before January 2, 2009, to full members of record as of December 5, 2008, which is the closing date for nominations. Returns will be counted February 24, 2009. Section Managers elected as a result of the above procedure will take office April 1, 2009.

If only one petition is received from a Section, that nominee shall be declared elected without opposition for a two-year term beginning April 1, 2009. If no petitions are received from a Section by the specified closing date, such Section will be resolicited in the April 2009 *QST*. A Section Manager elected through 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* QST

Building Trust in Georgia

Lynn Bianco, KN4YZ
kn4yz@arrl.net

Building trust and mutual respect is a process that often takes many years. In Fayette County, Georgia, we've been fortunate to have an excellent working relationship between our ARES® group, the Department of Public Safety and our Emergency Management Coordinator, Captain Pete Nelms. We recently began a new and unique program that elevates that trust and cooperation to a new level and helps our community.

Discussion between ARES, Public Safety, Emergency Management and 911 has resulted in a cooperative effort and partnership to allow ARES communicators to handle nonemergency yet critical events in the 911 Center. Due to the confidential information processed and relayed at the Center, it was essential no laws, policies or procedures were violated. On January 17, 2008, David Benoist, AG4ZR, Emergency Coordinator (EC); Lynn Bianco, KN4YZ, Assistant EC, and Cheryl Rogers, 911 Director, met to formulate an implementation plan.

Since then, a group of nine hams has undergone formal background checks, trained in criminal justice information system policies and procedures, attended security and integrity class, a basic call taking class and a Web-based emergency operations center class. All nine have now attained the designation of 911 Practitioner. An additional benefit the hams provide is the ability to use the HF/VHF/UHF/Winlink station in the Center to provide backup communications and communicate with SKYWARN at the National Weather Service (NWS) in nearby Peachtree City during inclement weather. In the words of Interim Director of Public Safety, Chief M. Allen McCullough, this provides "a win-win proposition and partnership for all involved."

The charter class of 911 Practitioners was formally recognized on June 26, 2008 by the Fayette County Board of Commissioners. The class includes David Benoist, AG4ZR; Lynn Bianco, KN4YZ; George Knight, N4FLT; Huey Kenmar, KI4NGD; David Alread, N4FGA; Jim Lynch, K4GVO; Brian Cook, KG4FJD; Jim Burchfield, W4JB, and Lewis Patterson, WD4GTY.

COURTESY LYNN BIANCO, KN4YZ

Charter class of Fayette County, GA, 911 Practitioners: (left to right) Commissioner Eric Maxwell; Commissioner Herb Frady; George Knight, N4FLT; David Alread, N4FGA; Commissioner Robert Horgan; ARRL Georgia Section Manager Susan Swiderski, AF4FO; Commission Chairman Jack Smith; Lynn Bianco, KN4YZ; Brian Cook, KG4FJD; David Benoist, AG4ZR; Commissioner Peter Pfeifer; Jim Burchfield, W4JB; Lewis Patterson, WD4GTY; Jim Lynch, K4GVO; 911 Supervisor Nicole Smith, KG4WUW; Interim Director of Public Safety M. Allen McCullough; 911 TAC Cathy Crenshaw, and Huey Kenmar, KI4NGD.

Building trust and respect is an ongoing process. Working beside and learning from the outstanding operators in our 911 Center gives us a much greater appreciation and understanding of the why and how of Public Safety. It also allows the Public Safety organizations to learn what capabilities we can contribute during times of disaster when resources are stretched thin.

VIP RED FLAG PATROL — PART 2

Paul Rios, KC6QLS
kc6qls@cox.net

Continuing our story about the California Fire VIP (CAL FIRE) "Volunteers In Prevention" Patrol (Public Service, *QST*, August 2008, pp 60-61), this past 4th of July holiday was the first time the Patrol at the Monte Vista Dispatch Center in San Diego County used its new Amateur Radio gear. The local media did four news reports about the new Amateur Radio gear and what the CAL FIRE VIP Patrol is and does. The first report aired July 3 to get the word out about the Patrol and to let everyone know that local volunteers will be out patrolling and looking for fires. This was a very timely piece due to all of the California fires burning to the north of San Diego County.

Rich Beisigl, N6NKJ, is the local Amateur Radio contact for CAL FIRE and had nine groups of two patrolling San Diego's

> ***"Some of them know people who lost homes in the 2003 and 2007 firestorms and say that's the reason they got involved in Amateur Radio in the first place, to serve the local community and help out in time of need."***

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

NTS Methods and Practices Guidelines

Here is an ARRL Web resource that is worth checking out: **www.arrl.org/FandES/field/nts-mpg/**. The NTS Methods and Practices Guidelines (NTS MPG), is the working reference manual on traffic net and message handling procedures in the ARRL National Traffic System (NTS). It also serves as an appendix to the *ARRL Public Service Communications Manual* (**www.arrl.org/FandES/field/pscm/**).

According to the manual's editor, Al Nollmeyer, W3YVQ, "The methods presented are a reasonably accurate snapshot of current practices. They are indeed practices, and not strict rules, but the beginner, Section, Region, Area and Transcontinental Corps net operators and management alike will find it beneficial to have a uniform protocol reference to be used by operators."

Backcountry and five patrols in Fallbrook and into North County looking for anything that may start a fire or looked out of place. We used a local repeater system that is maintained by RACES (Radio Amateur Civil Emergency Service). Overall, the radios work very well. We used 2 meters and 70 centimeters, but still had some dead spots due to the mountainous terrain.

Among the Amateur Radio operators on patrol was a husband and wife team, Steve Weed, KO4QT, and Linda Weed, KI6JUD. This was Steve's second patrol and Linda's first. While on patrol, Steve and Linda observed a man with a bag walking into the woods in a remote area. They called this information in to net control operator Paul Rios, KC6QLS, who reported to Roxanne Provaznik, Fire Prevention Specialist. Roxanne had Paul advise Steve and Linda to not engage, but to continue on patrol and double back to check for smoke. The subject seen off of Buckman Springs Road was later arrested and removed from the area as a transient and fire threat. This happened a week or so later.

Many of the volunteers were asked why they give their time. They told of a need to give back to the community. Some of them know people who lost homes in the 2003 and 2007 firestorms and say that's the reason they got involved in Amateur Radio in the first place, to serve the local community and help out in time of need.

Steve and Linda's patrol totaled over 150 miles. Multiply those miles by the number of volunteer patrols on the 4th of July holiday and you can imagine the amount of area patrolled. We covered nearly all of East County, Alpine, Crest, Campo, Cuyamaca and Lakeside just to name a few. Most of the areas had burned in the last firestorms.

The VIP Red Flag Patrol was a great success due to the enthusiasm and dedication of local Amateur Radio operators as well as the new radio equipment, which is capable of operating many bands simultaneously. Both new and seasoned VIP Red Flag Patrol Amateur Radio operators enjoyed aiding CAL FIRE in fire prevention and look forward to the next call-out, which will most likely be when the dry winds out of the east (commonly known as the Santa Ana winds) return.

SCHOOLS RECEIVE NOAA PUBLIC ALERT RADIOS

ARRL and Citizen Corps are teaming up to assist local school districts (if they need the help) to set up and register their National Oceanic and Atmospheric Administration (NOAA) Weather All Hazard Public Alert Radios.

An August 19 news release says: "Federal agencies have begun distributing more than 182,000 Public Alert Radios to preschools, Head Start programs, K-12 nonpublic schools and nonpublic school central offices, K-12 school district offices and post-secondary schools. In two earlier phases, the federal government distributed radios to all 97,000 K-12 public schools across the country, bringing the program to a close this September with a lifesaving radio in every school in the nation."

Two years ago, in the fall of 2006, some ARRL members, affiliated clubs and Field Organization appointees were called upon to help when this project was in its pilot phase.

"The radios are distributed by the US Department of Commerce's National Oceanic and Atmospheric Administration, with funding from the Department of Homeland Security and assistance from the Departments of Education and Health and Human Services," according to the news release.

The radios are designed to signal different types of alerts ranging from weather emergencies to child abductions, and from chemical accidents to acts of terrorism. The radio acts as a sentry, standing guard 24/7, to sound an alarm when danger threatens.

If you, as an individual Amateur Radio operator, as part of an Amateur Radio club or as an ARRL Field Organization appointee, would like to help Citizen Corps in this project, please contact your local Citizen Corps Council to offer assistance. Where there isn't a Council, please contact local emergency management.

Contacts should not be made directly to local schools but, instead, should be made by Citizen Corps and Emergency Management to local school district superintendents' offices to ensure a coordinated plan. Assistance to schools will be provided at the request of, and in coordination with, the school district.

For additional information on the Public Alert Radios for Schools program, see the Web site at **public-alert-radio.nws.noaa.gov**. The general public can learn about these radios at **www.weather.gov/nwr**. QST

The Doctor is IN

PROJECTS AND INFORMATION FOR THE ACTIVE AMATEUR

Q Charles, W4CTD, asks: I never digested a really simple concept. When something says, for example, "amateur bands above 420 MHz," I get confused. 420 MHz is not a band, it is a frequency. So does "amateur bands above 420 MHz" (the 70 cm or 0.7 meter band) mean 1.25, 2, 6 and 10 meters, because the number of the band is bigger than 0.70 meters, or does this mean amateur bands with frequencies above 420 MHz (70, 33, 23 cm)? By the same token, if we talk of frequencies above the 6 meter band, are we talking about frequencies in bands 10, 12, 15, 17, 20 meters, and so on, or are we talking about higher frequencies in the 2, 1.25, 0.7, 0.33 and 0.23 meter (or 23 cm) bands?

A Charles, I've been asked this more than once, so don't feel like you're out there all by yourself! This is a question that raises a historical trail in the answer. In the very early days of radio (even before my time!), it was common to refer to radio signals by their wavelengths. As radio broadcasting became popular, broadcasters tended to refer to their channel assignments in terms of frequency. Of course the two values have an equivalency based on the speed of light, $\lambda = C/f$, where λ is the wavelength, C the speed of light and f the frequency.

In the beginning days of radio, no one could decide which to use so you will find early radios (before around 1930) with dial markings in both frequency and wavelength. Government regulations began to specify frequency rather than wavelength around then, so common usage locked in step and now frequency is almost always used to specify a radio signal. You will still find wavelength used to describe a band of frequencies, however, such as the 31 meter shortwave broadcast band or the 20 meter amateur band. This is especially convenient when we talk about antennas since there is a relationship between wavelength band and the physical size of antennas.

Common usage generally gives the nod to frequency, and you now almost never see a current radio dial calibrated in wavelength. Thus, when someone refers to "signals above 420 MHz or 70 cm," they mean signals with a higher frequency. Occasionally you will also hear someone say "signals with a shorter wavelength than 70 cm," and that means the same thing, just to keep you on your toes!

Q Ralph, AA8RKI, asks: I have four mobile radios of different brands that were all supplied with the same type of power connector. This connector has two spade type terminals in a plastic housing, with the connectors at right-angles to one another, in a T shaped arrangement. What are these connectors called? Where can I get some spares?

A I know exactly what you mean — they seem to be used on almost all new V/UHF mobile radios that I've encountered. See Figure 1. I have a feeling that I have purchased them from RadioShack in the past, but a search of their online catalog had no results. Perhaps your local store will have some. They are definitely available from Workman Electronic Products, **www.workmanelectronics.com/itemcatalog.htm** — look under "I" for their ICCONN connector package. It contains a set of one each male and female. Workman is mainly a distributor with a $75 minimum order. Our local radio dealer, Lentini Communications (**www.lentinicomm.com**) has them in stock for about $2 per package. Alex Lentini, N1EBU, said that many dealers at Dayton had Workman products on display. If you can't find it at your local dealer give Alex a call at 800-666-0908.

Figure 1 — Typical power connectors used on many V/UHF mobile radios. The larger housing with the spade pins is generally used on the equipment side, while the socket on the right goes to the power source.

Q Wade, K4WMN, asks: In the *QST* article "Your Second HF Antenna," while I understand that the window line and tuner can get a substantial amount of power to the antenna, how well does such a non-resonant antenna do on receive?[1] The reason I ask is that if I try listening to 20 meters on my 40 meter coax fed dipole I often can only hear the strongest of signals. When I switch to an even lower shortened but resonant antenna I receive much better. Before I replace my current dipole with the one in the article, I want to make sure it will receive as well as transmit.

A The non-resonant antenna receives just fine. A 40 meter dipole fed with ladder or window line on 20 meters will actually have about 2 dB gain compared to a resonant 20 meter dipole at the same height. All the loss related factors discussed in the article apply to receive as well as transmit.

Thus, on 20 meters, your coax fed 40 meter dipole will try to receive just fine. When the signal from the antenna, with an impedance of about 2000 Ω hits the 50 Ω coax, it encounters a 40:1 mismatch, resulting in most of the received signal being reflected back to the antenna and reradiated with not much going down the coax. By using low-loss line and a tuner, the tuner makes the line look like a match at the antenna, and almost all the signal gets to your radio.

Q Mario, N2HUN, asks: I just obtained an interesting old book, *49 Easy to Build Electronic Projects* at the local library. Most of these projects use either a 2N464 or 2N366 transistor. I have checked with RadioShack to see if they have these or an equivalent, with no success. I do remember RadioShack used to sell a transistor substitution book, but alas no longer carries it. Would you know what transistors could be substituted for the above, or if there are equivalent tables somewhere?

A These are obsolete germanium transistors. It is difficult to find a direct substitute for them because most current semiconductors are based on silicon instead of germanium. One possibility is to obtain a large quantity of PNP and NPN germanium transistors from an Internet auction site and try to adapt the circuits to the transistors you have purchased. This can be a very challenging exercise.

[1] J. Hallas, W1ZR, "Getting on the Air — Your Second HF Antenna," *QST*, Jul 2008, pp 69-70.

Many of those early transistors weren't very good and putting in modern "equivalents" can result in unexpected problems such as oscillations. Old germanium transistors tend to change with age, so while you sometimes can find the originals, they may not perform quite like they did 40 years ago.

Q Bill, AB2EM, asks: I'm a bit concerned with poor band conditions. Is it just me or is it a general concern at ARRL? Any insights? I see very little in *QST* about chronically poor propagation.

A In one sense, propagation is a bit like the weather or the federal deficit — everybody talks about it, but nobody does much! We did have a recent article on the topic, but perhaps it's time to discuss some positive steps — at least for propagation — I'm not running for office this year![2] Thanks to Senior Lab Engineer Zack Lau, W1VT, we actually have some things you can do:

- You can move to Hawaii. Transequatorial skip to Australia on 10 and 15 meters occurs even during the sunspot minima.
- You could move closer to the equator, perhaps to Florida. Then learn to speak languages commonly spoken in Central and South America, the areas where your transequatorial signal ends up. A common problem is that you might have propagation, but then run into a language barrier.
- The problem is really one of scale. At the top of the sunspot cycle 10 meters is the hot band; at the bottom, 20 meters takes its place. If you scale up a 10 meter beam to 20 meters and double the height from 35 to 70 feet, you have a pretty good setup for DXing at the bottom of the cycle.

Or you can wait it out and hope that the sunspot count will start coming up soon. Just like the stock market and gas prices — things just have to get better someday — don't they?

Q Peter, MWØZZD, asks: My antenna is a doublet with 102 foot flat top about 25 feet above ground. I am using 450 Ω window line running along the ground. Although I do not get bad reports I wonder if I ought to raise the line above ground?

A Unlike coax cable, in which the fields (if properly terminated and decoupled) are entirely within the coax, the fields between balanced open wire or window line conductors extend beyond the space between them. Most of the fields are considered to be within a few times the wire spacing distance around the line.

Thus, minimum losses and interaction occurs if the transmission line is kept a distance greater than a few times the line spacing from lossy materials, or conductors that may couple to the fields removing energy or changing the line characteristic impedance.

I would position the wire so that it is 4 or more inches off the ground, since I suspect the earth will be quite lossy. Use caution to make sure that the cable is not where someone or some lawn mower will trip over it.

I have a very similar antenna system and bring my feed line to the house above personal contact height and hold it away from the structure using TV type screw in standoff insulators designed for 300 Ω TV twin lead. In this country they are available from electronics retailers, even though twin lead is hardly ever encountered anymore.

Q Tomm, W2BFE, asks: I have a commercial multiband vertical designed for 80 meters and up fed with 100 feet of 52 Ω coax. It works fine on its designed bands, but I would like to try 160 meters. What would happen if I used my wide range antenna tuner to load it at 100 W on 160 meters?

A I modeled your antenna as a half size center loaded 80 meter vertical with three elevated radials, which is probably as good as it would get. On 160 meters, the base impedance would be around 7.6 $-j1138$ Ω, an SWR of about 716:1 at 50 Ω. You didn't say what kind of coax you had. Table 1 shows what happens with 100 feet of some common 50 Ω types.

So if the tuner can match it, and you drive 100 W into it, you'll get between about ½ to 2 W to the antenna. It might get you a few contacts, but will not meet most folks' expectations.

Table 1
Results of Feeding Mismatched Vertical with Different Cable Types

Cable Type	*Loss (dB)*	*SWR Seen at Tuner*
RG-58	24.3	14.5
RG-8X	20.7	27.3
RG-213	20.7	27.3
LMR500	16.7	67.1

If you switch in a matching network, even just a series loading coil, at the base of the antenna, it should work much better. The drive impedance with a coil at the base would be about 10 Ω at resonance, and the resulting 5:1 SWR at the antenna should reduce the cable loss to 1 dB, even with lossy coax. The tuner should have no trouble tuning it, either.

Q Stan, KE5AWP, says he's new to HF and asks which HF bands he will find most useful so that he can set up the appropriate antennas to operate on them.

A Stan, one of the most interesting facets of Amateur Radio, at least to me, is that we have so many choices of bands to explore and they all are different depending on time of day, season and number of sunspots. Right now we continue to sit near the bottom of the sunspot cycle, but expect that sunspot activity will be going up soon and continue the general upward trend for at least five years. Higher sunspots will tend to increase the *maximum usable frequency* making the bands above 20 meters much more useful in the future. My personal characterizations of the bands are as follows:

80/75, 60 and 40 meters. These bands work well during periods of low sunspot activity, especially at night. They will work over moderate distances in the daytime, but at night can frequently support worldwide communication. You can count on these bands for many contacts around the country at night with modest antennas. International shortwave broadcasters use much of the 40 meter phone band in many parts of the world and the long distance propagation of those signals may limit usefulness on phone, but CW and digital modes work well. Unfortunately, many stations are not equipped with antennas that do very well for long distance work on these bands, especially on 80/75.

17, 20 and 30 meters. These bands are king right now. 20 meters is open to somewhere in the world most days, sometimes into the early evening. The 30 meter band is often open as well, and is increasingly popular with CW and RTTY operators. It is also often popular with DXpeditions, but voice isn't permitted. 17 meters is open at times with strong signals to moderate distances, and will act more like 20 meters, but with generally stronger signals, as the MUF increases.

10, 12 and 15 meters. These are the bands to watch as sunspots improve. Even now there are times, especially on 10 meters, during which sporadic medium range (1000 miles or so) skip via the lower E layer of the ionosphere is supported. Such openings often occur in mid to late afternoon and may last an hour or so. Once the sunspots are in full bloom, these bands will work very well with low attenuation to destinations around the world, usually via paths in common sunlight.

So for right now, I'd work hardest on antennas for 80 through 20 meters, but have something available for the higher bands so you don't miss out. In another year or two, I might refocus my efforts toward the higher bands.

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

[2] S. Ford, WB8IMY, "Waiting for the Sun," *QST*, Oct 2007, pp 47-49.

Antennas.us 70-cm Satellite Antenna

I once dreamed that I owned a pair of solid-gold Yagi antennas, one for 2 meters and another for 70 cm. They were both bolted to a single horizontal boom and the boom was secured to a massive azimuth/elevation rotator. With such an array at my fingertips, I held a place of honor among the amateur satellite elite. They marveled as my golden antennas tracked each spacecraft with deadly aim. My signals were solid and powerful right down to the horizon, as consistent as the sunrise. The elite operators gazed upon my station and despaired!

And then I woke up. Time for a reality check.

If my wife has anything to say about it, and she most definitely *does*, my prospects for someday planting a set of satellite Yagis and an az/el rotator on the rooftop are dim to say the least. Like many satellite-active hams, I often use omnidirectional antennas instead. They are small, stealthy and easy to install; no rotators required.

The problem with omni antennas, however, is that they lack gain in any particular direction. They can't focus your signal energy (transmitting or receiving) like a directional "beam" antenna can. The best an omnidirectional satellite antenna can do is provide a smooth, consistent pattern in all directions. This isn't as simple as it seems. In fact, some omnidirectional antennas have sharp dips or "nulls" in their signal patterns. Take the classic ground plane antenna as an example. It has a sharp null directly overhead. This translates into a major loss of signal when a satellite is high in the sky.

Engineers have devised a number of omnidirectional antennas for satellite operating, but the *quadrifilar helix* ranks among the best. It is comprised of four equal-length filament conductors (*filars*) wound in the form of a corkscrew and fed in quadrature. The result is a nearly perfect circularly polarized pattern.

Quadrifilar antennas can be challenging to build. Alternatively, you can purchase them off the shelf from marine electronics suppliers, but the cost will probably have you reaching for the smelling salts.

Fortunately, an affordable quadrifilar antenna designed for ham applications has entered the market: the Antennas.us model UC-4364-328.

Compact and Mysterious

The Antennas.us quadrifilar is designed for operation on 70 cm. That's a popular band for downlinks from several ham satellites such as OSCAR 51. It is also an uplink band for satellites such as OSCAR 52. For this review, we purchased the "transmit" model (rated at 50 W continuous). There is also a receive-only model.

The antenna arrives in the form of an

inscrutable black cylinder, 6 inches tall and a bit over 3 inches in diameter at the base. The antenna is permanently sealed within the plastic weatherproof cylinder and completely hidden from view. Unless you take a chain saw to the cylinder in a fit of mindless curiosity, you'll never see the helix. We opted to keep ours intact.

The cylinder base includes a flange with four 10-32 mounting holes. A 10-foot length of RG-58 coax snakes away from the base and terminates in the plug of your choice.

According to the data sheet that accompanied the antenna, it sports an SWR bandwidth that never rises above 1.5:1 from 436 to 438 MHz. I swept the antenna with an analyzer and was able to confirm the spec.

So How Does it Play?

We lack an antenna test range at ARRL HQ, so the best I could do was compare the UC-4364-328 against other omnidirectional antennas using similar satellite passes (same azimuths and elevations) and similar satellites.

The first test involved eavesdropping on the 70-cm downlink from OSCAR 51. The Antennas.us quadrifilar easily outperformed an ordinary ground plane antenna. No surprise there, but it also proved superior to my "eggbeater" satellite antenna. Where my eggbeater suffered a few dropouts, the Antenna.us quadrifilar delivered remarkably stable signals. Signal levels did fluctuate with the quadrifilar, but not nearly to the degree measured with the eggbeater.

During the second phase of my tests, I used the quadrifilar antenna to uplink to OSCAR 52, making several SSB contacts with 50 W output. Once again, stations reported stable signals most of the time. The eggbeater performed similarly, but the ground plane was downright awful in comparison.

Not a Panacea

A quadrifilar satellite antenna will almost always come up short compared to even a modest beam antenna. You just can't beat the advantage of having a focused signal pattern when you're communicating through spacecraft hundreds of miles away. But if your circumstances don't permit "dream beams," you'll want the best omnidirectional antennas you can afford. The UC-4364-328 is definitely in that category. At about $80 for the receive-only model, this quadrifilar is a bargain; at $93 for the transmit model, it's still a bargain. The antenna seems well engineered, is extremely durable and blends well into any visual setting.

If you decide to purchase the UC-4364-328, I'd recommend the use of a low-noise 70-cm receive preamplifier. I'd make the same recommendation for any omnidirectional satellite antenna. Omni antennas need all the help they can get.

Also, you'll lose less than 1 dB in the UC-4364-328's short length of RG-58 coax, but you should definitely use a good low-loss cable the rest of the way back to your radio. Every bit of RF is precious!

Manufacturer: Antennas.us, 5425 NW 24th St, Units 201-203, Margate, FL 33063; tel 877-826-8366; **www.antennas.us/**. *Transmit version: $92.74; receive-only: $79.95.*

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

A Wireless PTT Switch for Mobile Operations

Keep your hands on the wheel while talking from your car.

Geoff Haines, N1GY

In recent years the virtues of *hands free* operation of cell phones and other devices have been debated at length. Several states have enacted laws requiring hands-free operation. Unfortunately, although many of these laws specifically exempt Amateur Radio, the holding of a standard hand microphone while driving may result in a discussion of the law with a local or state law enforcement officer who may not understand the fine points of the different services.

Keep Those Hands on the Wheel

As I was developing an adapter to permit the use of universal type cell phone headsets (or ear sets, if you like), I saw an opportunity to adapt this idea to my mobile setup. I wanted to have both the hand mic and the ear set available for use, so a mic switcher was the core of the project. In order to provide a PTT for the ear set, some way would have to be found to place the PTT switch on the steering wheel. Anywhere else and the concept of using an ear set doesn't result in hands-free operation.

The usual way to accomplish this is to place a wired PTT switch on a spoke of the steering wheel with a coil cord, not unlike a telephone handset cord, running around and down the steering column where it connects to the radio. Aircraft, motorcycles and racing cars have used this technique for years.

The biggest problem with this for street driven cars is very basic. Aircraft, motorcycles and racecars have a very limited range of motion of the steering mechanism. Usually they move no more than 180° lock to lock. That is from full left to full right turns of the steering wheel or handlebars or yoke, in the case of aircraft. With just a half turn, a coiled cord from the PTT switch has little opportunity to get fouled in the steering gear. The average street driven vehicle, on the other hand, has as much as 3 to 3½ turns lock to lock. It also has turn signal and shift levers, cruise controls and air bags along with the steering function. These all create hazards for the PTT cord and thus for the driver.

There's a Better Way

I wanted to devise a better way to operate the PTT circuit of the radio, one that would not involve wires at all. A number of circuits and devices were considered, all seemingly expensive or unreliable. I happened to be discussing the problem with a fellow amateur one day and he suggested a simple solution — a garage door remote control transmitter and receiver.

The Wireless Solution

Bob, KI4HXT, told me that he worked in that field and that a single channel transmitter and receiver could be had for the asking. No better offer than that, for sure. We got together and Bob showed me how they worked. A relay on the receiver board will stay closed as long as the push button on the remote is pushed. The relay releases as soon as the remote's button is released. Sure sounds like a PTT switch to me. If the antenna is removed from the receiver, the range of the remote is decreased to about 5 to 10 feet. Encoding of the transmitter signal and the receiver decoder keeps everyone else's garage door remote from keying my radio.

Bob explained that some models of receiver run on 24 V while others run on 12 V dc and some can do both. The remote transmitters are usually powered by a small 12 V battery about half the size of a AAA cell or a 9 V battery just like the one in many small consumer grade AM/FM receivers. Some of the 9 V units may operate on the 12 V cell but this would require a different battery holder. This could be done, however, to repackage the transmitter into a better size and/or shape for mounting on the steering wheel until you find a key ring type.

As long as the remote and the receiver are compatible, meaning the receiver can read the remote's coded transmission, all will be well. These devices operate at around 300 MHz and operate under Part 15 of the FCC rules. The encoding and decoding of the signal from the remote to the receiver is set by the manual adjustment of a 10 position DIP switch in each unit to the same code. Other more expensive units use different coding methods. The DIP switch coding should be just fine for this application.

The units I used for this project are made by Linear Corporation under the trade name Multicode. They are a single channel remote and receiver system. The specific models are Multicode 3070 for the transmitter remote and GRD 1-channel Delta-3 for the receiver. Many, many thanks to Bob, KI4HXT, for all his help and advice with this project.

Figure 1 — Key ring size remote transmitter Velcro attached to the steering wheel.

Making it Play

I took home the used units Bob donated to the cause and wired the receiver up for my project. There are four wires exiting from the receiver case that is about 6 × 4 × 1½ inches. Two grey wires are the leads from the relay. A ⅛ inch mono plug was wired to these to fit the PTT jack on my mic controller/selector. Closing the relay closes the PTT circuit for the transceiver in my SUV. The other pair of wires are our old buddies red and black and they get wired to a source of 13.8 V dc.

My ICOM IC-706MkIIG has a master ON OFF switch in the power line from the battery of the car. Feeding the PTT receiver from that same source means that when the radio is turned off, so is the PTT receiver. Thus, there is no current drain while the vehicle is parked and unattended. The battery for the remote transmitter only provides current while the button is pushed. Batteries are readily available at most battery stores.

The remotes come in several sizes. Some are meant to be mounted on the visor of the car; others are designed to hang on a key ring. This latter type, the Multicode 3070, is the best for steering wheel mounting as it is only about 2 × 1½ × ⅝ inches thick. It even comes with a Velcro mounting system ready to strap it to a spoke of the steering wheel with hook and loop ribbon as shown in Figure 1 along with the ear set. Most of these remotes cost around $25, although I have seen them offered online for as little as $14. The matching receivers usually cost around $35 to $40 and again online prices will vary widely.

On the Road Again

Okay, so just what have we accomplished with our little gadget. Well, first we have a reliable way to control the PTT of the radio without taking our hands off the wheel. We also do not have a coiled cord wrapped around the steering column, sometimes getting caught on the turn signal lever or the ignition keys. We can operate safely and still have the normal finger or thumb operated push to talk type operation. No VOX going wild every time a truck drives by or when your window is open and the wind noise

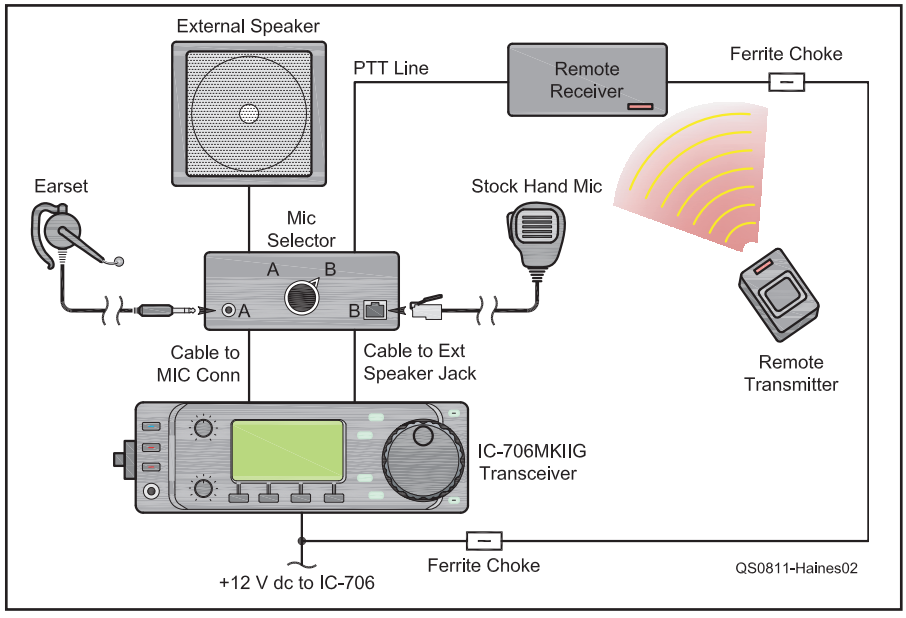


Figure 2 — Block diagram of the mic and control configuration.

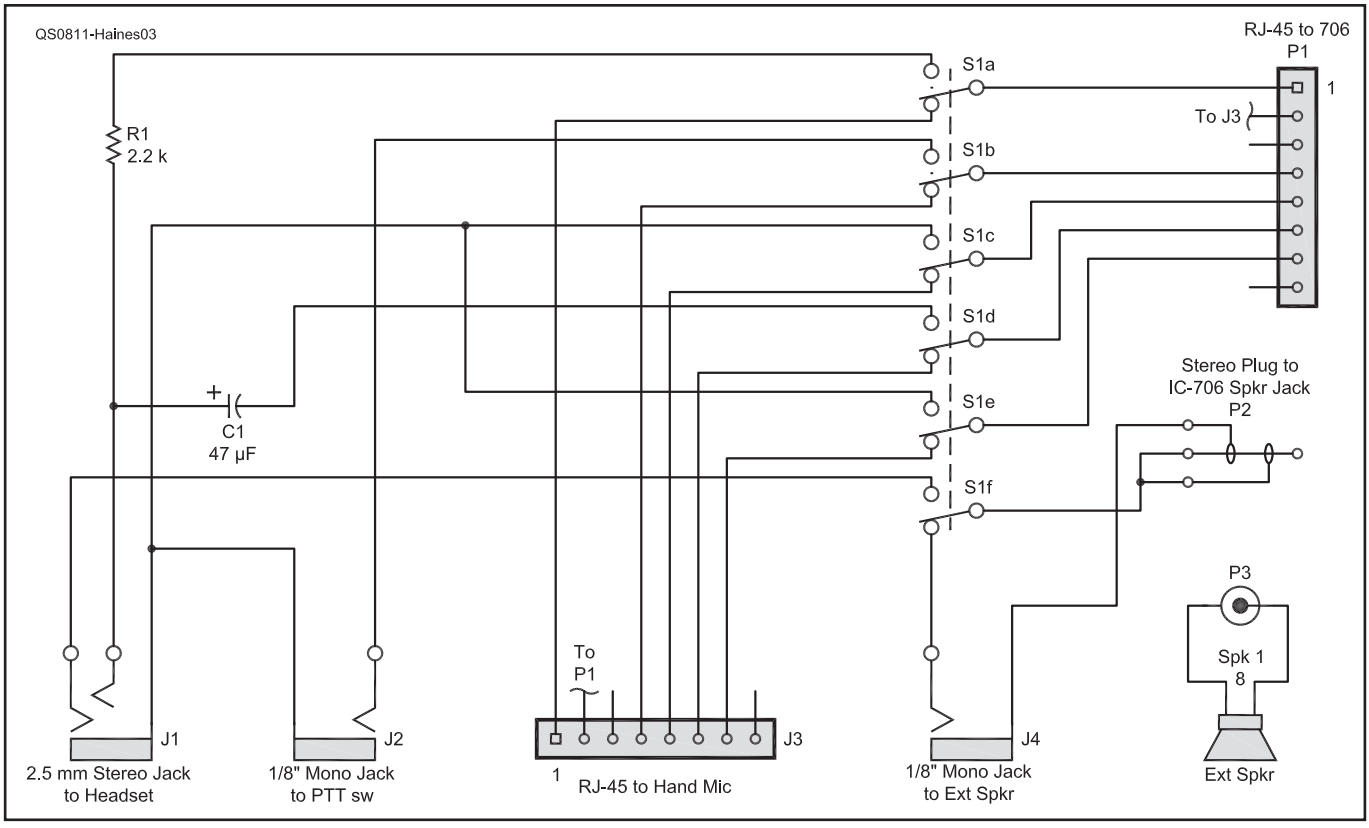


Figure 3 — Schematic of switch box used to select regular mic and speaker or ear set.

Figure 4 — Complete mobile station, ready to go.

picks up. Combined with a cell phone type ear set the appearance is of a driver following the hands-free principle.

But Wait, There's More!

Now, how do we connect this to the amateur transceiver? As I mentioned before, I wanted to have the option of using the regular hand mic or the cell phone ear set. To do this I needed a switching mechanism. As has been written about by others in the pages of *QST*, I chose to use an old A-B data switch from the days before computers had USB hubs. These are available at computer shows and hamfests for mere fractions of what they cost new and alternatively are still produced by some aftermarket computer gear manufacturers at low cost. The complete system is shown in block diagram form in Figure 2.

As long as the selected switch has enough pathways to satisfy the needs of your radio to mic connection and for switching the receive audio from the external speaker to the ear set, you are all set. Then it becomes a matter of substituting microphone connectors for the original DB-15 or DB-25 computer connections. Figure 3 is a circuit diagram that I use for this type of device. These switches work very well. I have installed similar mic switchers on five of my radios from Alinco DR-150s to ICOM IC-706s and a Yaesu FT-7800.

Making it Play

The circuitry to adapt the cell phone ear set to the transceiver is very simple. Usually just one resistor, the value of which matches the impedance of the stock microphone, and a polarized capacitor to keep the dc off the mic line to the radio. Some of the Yaesu rigs such as the FT-7800 and '8800 need a second resistor in the PTT line. Normally something around 27 kΩ works well. The '706 and the DR-150 just ground the PTT line for transmit. Some Yaesu rigs of late want to see that resistance instead of just ground.

These few components can be installed inside the mic selector switch box at the 2.5 mm stereo jack for the cellular ear set. The PTT line for the ear set is run to a ⅛ inch mono jack where the relay of the PTT receiver plugs in. Remember to connect an external speaker to the selector as well; otherwise your radio will be very quiet when using the standard hand mic. The mic selector circuit diagram, Figure 3, shows how the receive audio is sent to either the external speaker or the phone of the ear set.

I repackaged my selector into a RadioShack enclosure since the original enclosure was too big for the available space in my installation. If you have more space you may be able to use the box that the switch comes in.

Speaking of RadioShack, I should mention that I purchased the ear set that I use in the car from them. List price was less than $7 and it has adjustable volume for the earpiece as well as adjustable sensitivity for the mic side of the device. Using it with my IC-706MkIIG, I had to turn the mic sensitivity down to minimum to keep it from overdriving the radio. Nice little gadget that.

I am very happy with the results of this project. I have the choice of the stock hand mic or the cellular ear set with the PTT for the ear set right on the steering wheel. I do not have to take my hand off the steering wheel to answer another ham on the frequency and there are no wires to get tangled up on the column. The only major problem I encountered was some interference when the radio was set to any frequency from 147 MHz to 148 MHz. This was cured by putting two inexpensive ferrite chokes on the power wires to the remote PTT receiver. Apparently the feeding of power to both the IC-706 and the remote receiver caused interference to the remote receiver. With the chokes in place at both ends of the power lines to it, the interference disappeared completely. All of the other frequencies and bands appear to have no problem.

Photos by the author.

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He is the President of the Manatee Amateur Radio Club, a member of the ARRL, the Manatee ARES group, the Bradenton Amateur Radio Club, the Yale University Amateur Radio Club and the Meriden CT Amateur Radio Club. He is also Assistant Section Manager. In his spare time, he enjoys homebrewing antennas and accessories for his Amateur Radio operations. Geoff can be reached at 708 52nd Av Ln W, Bradenton, FL 34207; **n1gy@arrl.net**.

W1ZR

GETTING ON THE AIR

Making that DC Distribution System Uninterruptible

Expand your dc distribution system to keep your station going in emergencies.

In September 2008 *QST*, we described the advantages of a 13.8 V dc power distribution system to run all the solid state nominal "12 V" equipment in the modern station.[1] We mentioned that once that system was in place, it was relatively easy to upgrade to a system that will operate even when the household ac supply fails. Note that I said "when," not "if"! This provides a real plus for anyone involved in emergency communication. While on-scene communications support is often the EmComm focus, there is also a need in most organizations for survivable base stations with long-haul capability to get traffic out of the region, for example.

So What's the Plan

The energy for survivability is provided by one or more rechargeable storage batteries. The idea is that while the ac mains are up and running, the battery system is being maintained at full charge. If ac power drops, the storage battery provides power until mains power returns. What makes it uninterruptible is that with either configuration discussed below, no action needs to be taken in order to make the transition; like the battery bunny on TV, the station just keeps on running.

Option 1 — A Battery Charger in Line

Figure 1 shows the configuration of a battery charger charging a storage battery that together provide power during ac powered operation. This is similar to a mobile installation in which the car's alternator keeps the battery charged as the battery powers the loads.

A nice feature of this system is that the charger just needs to provide for the average current demand, while the battery provides for the peaks. In the typical 100 W HF station, the maximum load during key down or voice peaks is in the neighborhood of 20 A plus any other powered up equipment. The average will be much less, but dependent on modes used, with RTTY or FM maintaining the peak during a whole transmission. In my station, a 5 A charger has never had to work very hard. I described this configuration in some detail in an earlier article.[2,3]

If you buy a storage battery and 5 A charger, you will likely not spend much more than you would for a power supply that will provide 20 to 25 A and that won't work during a power failure.

One note of caution regarding chargers. As described in Note 3, the original marine charger, and all other marine chargers I tested, put out lots of RF noise as well as dc. I found a suitable candidate that produces virtually no hash from A-A Engineering.[4]

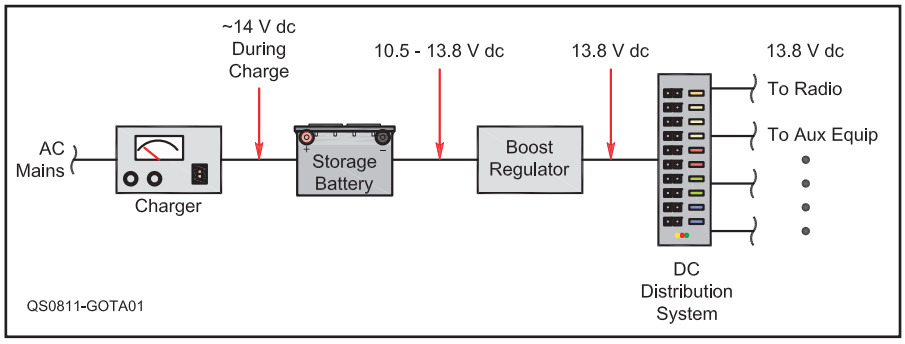

Figure 1 — Charger based uninterruptible power system (UPS) block diagram.

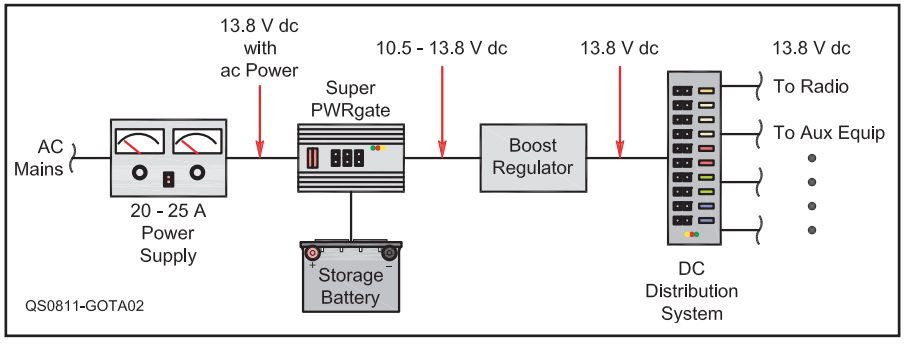

Figure 2 — UPS system using existing transceiver power supply and PWRgate device.

Table 1

Loss of Connecting Wire Under Different Conditions (20 A Load)

Wire Size (AWG)	*Resistance (Ω/1000')*	*Loss for 10' (20' wire) V*	*Load Voltage at 13.8 V*	*Load Voltage at 12 V*
10	*1.018*	0.41	13.39	11.59
12	1.619	0.65	13.15	11.35
14	2.575	1.03	12.77	10.97
16	4.094	1.64	12.16	10.36

[1]J. Hallas, W1ZR, "Power to the People With a DC Power Distribution System," *QST*, Sep 2008, p 67.

[2]J. Hallas, W1ZR, "Emergency Power at W1ZR," *QST*, Dec 2003, pp 41-44.

[3]J. Hallas, W1ZR, "Technical Correspondence," *QST*, Feb 2004, pp 82-83.

[4]J. Hallas, W1ZR, "Short Takes — The A&A Engineering 5 A Smart Battery Charger," *QST*, Mar 2004, p 58.

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Option 2 — Power Supply with Electronic Switching

If you already have a power supply providing full power to your radio and dc distribution system, there is a slightly different approach you may want to consider. West Mountain Radio offers the Super PWRgate.[5] This is a compact device that fits between your existing power supply and your dc distribution system. If power is available from the power supply, it is routed directly to your equipment, with some tapped off to maintain the charge of a storage battery connected to dedicated battery terminals. In the event of loss of power from the dc supply for any reason, the PWRgate instantly switches the equipment to battery power until the supply is back in operation. This configuration is shown in Figure 2.

Too Good to be True?

These seem like very simple arrangements that can provide significant benefits. As usual, there are a couple of possible pitfalls to avoid. First, see the sidebar on battery choice and battery safety. The next potential pitfall has to do with the voltage at which your equipment will no longer operate.

How Low Can You Go?

While you might think your "nominal 12 V dc" equipment and "nominal 12 V dc" storage battery would make a match made in heaven, as usual the devil is in the details:

- Check your radio specifications carefully. You will likely find that your transceiver is actually specified to operate at a nominal 13.8 V dc. If you are lucky, the manufacturer will provide a tolerance range, perhaps ±15% (11.7 to 15.9 V), or they will leave you to guess. Some will not work below 12 V. The Elecraft K3 may be the most resilient in this regard, specified to operate down to 11 V. Note that the level at which they still receive is likely to be lower than that at which they will transmit, due to wire loss — see below.

Note also that there's working and there's working. I was testing operation with my first UPS system and happily working someone on 20 meters at 11 V when someone broke in to say I was leaving key clicks all across the band. That isn't what I call *working*.

- While fully charged, and especially while still on the charger, your battery will be sitting at 13.8 V. After you lose charging power and start operating, the battery terminal voltage rapidly drops to 12.5 V and down to 12 V after a few hours. Depending on your radio specs, you may not get much operating time even if the radio is right at the battery.
- Unfortunately, your radio is often some distance from your battery — connected by wire with resistance. Table 1 gives some examples of the effect of wire loss for typical wire sizes.

Since the battery can provide useful output down to 10.5 V, it is clear that the full capacity of the system is diminished by the clashing of these three factors. Fortunately there is an easy solution.

[5]**www.westmountainradio.com**

Storage Battery 101

Switch to Safety

A typical lead-acid battery, the only reasonable approach for this kind of service with an extended outage, has a number of associated safety issues that must be considered by any responsible amateur. They are all easily taken into account, but must be explicitly addressed.

A charged storage battery contains a considerable amount of energy that it is designed to deliver in a controlled manner over a reasonable time. If anything metal gets across its terminals, a dropped tool or shorted connector, for example, the energy will attempt to leave the battery very quickly. This can result in considerable heat, perhaps vaporizing the object (I had my wedding ring melted while on my finger once, for example — not recommended), or worse causing the battery to explode spewing acid all over. The solution is fairly simple — put a fuse immediately at the battery terminal and put the battery in a covered plastic battery box, available at marine supply stores.

The other primary safety issue results from the fact that during charge, a standard battery emits hydrogen gas. This is quite explosive and needs to be vented. This says to me that conventional batteries must be positively vented or located outside. Fortunately, new battery technology is available that doesn't have this problem and is highly recommended.

There are now a few technologies that provide for "recombinant" operation. In a recombinant battery, most of the hydrogen isn't released, but recombines with oxygen within the battery to form water. Thus, you not only avoid the threat of explosion, but you never need to add water!

The recombinant technologies are found in batteries labeled AGM (Absorbative Glass Mat), VRLA (valve-regulated lead-acid), or Gel Cell. These batteries hold the electrolyte against the plates in a way that avoids (but doesn't quite eliminate) the release of hydrogen during the charging cycle. A small amount of gas is released still, but it is considered sufficiently small that these batteries can be used with normal household ventilation.

When selecting a battery, watch the description carefully. Not all "sealed" or "no maintenance" batteries are recombinant! Some just have no ports for water addition and provide a bit more water to start with, but emit all the hydrogen of an open top battery. When the water level finally falls below the top of the plates, they start to fail — not good for deep cycle use, or for avoiding explosion! Look for *AGM, VRLA* or *gel cell* if you want to minimize hydrogen emission.

Starting versus Deep Cycle Batteries

While the usual automobile battery looks like an attractive candidate for this service, unfortunately it isn't. An auto *starting* battery is designed to deliver a burst of high current for a short duration and then get recharged. In our application, a battery will typically get discharged all the way down to the level at which it can no longer sustain the equipment before it is recharged. A starting battery will do this only a few times before it fails to hold a charge.

A *deep cycle* battery is designed to do exactly what we want. These are intended for back up power and lighting applications as well as fishing boat trolling motors and other electric vehicles, such as motorized wheelchairs. These are generally available from marine dealers as well as full line battery dealers. A deep cycle battery, unlike the usual auto or marine starting battery, is designed so that it can be 75% discharged hundreds of times, rather than just a few times, and still be recharged to provide full capacity.* Fortunately, all the recombinant type of batteries are inherently deep cycle.

*For representative AGM battery specifications, life and discharge characteristics, see **www.douglasbattery.com/gproducts/pdf/dg12-80.pdf**.

Keep that Voltage Up in a Down Market

For about the price of an additional battery, a device can be obtained that will boost the voltage from the battery from near the bottom of its usefulness to 13.8 V. These are sold under a number of trade names by different manufacturers and nicely sidestep this issue. The battery boost device is a small switching power supply that puts out a steady 13.8 V dc with an input as low as you would want the battery to discharge to. We have reviewed one previously and have two others under review in this issue.[6,7]

This device goes in the line between the battery and the power distribution system. Note that it won't make the battery last longer. In fact, since it is not quite 100% efficient it actually reduces the total energy available from the system. What it does do is provide a longer operating time for your equipment.

[6]J. Hallas, W1ZR, "Product Review — The W4RRY Battery Booster," *QST*, Oct 2005, pp 71-72.

[7]P. Salas, AD5X, "Product Review — Two Battery Booster Supplies," *QST*, this issue, pp 46-51.

Some Thoughts on Solar Trackers

How to tell where and when to point that solar array for optimum performance.

Carl Olberg, AD7LA; Terry Ryan, KE7GRV, and Fred Zimmermann, N7PJN

When the subject of *solar* comes up, many amateurs think of photovoltaic (PV) panels and how nice they are for helping with the energy required to keep a station's batteries charged. This is especially true while in the field. We use them regularly and are very pleased with them.

Not Always as Simple as it Seems

If the PV panel is to capture the maximum amount of the available energy from the Sun, then it must be pointed directly at the Sun. Everyone knows that! If you observe PV panels in use, from time to time you will likely see the operator adjust the position of the panels so that they are pointed toward the Sun. Most of the time this aiming is approximate. Even if it were accomplished with great precision, the panel would not remain aimed for a very long time, since the Sun is a moving target.

How do we know when the panel is pointed directly at the Sun? The simplest aiming device is a short length of rod or dowel fixed perpendicular (normal) to the surface of the PV panel, or to some parallel surface. If the vertical rod casts no shadow on the surrounding surface, then there are two possible explanations:

- The surface is completely perpendicular to the inbound radiation, and maximum energy is presented to the PV panel.
- A cloud is obscuring the direct sunlight and there are no shadows, period. This is a two-axis solution.

If there is a shadow, how does the effective area of the PV panel vary with the length of the shadow? Let us assume that the North-South axis is aligned and we are dealing with alignment errors in the East-West direction, a one-axis problem. The effective width of the panel is a function of the cosine of the angle of misalignment. If the panel is in alignment, the angle is 0° and the cosine is 1.0 — the panel receives the full effect of the sunlight.

If the panel is on edge to the Sun the angle of misalignment is 90°, the value of the cosine is 0.0 and the panel receives no sunlight. One interesting thing about the cosine function is that it decreases very little for small angles. Small aiming errors will thus not affect the amount of energy received by very much.

AD7LA

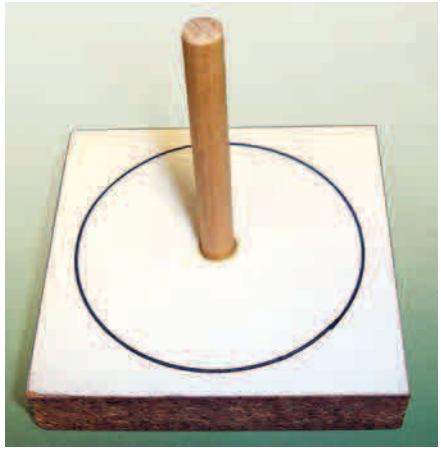

Figure 1 — Homebrew solar panel aiming device.

The cosine of 25° is 0.906, or we can say a misalignment of 25° results in the panel being approximately 90% effective. If we are positioned at an error of 10°, then the effective area is at a value of 98.5%.

Staying the Course

One way to achieve efficiencies above a specified level is to assign a junior member of the party to be the *aimer*. The aimer's job is to monitor the length of the shadow, and to keep repositioning the panel so that the length of the shadow does not grow beyond a specified length. The specified shadow length for 90% efficiency would be the tangent of 25° times the rod length. A circle of this radius drawn around the base of the rod will provide an easy to read limit. If the aimer accomplishes this task for very long, he will soon realize that the Sun is traveling across the sky at a fixed rate, and that if he knew that rate, the aimer could determine at what interval he would need to revisit the panel for updating its aim.

The Sun travels around the Earth (apologies to Copernicus) at the rate of 4 minutes per degree.[1] If 25° (90%) is the target limit, then with the panel perfectly aimed, it will require re-aiming in 100 minutes. After doing that a number of times, the aimer would realize that if the panel is set up with a shadow pointing West of 25°, instead of accurately aiming the panel, he can achieve the required 90% (or better) for twice as long or 3 hours and 20 minutes per setting, at which time the shadow will be pointing East.

Making Your Tracking Instrument

We made the aiming device shown in Figure 1 using a small diameter wooden dowel for the shadow casting element. The wooden dowel should be less hazardous than alternatives such as a nail or metal rod. For those of you who do not care for trigonometry or for trackers but just want to have a "calibrated" aiming device, you might do the following:

Select a flat piece of wood or similar material about ½ to ¾ inch thick, about 2½ inches square.

Locate the center of the base and using a compass draw a 1$\frac{1}{16}$ inch radius circle around the center. Using a drill press, drill a hole to fit the actual diameter of a ¼ inch dowel, all the way through.

Cut a piece of ¼ inch diameter dowel, 2.0 inches plus the thickness of base long. Using a file or fine sandpaper put a *small* chamfer on each end of the dowel. Glue the dowel into the hole in the base making certain that 2.0 inches of its length extends out of the base.

You now have an aiming device calibrated to 25° when the tip of the shadow touches the circle. Keep the shadow inside the circle to meet your target efficiency.

But Wait, There's More!

If daylight lasts for 12 hours, then the aimer must visit the panel only four times per day. It is important to understand that by accepting this 25° aiming error, we are not limiting the overall performance of the panel to 90%; we are setting the boundary of acceptable aiming error. The panel will always be producing at or better than that limit. In fact the average effectiveness from –25° to +25° is almost 97%.

Principal author Carl Olberg, AD7LA, is an ARRL member and can be reached at 8655 East via del Palacio, Scottsdale, AZ 85258 or at **cdolberg@aol.com**.

[1]The Earth turns 360° each day. With 24 hours per day times 60 minutes per hour, we have a total of 1440 minutes per day or 4 minutes per degree.

TransWorld Adventurer Antenna

Joel R. Hallas, W1ZR
QST Technical Editor

The TransWorld Adventurer, formerly sold as the TW2010, is a capacity-hat-and-inductance-loaded vertical dipole for five bands from 20 through 10 meters. What makes the Adventurer stand out is its compact and rapid assembly. With its optional *quadrapod* mounting stand, the antenna can be set up anywhere that has room for its 5 foot long perpendicular legs, although it is recommended that it be 33 feet from trees and large metal objects. The assembled antenna is a bit over 8 feet tall (see Figure 1).

Putting it Together

The Adventurer collapses into three 2.5 foot pieces of black powder-coated aluminum. The top and bottom sections have folding capacity hat elements secured by hand-tightened plastic wing nuts with solid aluminum inserts. The middle section includes the remotely controlled band switching and matching box. The three sections telescope together and are secured by bolts with the same kind of wing nuts. The assembly can be completed without tools in less than two minutes. I was impressed with the solidness of all the materials and the rigidity of the completed assembly widow.

W1NCY

Figure 1 — The author tightens up the last thumb screw of the Adventurer mounted optional quadrapod.

The Adventurer comes equipped with a permanent mounting post intended for mounting in concrete. This post is also usable with U-bolts on a patio rail support. For its more likely use as a travel antenna, consider the *quadrapod* option. It makes deployment literally a snap for any surface that is approximately horizontal.

All the Adventurer components, including the control unit and 65 foot control cable, fit in the carry bag.

Operation

The heart of the Adventurer is in the matching unit located at the center of the midsection. It contains a pair of loading coils for each band as well as a center matching inductor and relays for remote switching. A weatherproof connector for the supplied control cable and an SO-239 coax receptacle complete the package. The unit is specified to cover the entire 17, 15 and 12 meter bands with less than a 1.5:1 SWR. On 20 meters, it will cover a 200 kHz portion and on 10 meters a 1.21 MHz portion with the same SWR. Our review model seemed to be centered in the phone portions of the bands. As described in the manual, you can adjust the SWR bandwidth by slightly squeezing the loading coils, shifting it more toward the CW/data frequencies, if you desire. See Figure 2 for an interior view of the matching unit.

If you have a recent Yaesu or ICOM radio, optional cables are available that will switch bands at the antenna automatically based on radio supplied BAND DATA signals. I didn't have a cable or radio set up to try this feature. If the control box is not connected or powered on, the antenna defaults to 20 meters.

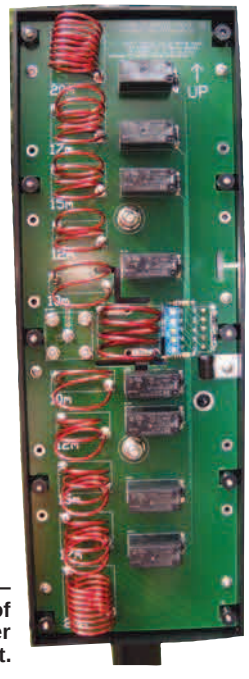

Figure 2 — Interior view of the Adventurer matching unit.

The Adventurer on the Air

In keeping with the spirit of the antenna's application, I brought my Elecraft K3/100 transceiver and a compact power supply to a patio table and put the antenna up in the back yard. I was on the air in minutes and quickly connected with Don, WV4X, in Virginia on 17 meter SSB. He was booming in at 10 to 20 dB over S9, and said I was doing the same his way. On the other hand, he was using a three element Yagi and running high power.

For a more objective performance assessment, I moved the radio back to its usual location and set it up so I could switch between the ground-mounted Adventurer and my other antennas. The one I thought best for a fair comparison was a 20, 15 and 10 meter trap dipole at about 30 feet — about as high as I can usually get a vacation antenna.

EZNEC antenna modeling software predicted that the Adventurer would perform about one S unit below my dipole. This turned out to be true in my on-air testing. Even so, the single S-unit difference was barely noticeable.

In Summary

I found the Adventurer a surprising performer considering its footprint and ease of transport and assembly. In addition to its prime role as a portable antenna, it would be a great candidate as an antenna for stealth operation — it's easy to bring out to use when on the air, especially as the long-anticipated sunspots come back and make the HF bands 20 meters and above even more useful. In addition, it would make a natural antenna for inclusion in an emergency communications go-kit, or for use in ARRL Field Day.Also available is the Backpacker antenna. This is similar to the Adventurerr, but has a manually switched matching and band switching box.

Manufacturer: Trans World Antennas at 756 Mountain Top Ln, Cookeville, TN 38506-6323, **www.transworldantennas.com**, *tel 931-537-2601. Price: Adventurer antenna with controller, permanent mount and control cable, $399.95 plus shipping; quadrapod base $89.95 plus shipping. The Adventurer antenna system package adds the quadrapod and carry bag, $549.95 including shipping in the US; Backpacker system package with same accessories, $399.95.* QST

NØAX

HANDS-ON RADIO

Experiment #70 — Three-Terminal Regulators

Although you may have been expecting an article on construction techniques this month, I'm writing about an application of technology from an earlier column, instead. It's hurricane season as I write (betwixt Gustav and Hanna) and soon to be windstorm season in my home, the Pacific Northwest. This prompted me to review and update my *go-kit* of portable radios, packed in a plastic storage container. As I plugged in multiple wall-wart supplies to charge their batteries, I thought, "There has to be a better way!" And soon, there was.

But first, it was necessary to understand the go-kit's requirements for power. In my collection of portable radios, I have a VX-5 and two VX-1 Yaesu FM handhelds as well as a Bearcat BC246T scanner. I also have a four cell NiMH/NiCad battery charger. The VX-1s and the BC246T each require 6 V dc to charge or operate while the VX-5 and charger need 12 V dc. I want to charge every piece of equipment while it is inside the go-kit from any convenient 12 V dc source, such as a vehicle or power supply. I wanted all non-proprietary power connectors to be Anderson Powerpole type, the ARES® standard.[1] The go-kit should have a single external power connection. Visible indicators should show the status of 12 V and 6 V power. This set of requirements resulted in the system diagram of Figure 1. (Starting with determination of the requirements is crucial to creating a satisfactory design.)

This column describes the 12 V to 6 V converter. I decided to build my own converter, based on a three-terminal voltage regulator of the type you first met in Hands-On Experiment #8 on linear voltage regulators.[2] I chose the LM317T,[3] which is widely available and easy to use. By using a pair of programming resistors, output voltages can be selected from 1.2 V up to about 3 V below the input voltage, which can be as high as 40 V.

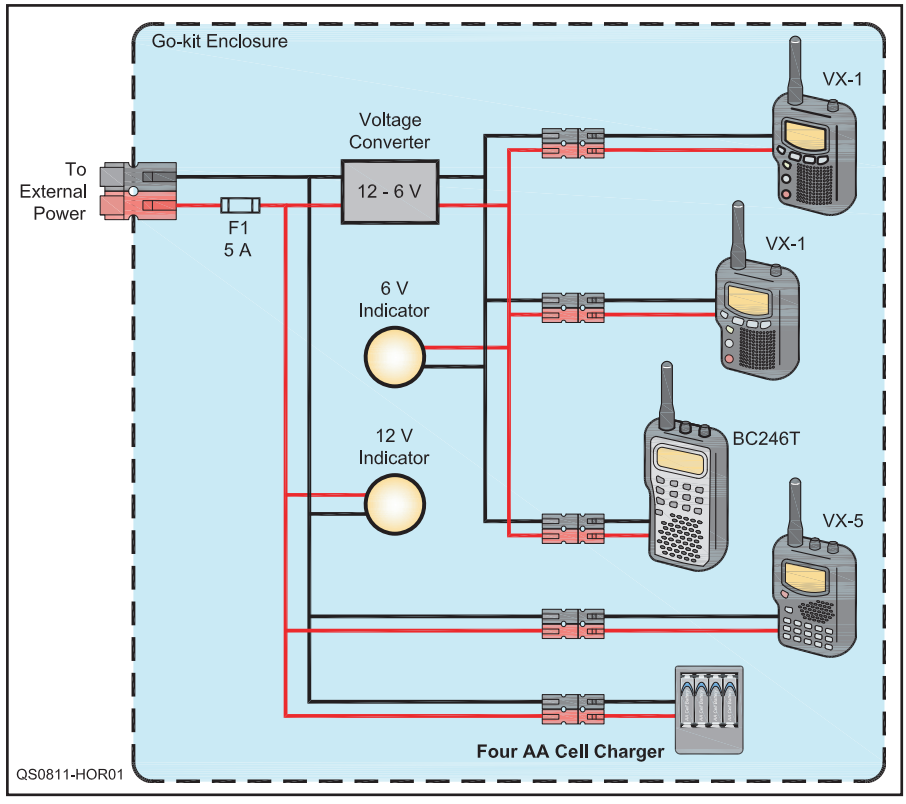

Figure 1 — A 12 V power distribution system for a go-kit. A 6 V regulator provides power for smaller radios. The indicator shows the status of each supply. Powerpole connectors are used throughout.

With an adequate heat sink, the LM317 can supply up to 3.4 A of current.

How the LM317 Works

As described in Experiment #8, a linear voltage regulator is basically a smart resistor, changing its value to maintain a constant voltage at the output, despite changing input voltage and load current. The LM317 attempts to maintain a constant 1.2 V between the ADJUST and OUTPUT pins by supplying more or less current to the load. From the LM317 data sheet, I selected the schematic shown in Figure 2.

R1 and R2 form a voltage divider across the output voltage, V_{OUT}. The voltage at the junction of R1 and R2 (the ADJUST pin) is $V_{ADJ} = V_{OUT} \times R2/(R1+R2)$. The voltage across R1 is then $V_{R1} = V_{OUT} - V_{ADJ} = V_{OUT} \times (1 - R2/(R1+R2))$. If the LM317 maintains $V_{R1} = 1.2$ V, then $V_{OUT} = 1.2 \times (1 + R2/R1)$.

For $V_{OUT} = 6$ V, the ratio R2/R1 must be $(6 / 1.2) - 1 = 4$. Any combination of R2 and R1 can work with the following constraints: R1+R2 should not consume excessive current and R2 has to be small enough that the voltage error from the small current flowing out of the ADJUST pin (up to 100 µA) does not affect V_{OUT} by raising the voltage across R2. (This is described in detail in the Application Hints section of the LM317 data sheet.)

The data sheet recommends a value of 240 Ω for R1, so I picked the more common value of 270 Ω. That choice means $R2 = 270 \times (6 / 1.2 - 1)) = 1080$ Ω, so I chose 1100 Ω. The exact value of V_{OUT} should then be $½ \times (1 + 1100/270) = 6.1$ V, just fine for my purposes. As an exercise, pick some other common output voltage, such as 5 V or 9 V, and do the calculations of R1 and R2 using standard values. See how close you can get to the desired output voltage by altering the resistor values.

[1]Anderson Powerpole connectors (**www.andersonpower.com**) are rapidly being adopted as the standard power connector for ARES® teams.

[2]Hands-On Radio experiments are available online to ARRL members at **www.arrl.org/tis/info/HTML/Hands-On-Radio**. The first 61 experiments are also available as *ARRL's Hands-On Radio Experiments* from the ARRL at **www.arrl.org/shop**, order number 1255.

[3]**www.national.com/pf/LM/LM317.html**.

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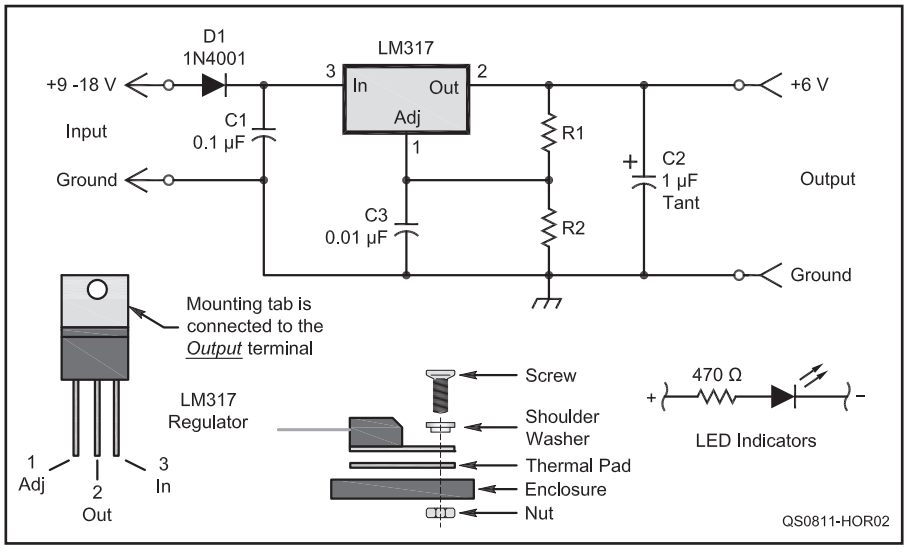


Figure 2 — An LM317T adjustable three-terminal voltage regulator IC is used to convert 12 V input power to a 6 V output. The output voltage of the circuit is set by the ratio of R1 and R2 as explained in the text. Both indicators use standard LEDs such as RadioShack 276-209 (red) and 276-304 (green).

Taking the Heat

The next part of using a three-terminal regulator is determining how much heat it will dissipate and figuring out how to get rid of it. The amount of power a regulator dissipates is calculated in the same way as a resistor — the voltage across the regulator times the current through it ($P = V \times I$). We know the voltage across the regulator; $V_{IN} - V_{OUT} = 13.8 - 6.1 = 7.7$ V. (I used the nominal automotive supply voltage as an input voltage the circuit was likely to encounter during long periods of use.)

What is the current it will have to supply? The highest load current (and the highest power dissipation) occurs when all three radios are charging. From their specifications, the VX-1s draw 150 mA each (max) and the BC246T 500 mA (max) for a total of 800 mA, neglecting the 10 mA or so of current that a visual indicator would draw. (This is unlikely to be sustained, but could last long enough to generate a fair amount of heat, so it is a conservative estimate.)

The heat to be dissipated is then 7.7 V × 0.8 A = 6.2 W, enough that a heat sink will be required. (The process of selecting a heat sink is described in Hands-On Radio Experiment #24 in *QST* for January 2005.) Since the circuit will be installed in the closed up go-kit, I decided to make the heat sink the circuit's enclosure so that the maximum amount of air could circulate around it.

If the LM317 gets too hot, it will enter *thermal shutdown mode*. Internal protective circuitry senses the temperature and cuts output current to reduce the temperature to a safe level. This often leads to the regulator turning current off and on up to several times a second. Because the indicator will dim from the lower average voltage, I'll be alerted to the over-current condition.

Caveats and Considerations

Why not use a fixed-voltage regulator such as the 6 V output 7806? That would certainly work, but it's not as easy to find as the LM317, which is stocked by RadioShack (p/n 276-1778). If you have a supply of LM317s, you can pretty much whip up any regulator you need in short order and the only extra expense is two resistors and a disc capacitor. Be aware that the *pinouts* (the pin by pin connections) are different for the 7800 series and LM317 regulators and that the LM317 mounting tab is *hot* — connected to the output pin.

Three-terminal regulators also require that you pay attention to their *stability* requirements. Almost all of these ICs specify that a bypass capacitor be placed at the INPUT pin of the regulator if the dc source filter capacitors are more than a few inches from the IC. The long leads would enable noise or RF signals at the input to disturb the regulator's operation.

The ADJUST pin is also bypassed to ground to prevent noise signals from affecting the regulator maintaining 1.2 V across R1. Since it's very likely that the go-kit will be used in the presence of RF, a bypass capacitor is cheap insurance against interference to the regulator.

A 1 µF tantalum capacitor is used at the output to prevent the regulator's output from ringing in response to *transient* (short duration) changes in load current. Tantalum capacitors are used because of their excellent performance above 100 kHz, at which point the inductance present in all electrolytic capacitors would affect performance significantly. (See Experiment #63 for a discussion of capacitor types and performance.) If an electrolytic capacitor is used, a value of 25 µF or greater is recommended.

If you read the Application Hints section of the LM317 data sheet, you will also find paragraphs describing how to prevent currents flowing back through the regulator under certain circumstances. I felt these were unlikely to be encountered and so only added reverse-polarity protection diode D1 in the input circuit. This 1N4001 is rated at 1 A, enough for the expected maximum current.

The Finished Product

The enclosure is an electrical wiring junction box with the regulator mounted on it. It's heavy enough to absorb the heat load at full charge and has enough surface area to dump the heat inside the go-kit container. The regulator circuit is built on a piece of PC board scrap "air circuit" style. The junction box is attached to the inside of the container with mounting screws. (Photos of the completed converter are on the Hands-On Radio Web site.)

The indicators are regular LEDs with a series 470 Ω resistor. The 6 V indicator draws (6 – 1.5) / 470 = 10 mA and the 12 V indicator about 22 mA. Both are bright enough to be seen through the plastic wall of the container. You can use incandescent bulbs if you prefer — or none!

Input voltage is supplied through a pair of Powerpole connectors attached to the outside of the go-kit using an aluminum mounting plate. (Power Werx p/n 1462G1 — **www.powerwerx.com**) An in-line, 5 A fuse is included for safety. I couldn't be more pleased with the results — instead of unpacking all of the radios, untangling their charging cords and trying to find outlets for the wall-warts, I now just plug the entire kit into a 12 V power supply or if I'm in the car, to the cigarette lighter. Sweet! I'll bet you have a batch of radios and accessories that could use the same treatment! Now that you know how to design and build your own dc regulators, what's stopping you?

Parts List (regulator only)

- Capacitors — 0.1 µF and 0.01 µF disc ceramic; 1 µF, 16 V tantalum capacitor.
- Fuse — 5 A in-line.
- Integrated circuit — LM317T voltage regulator with thermal pad, shoulder washer, mounting screw, lockwasher and nut.
- Diode — 1N4001 rectifier.
- Resistors 270 Ω and 1100 Ω.
- PC board or perfboard scrap.

Recommended Reading

The NEC application note on using three-terminal regulators (**tinyurl.com/6rmafe**) is full of good information. A presentation on 12 V wiring for radios (**www.arrl.org/FandES/ead/materials/12-VDC-Distribution.ppt**) covers issues associated with power distribution for radios.

Next Month

I promise we'll do the construction techniques experiment mentioned last time! QST

HINTS & KINKS

A 5 MINUTE SURFACE MOUNT DEVICE HOLDER

◊ Recently, I was asked if I could repair a few Motorola Spectra radios. These radios have a known surface mount (SMD) capacitor problem and the most expedient way of repairing them is a wholesale change-out of its electrolytic surface mount capacitors.[1]

Rick Littlefield, K1BQT, published an article on building an aid for installing surface mount components.[2] There were, however, a couple of issues that precluded me from using the tool in the article. First, even though K1BQT's design is elegant and requires a minimal amount of assembly work, I needed something to work on circuit boards installed inside of a chassis. This would require some sort of modification to permit a vertical height adjustment for reaching over and into a chassis to the internal circuit boards. Secondly, I wanted to use something that would be even quicker to assemble.

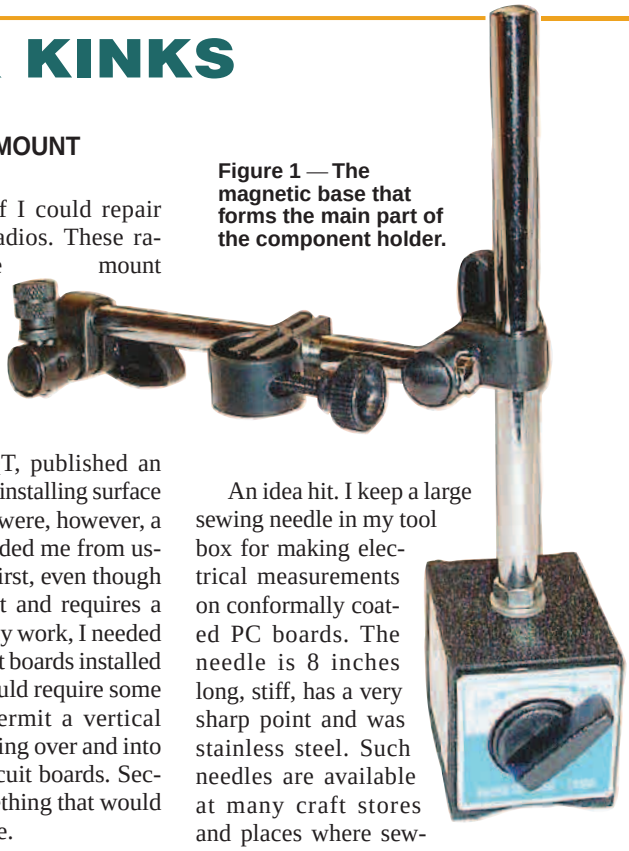


Figure 1 — The magnetic base that forms the main part of the component holder.

Description

Recently, I purchased a magnetic base for about $7.[3] A magnetic base is used by machinists to hold a precision measuring indicator in place and has to be adjustable in three axes to make measurements. It has a weighted base and a permanent magnet that can be turned "on or off" to aid in holding it in place. See Figure 1.

I wanted to build an SMD holder that could be adjusted vertically as well as horizontally. While thinking about something I might have around the shop that could do this, the magnetic base came to mind. I needed a component holder that would be adjustable in two axes and that could reach over and into the radios. The magnetic base can be adjusted in three different axes and had a vertical adjustment range of about 10 to 12 inches.

Looking at the base, it appeared it might just work, if I could find some way to modify the end to hold some sort of component hold-down device. In the original *QST* article, a threaded rod was used.

An idea hit. I keep a large sewing needle in my tool box for making electrical measurements on conformally coated PC boards. The needle is 8 inches long, stiff, has a very sharp point and was stainless steel. Such needles are available at many craft stores and places where sewing and embroidery items are sold.

Construction

The reason I call this the 5 Minute Surface Mount Device Holder is because that is about all the time it takes to assemble the unit. First, follow the instructions included with the magnetic base to assemble it. After assembly, on the end of the horizontal rod there is an indicator clamp. Attached to this indicator clamp is an adjustment bushing. Remove it. See Figures 2 and 3.

Rotate the indicator clamp 90° until you see a smaller hole. Push the 8 inch sewing needle through this hole and tighten the clamp to hold it in place. You're done!

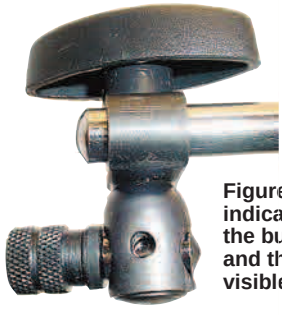


Figure 2 — The indicator clamp with the bushing installed and the "needle" hole visible on top.

Figure 3 — Remove this part (bushing) to prepare the base for use as an SMD component holder.

Operation

Operation is as simple as construction. Move the magnetic base and attached 8 inch needle over to the device under construction or repair. Rotate the needle point down. Adjust the clamps on the horizontal and vertical rods to position the needle over the top of the component to be held into place. See Figures 4 and 5. Tighten the clamps to hold the rods and needle in place.

If you have a non-magnetic workbench, or

Figure 4 — The holder assembly in use on an SMD component.

Figure 5 — Close-up of the needle keeping an SMD component in place.

[1]For more information on repairing these radios, see **www.repeater-builder.com/motorola/spectra/spectra-caps.html** by Robert Meister, WA1MIK, edited by Mike Morris, WA6ILQ.

[2]R. Littlefield, K1BQT, "Build a Simple SMD Workstation," *QST,* Jul 2000, pp 56-57.

[3]The magnetic base I purchased was from Harbor Freight tools (**www.harborfreight.com**). The catalog number is 5645.

Steve Sant Andrea, WB2GYK ♦ Assistant Editor ♦ h&k@arrl.org

if you find the base not quite heavy enough to suit you, you can place a piece of sheet metal under the base and turn the magnet "on" for added stability. I found I did not need to do this, but it's another option available.

You'll spend more time purchasing the needle and magnetic base than you spend on assembly of this project. The few minutes spent assembling it will pay back many, many times over verses the tedious time spent trying to hold down a surface mount component with a toothpick or some other manual means. — *73, E. Kirk Ellis, KI4RK, 203 Edgebrook Dr, Pikeville, NC 27863,* **ki4rk@arrl.net.** *All photos for this item by E. Kirk Ellis, KI4RK*

MATCHING METERS TO THE MEASUREMENT

♢I recently needed an expanded scale voltmeter showing 12 to 15 V dc. Conservation of energy was not too important (it was part of a battery charging system) so I used the 0-1 mA meter I had on hand. The circuit consists of the meter (M1), a 12 V Zener diode (Z1) and a resistor (R1) in series. As voltage increased across the circuit the Zener diode (Z1) will conduct when the Zener voltage (12 V dc) is exceeded. This establishes the zero point. To set the full scale (15 V dc) point calculate as follows:

A) 15 V − 12 V = 3 V dc across R1 and M1 when there is 15 V across the whole circuit.

B) 3 V⁄0.001 A = 3000 Ω total resistance for M1 and R1.

C) 3000 Ω − 200 Ω (resistance of M1) = 2800 Ω for R1 (2700 Ω being the closest standard value.

The *ARRL Handbook* tells you how to determine your meter resistance or look it up in a catalogue; you can then do the calculations for your own meter and voltage range. If all else fails use a resistor substitution box or pot set at a very high value and adjust down until you get full deflection at the desired voltage. I calibrated the instrument by using an adjustable power supply and a digital voltmeter. You can make up a little chart giving new values indexed to the original meter scale numbers or use a scanner and computer to make a new meter face. — *73, Scott McCann, W3MEO, 160 Shields Ln, Queenstown, MD 21658,* **achess@juno.com**

HEARING AIDS AS HEADPHONES

♢Hearing loss is a fact of life for old hams like me. My spouse persuaded me to get hearing aids, but the hearing aids caused feedback when I used my regular headphones. How was I to operate the rig without annoying my spouse with sounds of CW emanating from speakers? It was too much trouble to remove my hearing aids every time I used headphones.

T-Coil to the Rescue

My hearing aids came with T-Coils — magnetic pickups designed to enable telephone conversations. Would this work with my rig?

Large magnetic loops are part of many public address systems, so I decided to experiment with my own. My junk box contained a scrap of eight conductor rotator control cable about 20 feet long, which I configured as an 8 turn loop. By trial and error, I determined the best location for this audio amplifier fed loop — the ceiling of my shack. The input of the amplifier is plugged into my rig's phone jack.

My friends in the Tennessee Contest Group now call me "The Bionic Man" because I hear my rig without benefit of connecting wires. Also note that hearing aids with bluetooth technology are available and could be a better alternative.

Special Considerations

1. T-coils in hearing aids are very directional so sometimes I must adjust the position of my head to avoid nulls.

2. Both ears respond to the same magnetic signal, so stereo (for two radios) is not possible with this configuration.

3. A CRT computer monitor also responds to a magnetic signal, so to avoid squiggles on my screen the output coil from the amplifier needs to be separated from the monitor and the power kept at a minimum.

4. Current-output type audio amplifiers work best for feeding wire loops — but these are expensive. I decided to use an amplifier I already had and not to worry about tuning and matching. — *73, Bill Hall, K3CQ, Apt 314, The Saint Paul, 5031 Hillsboro Rd, Nashville, TN 37215,* **k3cq@bellsouth.net**

KEEPING POWER SUPPLIES COOL

♢While operating Radioteletype (RTTY) recently, I noticed the heat fins of my Astron RS-35A power supply were quite hot to the touch. Although this excellent supply was still operating fine, I know that heat is an enemy of electronics — and RTTY operation generates a lot of heat.

I decided to mount a couple of small muffin fans to the heat sink. These are typically available at hamfests for $2-3 each, so I knew this would be a cheap fix. The fans draw just a watt or two. While there's probably nothing new in this story so far, I did two things that might be of interest:

First, I used two fans and connected them in series. See Figure 6. (Be sure to use fans with the same current drain. Otherwise the one with the larger drain won't get enough current.) Connecting them in series kept the noise down in the shack and still allowed for plenty of cooling. I chose to mount them blowing in over the heat sink, but I suppose you would get equal results if you blew the air away from the power supply. Be sure to purchase and install the small metal protective grills for safety.

Second, I gave some thought to how I would mount them on the heat sink. I didn't want to drill any holes — what about hot-melt glue? So I tried that, and it worked beautifully. (Careful, the hot-melt glue sets up immediately — you're mounting it to a heat sink after all!) So everything seemed just fine until I pulled the supply out to take a picture for this article and bumped one of the fans causing it to pop off. So v2.0 of this concept used a combination of household GOOP adhesive (**www.amazinggoop.com**) for strength and hot-melt glue for instant set-up. This approach seems to be working just fine.

The final result is that the fans are working perfectly and the power supply stays just a cool as a cucumber even in the "heat" of RTTY contests. — *73, Mark Klocksin, WA9IVH, 1725 Wilmette Ave, Wilmette, IL 60091,* **wa9ivh@arrl.net**

MARK KLOCKSIN, WA9IVH

Figure 6 — The fans mounted on the supply heat sink keeping the transistors cool.

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

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

WB8IMY

ECLECTIC TECHNOLOGY

Tracking Trains on 900 MHz

Barry Baines, WD4ASW, knows that I have a soft place in my heart for trains. I'm one of those annoying people who actually *enjoy* being stuck in traffic at railroad crossings (the closer to the gates, the better).

So you can imagine my astonishment when Barry cornered me in the ARRL booth at this year's Dayton Hamvention® and began telling me how he and others are monitoring rail activity by intercepting data transmissions on 900 MHz.

The short story begins with trackside devices that the railroads use to monitor train activity at various points. It is part of a network known as the *Advanced Train Control System*, or *ATCS*. In ATCS-equipped territory, the railroad dispatcher manipulates the switches and signals by sending data to *control points*. The control points respond by sending back *indications* — data that indicates their status.

This data exchange is sent "in the clear" (unencrypted) in the 900 MHz band. The trick to exploiting ATCS for hobbyist purposes is identifying the transmission sites, receiving the data, decoding the data, creating graphical displays (*layouts*) to provide a visual representation and, finally, making this wealth of real-time information available to railroad fans via the Internet. This is where Barry and company come into play.

Barry and his compatriots (many of whom are hams) have created ATCS monitoring packages consisting of 900 MHz receivers, vertical antennas and computers. They look for businesses or residences near ATCS-equipped rail lines where they can set up their packages. Fortunately, the 900 MHz signals traverse a pretty good distance, so in many cases there is a cooperative ham somewhere in the vicinity. You'd think that most people would balk at these requests, but ATCS monitoring sites are springing up like mushrooms.

Once a monitor package is up and running, it decodes the data and sends the information via the Internet to an *aggregator* site. The aggregator collects data from a series of monitors and acts as a single information source for a particular territory.

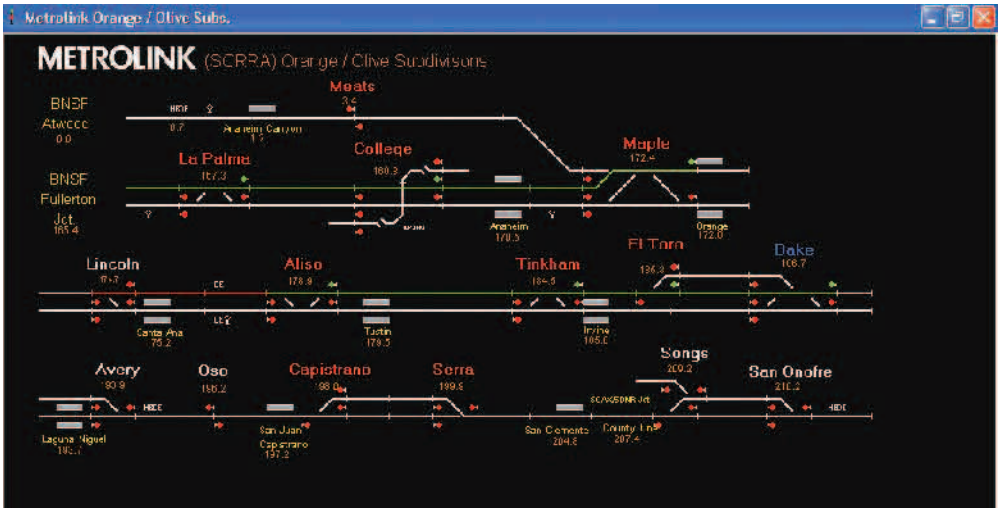
You can tap into this unique information stream by first joining the ATCS Monitor Yahoo Group at **finance.groups.yahoo.com/group/ATCS_Monitor/**. Once you are a member (it's free), you can download and install the main *Windows* executable file *atcsmon.exe* along with track layouts for your areas of interest. With *atcsmon* running, you can connect to an aggregator for the area you wish to monitor and actually watch as the dispatcher routes the trains. You can even monitor train movements as blocks become occupied with passing trains. All you need is a computer and an Internet connection to receive information from the appropriate aggregator. Of course, if you find yourself near a control point and have the necessary radio and computer hardware, you can monitor it directly.

Barry's personal interest is in the CSX *A-Line* running from south of Richmond, Virginia to Jacksonville, Florida. He has done most of the server installs and developed the layouts along this route. His most recent server installs cover Florence and Charleston and he is working to fill the gaps in the coverage. Feel free to contact Barry (**wd4asw@amsat.org**) if you're interested in hosting an ATCS monitor package in these areas.

D-STAR "TV"

John Brown, GM7HHB, in Kirknewton, Scotland, has created a *Windows* application (*XP* or *Vista*) that allows you to send still images using the 1200 bps data stream that is available on all D-STAR rigs. Yes, 1200 bps is achingly slow for image communication, but if you aren't using a 1.2 GHz D-STAR transceiver with 128 kbps capability, this is a fine alternative. John's application compresses the image to improve the transfer speed. The result is something similar to an HF Slow Scan TV image sent in roughly the same amount of time.

The software is free for downloading at **www.dstartv.com/**. Note that it requires Microsoft's *.NET Framework 3.5* on your computer, but that is also free at **www.microsoft.com**.



By grabbing a track layout and using it with the ATCS monitoring software, you can observe railroad activity in a particular area. The green lines indicate open blocks.

Corral Your CPU Cycles with *Process Lasso*

Here is a unique gem I've recently stumbled across. *Process Lasso* is an application that automatically adjusts the allocation of CPU cycles to improve the performance of your computer in high-load situations. It does this by temporarily lowering the priorities of processes that are consuming too many CPU cycles, giving other processes a chance to grab some desperately needed attention.

The application is handy if you are running many different *Windows* applications simultaneously in an underpowered station computer. Best of all, *Process Lasso* is free. Go to **www.bitsum.com/prolasso.php**. QST

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This Month in Contesting

Sean Kutzko, KX9X
ARRL Contest Branch Manager, kx9x@arrl.org

CONTESTING AND EMCOMM — MORE IN COMMON THAN YOU THINK

I'm writing this on Monday, September 15, two days after Hurricane Ike hit Galveston and Houston, Texas. Most of the staff here at ARRL HQ have been working in some capacity in a support role for hurricane operations. The previous two weeks gave us Hurricanes Hanna and Gustav; our Emergency Preparedness and Response Manager, Dennis Dura, K2DCD, has been a busy man lately.

Part of our efforts here at HQ was to check in and monitor various net operations related to the hurricanes, both on HF and VHF, and provide support if asked. While listening to the various nets, some operators were able to pass messages with ease and others had to repeat their info several times. What made the difference?

1) Use of phonetics. Stations that used phonetics regularly were able to deliver their messages to Net Control more efficiently, saving time and avoiding mistakes. Indeed, one Net Control constantly requested stations on the net to use "ITU standard phonetics."

2) Listening. There were many instances in which stations responding to Net Control would interject information that was not what Net Control was looking for, which again slows down response time.

The ARRL offers several courses on Emergency Communications preparedness. While these are essential sources of knowledge, they provide only part of the picture. It's no different in the working world; having a textbook understanding of your subject matter is not necessarily the same as practical application of that knowledge. EmComm operators need to know how to communicate effectively and efficiently, using different kinds of equipment, antennas and communication modes.

Radiosport provides that skill set. The purpose of on-air contests is to exchange information quickly and efficiently, on numerous Amateur bands and modes, using a wide variety of equipment and antennas. Does that sound like a skill that EmComm operators need to have? Absolutely! There is no better way for operators interested in sending and receiving information quickly, correctly and efficiently to acquire those skills than to participate in Amateur Radio contests.

The weekend of November 15-17 provides an excellent opportunity to get your feet wet. The 75th running of the ARRL SSB November Sweepstakes takes place that weekend. The October *QST* Radiosport insert includes an excellent how-to article by Ward Silver, NØAX, on how to participate in Sweepstakes. I encourage all operators interested in bettering their on-air skill set to join us and have some fun. If you consider it an investment in your operating skill, how can you go wrong?

The relationship between EmComm and Contesting is a two-way street. Established contesters, generally speaking, have excellent stations and antennas at their disposal, and have the efficient operating skills that are required. However, they may not have the understanding of basic protocols or modes that are utilized during an emergency. For example, during the operations for Hurricane Ike, W1AW was able to monitor an emergency net in Texas on 75 meters around the clock, thanks to West Gulf Vice Director Dr David Woolweaver, K5RAV's HF-to-EchoLink conduit. Without the EchoLink conduit, we here at HQ would not have had easy access to real-time, first-source information; its value cannot be understated. It worked so well that Dennis, K2DCD, wants to explore this application on a much broader scale for future emergencies. How many contesters have explored what EchoLink has to offer?

Another vital source of knowledge contesters can tap into is their local ARES/RACES chapters; those are the people who already have a response plan in place. By taking an EmComm course and getting involved, contesters could provide additional resources on the local or regional level without having to "re-invent the wheel." The use of contest stations during a disaster is something that should be explored and encouraged.

It's not an issue of one aspect of Amateur Radio being better than another; we are all part of the solution. A well-rounded amateur with broad experience can provide more assistance than one who has only explored one aspect of this diverse service and hobby. Let's work together to benefit ourselves, Amateur Radio in general and the population at large.

November 2008 QUALIFYING RUNS

♦ W1AW Qualifying Runs are 9 AM EST (1400Z) Wednesday, November 5 and 7 PM EST Tuesday, November 18 (0000Z November 19). The West Coast Qualifying Run will be transmitted on 3590 kHz by station K6YR at 9 PM PST Wednesday, November 12 (0500Z November 13) (10-40 WPM). Unless otherwise indicated, code speeds are from 10-35 WPM.

In the November/December "Contesting 101"

Kirk Pickering, K4RO, gets philosophical on discovering the competitive streak in all of us, understanding the playing field, location and "fairness," and what that all means in the end. "Contesting 101" can be found in the *National Contest Journal,* published six times per year. For subscription information, visit **www.arrl.org/ncj**.

Operating Tip of the Month

"Use your cans. Headphones allow you to pull the "weak ones" out of the pileups better than most speakers. They reduce background room noise and are nicer to others in the house."

CONTEST CORRAL

in association with the *National Contest Journal*

NOVEMBER 2008

Start & Finish	HF	VHF+	Contest Title	SSB	CW	Dig	Exchange	Sponsor's Web Site
1 Nov 0600Z - 2 Nov 1800Z	3.5-28		IPA Contest	✘	✘		RST and serial or "IPA" and state	www.ipa-rc.de
1 Nov 1200Z - 2 Nov 1200Z	1.8-28		Ukranian DX Contest	✘	✘		RST and serial or Ukraine oblast	www.ucc.zp.ua
1 Nov 1700Z - 2 Nov 0500Z			Radio Club of America QSO Party	✘			RST, QTH, name, equipment	www.radioclubofamerica.org
1 Nov 2100Z - 3 Nov 0300Z	1.8-28		ARRL November Sweepstakes		✘		Serial, category, call, check, ARRL sec	arrl.org/contests
1 Nov 2100Z - 3 Nov 0300Z	1.8-28		Collegiate ARC Championship		✘		See ARRL Sweepstakes	www.collegiatechampionship.org
2 Nov 0900Z - 4 Nov 1700Z	3.5-28		High Speed Club CW Contest		✘		RST and MSC member nr or "NM"	www.dl3bzz.de/html/hscconte.html
2 Nov 1100Z - 2 Nov 1700Z	28		DARC 10-Meter Digital "Corona"			✘	RST and serial	www.darc.de/referate/dx/fed.htm
8 Nov 0000Z - 9 Nov 2400Z	3.5-28		Worked All Europe DX Contest			✘	RST and serial (see Web for QTC rules)	www.waedc.de
8 Nov 0700Z - 9 Nov 1300Z	3.5-28		Japan International DX Contest	✘			RST and JA prefecture or CQ Zone	jidx.org
8 Nov 1200Z - 9 Nov 1200Z	1.8-28		OK-OM DX Contest		✘		RST and serial or OK/OM district	okomdx.crk.cz
8 Nov 1400Z - 9 Nov 0200Z	1.8-28	50	Kentucky QSO Party	✘	✘		RST and serial or KY county	wkdxa.com/page2.html
8 Nov 1900Z - 10 Nov 0500Z	1.8-28	50-440	CQ WE (Western Electric)	✘	✘	✘	Call, name, Bell QTH, yrs of svc (see Web)	cqwe.cboh.org
15 Nov 0000Z - 16 Nov 2400Z		50-1296	ARRL EME Contest	✘	✘	✘	Both call signs, sig rpt, acknowledgment	arrl.org/contests
15 Nov 0000Z - 16 Nov 2400Z	1.8-28		JT 50th Anniversary Contest	✘	✘		RST and serial or "50" for JT hams	
15 Nov 1200Z - 16 Nov 1200Z	3.5-28		LZ DX Contest	✘	✘		RST and ITU Zone or LZ district	www.qsl.net/lz1fw/contest
15 Nov 2100Z - 17 Nov 0300Z	1.8-28		ARRL November Sweepstakes	✘			Serial, category, call, check, ARRL sec	arrl.org/contests
15 Nov 2100Z - 17 Nov 0300Z	1.8-28		Collegiate ARC Championship	✘			See ARRL Sweepstakes	www.collegiatechampionship.org
15 Nov 2100Z - 16 Nov 0100Z	1.8		RSGB 1.8MHz Contest		✘		RST, serial, UK district	www.rsgbhfcc.org
16 Nov 0000Z - 16 Nov 2400Z	1.8-28		PSK63 QSO Party			✘	EPC member nr or RST and serial	www.eu.srars.org
22 Nov 0000Z - 23 Nov 2400Z	1.8-28		CW World Wide DX CW		✘		RST and CQ zone	cqww.com

All dates refer to UTC and may be different than calendar date in North America. No contest activity occurs on 30, 17, 12 meters.
Refer to the contest Web sites for full rules, scoring information, operating periods or time limits, and log submission information.
Serial — Sequential number of the contact. S/P/C — State, Province, DXCC Entity
Publication deadline for Contest Corral listings is the first of the second month prior to publication.

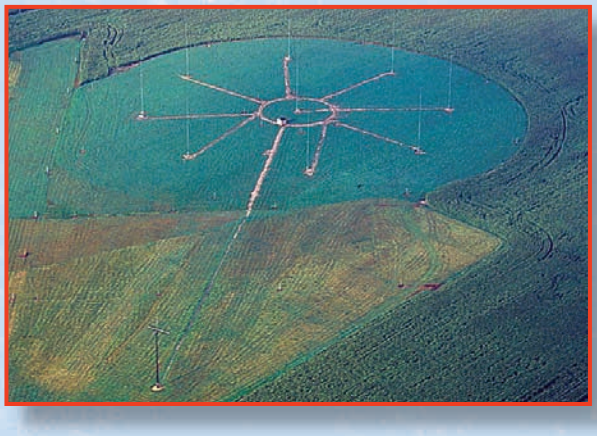
Check for updates, additional contests and a downloadable PDF version online at www.arrl.org/contests

Sean's Picks

- **State QSO Parties this month:** Kentucky
- **ARRL November Sweepstakes (CW = Nov 1-3, Phone = Nov 15-17):** The 75th running of the premier W/VE contest is really going to be something special. With lots of special prizes available for all levels of participation, this is simply an event you do *not* want to miss!
- **Japan International DX Contest, Phone (Nov 8-9):** This is one of the unsung great events. With tons of activity and very good-looking awards, the Japan Amateur Radio League (JARL) has a definite winner on their hands. Get in on the action and see why.
- **RSGB 1.8 MHz Contest (Nov 15-16):** Get the 160 meter DX season off to a great start by working our UK friends "across the pond." Non-UK stations try and work as many UK Districts as possible.
- **CQ WW DX Contest CW:** The largest CW contest in the world. Boatloads of DX to be worked, even by a newcomer to CW. Definitely not one to miss!

ARRL 160 Meter Contest

Top Band is Hot!


K9DX

- Wintertime at the bottom of the sunspot cycle means excellent conditions for "Top Band." Get in on this CW-only event and enjoy a really hot band on a cold winter's night!
- Don't have a 160 meter antenna? Load up whatever length of wire you can find; you *will* make QSOs with it!
- W/VE stations send a signal report and ARRL/RAC section. DX stations just send a signal report.

2200 UTC Friday, December 5 – 1600 UTC Sunday, December 7, 2008

ARRL 10 Meter Contest


K3LR

"Don't tell me this band ain't got no heart...you just gotta poke around."

- Enter as Phone only, CW only, or a mix of both as a Single Operator, or get some friends together and try your hands as a Multi-operator team!
- A *great* event for Technician-class licensees…work stations on SSB from 28.3 MHz – 28.5 MHz!
- W/VE stations (including Alaska and Hawaii) send a signal report and State or Province. DX stations send a signal report and sequential serial number.

0000 UTC Saturday, December 13 –
2359 UTC Sunday, December 14, 2008

Complete rules for both contests may be found at

www.arrl.org/contests

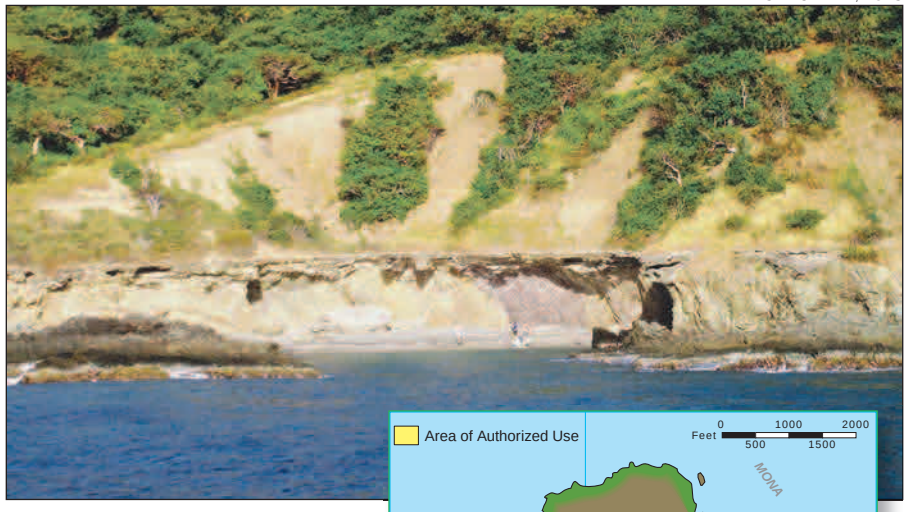
W3UR

HOW'S DX?

Desecheo Island — KP5

Desecheo Island is a small uninhabited island situated in the Mona Channel between Puerto Rico and Hispaniola (HI/HH). The island is located at 18° 23' North and 67° 29' West (FK68gj) and is about 21 kilometers (14 miles) west of Punta, Puerto Rico. Desecheo is approximately 1.45 square kilometers (360 acres) in size. It consists of rugged mountainous terrain that rises to 218 meters (715 feet). There are also several islets located just off shore — El Murro located on the western end of the island and Dospiedras on the eastern side.

KAMAL SIRAGELDIN, N3KS



This was the landing site of the December 2005 DXpedition by N3KS and K3LP. The opening is about 10.7 meters (35 feet) wide.

A map of Desecheo Island with the "safe area" located at the western tip.

History of Desecheo Island

It is believed that Desecheo Island was discovered by Christopher Columbus on his second voyage (1493-1494) to the New World. The name Desecheo was given to the Spanish explorer Nunez Alvarez de Aragon by the Taino Indians in 1517. In the 1700s smugglers reportedly hunted wild goats on the island. President William Howard Taft named the island as a "preserve and breeding ground" for seabirds in 1912. During the 1920s attempts were made to farm with both cattle and crops. In 1937 President Franklin D. Roosevelt reassigned Desecheo to the local government of Puerto Rico to be used as a forest and bird preserve. During World War II the island was handed back to the federal government and was used for target practice both by bombers and heavy duty artillery until 1952. Craters and ordnance can still be found in quarantined areas of the island. The US Air Force was a frequent visitor to the island between 1952 and 1964 for survival training. The military put Desecheo on the surplus list in 1965; it was "acquired by the Department of Health, Education, and Welfare" in the summer of 1966. The following year rhesus monkeys were introduced to the island. The US Fish and Wildlife Service (USFWS) was given administration of the island in December of 1976 and National Wildlife Refuge status was obtained in 1983.

DXCC History

At the 1979 annual meeting of the ARRL Board of Directors, held January 24-25, Mr Gay Milius, W4UG, "as Liaison, read the report of the DX Advisory Committee, which discussed the status of Desecheo Island." In the "How's DX?" column of the August 1979 *QST* (page 82) it was announced that "upon recommendation of the DXAC, the island of Desecheo is hereby accepted for country status. This action precedes the changes in the DXCC rules concerning separate administrations and entities. All contacts with Desecheo made after March 1, 1979, will be credited beginning September 1, 1978." Desecheo was the last DXCC entity to be added to the DXCC list before the elimination of the "distinctively separate administration" clause in the country criteria.

The first approved DXpedition to Desecheo Island was KP4AM/D, which took place in early March 1979. That team included N4EA, KP4Q, N4ZC, KP4DPD, KV4KV (now KP2A) and KP4AM (now W4DN). KP2A/KP5 made several DXpeditions to Desecheo Island (1981, '89 and '91). During the 1981 DXpedition the team made 42,743 QSOs. During their second operation a dinghy turned over in the rough seas. HI3RST/KP5 and WP4ATF/KP5 were there in July 1984. Members of the Texas DX Society were operating as NR5M/KP5, K5LZO/KP5 and KA5SBS/KP5 in March 1985 making around 17,000 QSOs. In January 1988 NJ7D and KP4HL operated portable KP5. During the March 1989 ARRL DX SSB Contest W8KKF/WP5 was active. KP5/N1DX and KP5/KØBJ were on the island in March 1992 and made 6300 QSOs. AA4VK, KW2P, NØTG and WØRJU operated from there with their home calls in late December 1992 and early January 1993. 23,000 QSOs were made in 4 days. The last operation was that of N3KS/KP5 and K3LP/KP5 in December 2005. The two ops were there for less than 2 days managing 7300 Qs. It should also be noted that KV4KV (ops KV4KV now KP2A and WØDX) operated

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portable from Desecheo Island in October 1978; however, they did not have permission from the USFWS and this operation did not count for DXCC.

USFWS Opening the Door to KP5?

Back in late June a letter was sent to would-be KP5 DXpeditioners. The US Department of the Interior's Fish and Wildlife Service (FWS) dug back into their files finding the names and addresses of those who showed interest in going to Desecheo. It's not known by this editor exactly how many letters were sent. We do know applications were pulled from as far back as 1997. I am aware of about 10 different individuals or groups who received the letter, which can be seen at **www.dailydx.com/Desecheo.pdf**. Not all of the groups will be able to go. In fact only one group has the possibility of going. As of the writing of this column (mid September) no group has been told they can go!

A reliable source tells us the following: "There is a tentative agreement to facilitate access to the Desecheo Island National Wildlife Refuge by Amateur Radio operators in conjunction with future USFWS management activities in the refuge. The plan would allow Amateur Radio activation of Desecheo for up to 14 days under strict guidelines and close USFWS supervision.

"USFWS expects to grant a Special Use Permit (SUP) for Amateur Radio operations to one group selected from among large number of prior applicants. These applicants have recently been contacted by the agency and provided a number of stringent requirements that must be met. They were told that if they are still interested in operating from Desecheo they had 45 days to submit a proposal. The letter was dated June 30, 2008, with an August 14 deadline. The final selection will be made based upon which proposal best satisfies USFWS requirements. The timing of this operation is still uncertain but is likely to be in the September through December 2008 time frame. The actual dates of the operation are dependent on a number of variables, but the team and DXers should have a minimum of 30 days notice.

"We are not sure, but we believe as many as a dozen proposals have been submitted. Apparently, the final selection will be made by a three person panel. Continue to remain patient as the selection process proceeds. Apparently, DXers worldwide can look forward to the first USFWS-authorized activation of Desecheo Island in many years."

This is great news and if properly handled by the DX community could possibly lead to future operations from Desecheo and perhaps Navassa Island — KP1. Keep an eye on your favorite DX newsletter for any updates on this rare one.

DX NEWS FROM AROUND THE GLOBE

9L — Sierra Leone

Karl-Heinz Ilg, DK2WV, is taking a team of operators with him to Sierra Leone this time. During June he operated as 9LØW and asked if a group of operators could give a ham radio course there. That's what they'll be doing between October 21 and November 11, plus they will be giving equipment and materials to the University of Freetown. On the team will be DJ4LK, DK2WV, DL1YFF and a 9L1 operator. They will be on 160-6 meters with Spiderbeams, phased arrays, K9AY loops or Beverages. QSL via DK2WV direct with a self addressed stamped envelope and sufficient return postage funds, or via the bureau. With a cost of $14,000 US beyond air fare, they are looking for sponsors. You may contact them at **k.ilg@arcor.de**.

A5 — Buhtan

Frank, I2DMI (T88RY), informs that he has just received his A52RY license. He'll be visiting Bhutan during the 2008 Christmas Holidays (December 22-31) along with his wife Giovanna. Frank will be active in his spare time and only when the tour takes him to Thimphu City, which is where the Ham Centre is located. He will try to be active as long as possible. This will be an RTTY only operation.

A3 — Tonga

Mori Tsuguhito, JA2ZS, is planning an expedition to Tonga, A35, with a few friends. November 11-17. JA2AAU, JA2AIC, JA2LSS, JA2ATE and JA2ZS will have the call signs A35AU, A35IC, A35SS, A35TE and A35ZS. They'll be on 160-10, CW, SSB and digital. Each op will handle their own QSLs.

FR — Glorioso Islands

Another DXpedition to keep a lookout for is the French Military DXpedition to Glorioso Islands. Didier, F5OGL, recently gave an update, as there have been many rumors on this rare one. In mid-August hurricane shelters were nearly completed and those installing the new buildings were expected to depart the island. Afterward, French military personnel will return to the island. For the past 3 years Didier has been in close contact with the head chief of the islands, who is in full support of the team's planned DXpedition. All of the "necessary authorizations are in hand." The last issue currently being nailed down is the travel arrangements. Glorioso currently ranks number 4 on the most wanted list. All of the team members for this DXpedition will be from the French military. Civilians are not allowed on the island. The team is hoping to have this one on the air by the end of 2008. They have a Web page at **http://glorieuses2008.free.fr/**.

JT — Mongolia

The Mongolian Amateur Radio Society, MARS, is putting together the JT Ham Radio 50th Anniversary DX Contest. Various JT stations will be on the air on 160, 80, 40, 20, 15 and 10 meters SSB and CW from 0000Z November 15 to 0000Z November 16.

P2 — Papau New Guinea

Hugh Clark, K6HFA, plans to stop in A3 — Tonga (possibly OC-191) and possibly Samoa (5W) from September 26 to October 10. He's trying to line up transport for OC-191 but nothing is firmed up yet. Then maybe he'll have more Pacific activity, possibly C2, FW, H4 and VK9. Afterward, he'll join up with the P29 team who will operate from Garove (OC-181) and Hermit (OC-041), which will take place in late October and early November. The call sign is not known at this time. Next, he plans to go to Kokopo, East New Britain (OC-008), Papua New Guinea. He'll be there from October 11-17. The rest of the team (AD6E, G3KHZ, CT1AGF and W5GAI) will meet Hugh on October 17 in Port Moresby, where they will overnight. The group will then set sail aboard the *Barbarian II* for Garove (P29VLR) and Hermit (P29NI). After those two islands Hugh will go to Manus (OC-025) where he expects to be operating from November 5-9, call sign unknown at this moment. The rest of the team will presumably head home. They have a Web page at **www.425dxn.org/dxped/p29_2008/**. QSL P29VLR via SM6CVX and P29NI via G3KHZ.

S2 — Bangladesh

David, EB7DX, tells us of a December 2008 IOTA DXpedition to Bangladesh's St Martin's Island (AS-127). This will be a 6 day operation, to be announced at a later date. Tutul, S21RC, and Manju, S21AM, will be two of the ops and they are expecting others. A Web site has been set up at **http://s2iota.eb7dx.com/**. There will be a log search, after the DXpedition. The call sign is pending and is expected to be announced at a future date. QSL via EB7DX, David Lianez Fernandez, PO Box 163, 21080 Huelva, Spain. Logs will be posted to LoTW 1 year after the operation.

S7 — Seychelles

Mauro, IW5CWA, says Luca, I5IHE, will be operating from Praslen Island (AF-024) in the Seychelles at the end of October. The call will be S79LC, October 26-November 11. He'll be on CW, SSB, RTTY and SSTV. QSL via IW5CWA.

T8 — Palau

T88CJ and T88CI, Palau, are the call signs for Tibi, HA7TM, and Pista, HA5AO, during their operation November 22 at 0200Z to December 3 at 1500Z this fall. They have received their licenses. QSL to their home calls.

VU4 AND VU7 — ANDAMAN, NICOBAR AND LAKSHADWEEP ISLANDS

As of press time there are not a lot of details I can give out on the much anticipated VU4 — Andaman and Nicobar Islands as well as the VU7 — Lakshadweep Islands DXpeditions. Members of the National Institute of Amateur Radio (NIAR) will be holding their Silver Jubilee Celebrations in Hyderabad October 18-20. Afterward, some attendees, mostly from Germany and India, will be operating from VU4 and VU7 in the October 24 to November 3 time frame. Watch the NIAR Web site at **www.niar.org** and the DX rags for the latest news on these two rare ones.


W3ZZ

THE WORLD ABOVE 50 MHz

This and That

Weak signal VHF operation is definitely growing. I see that in my local radio club, the Potomac Valley Radio Club, whose members are primarily HF contesters and DX chasers. Ten years ago only a handful of members operated the VHF bands. Five years ago that had expanded but their numbers were still very small. Now the numbers have more than doubled over a few years ago. Perhaps it is because most new higher end HF radios include 6 meters. Perhaps it is the extended sunspot minimum with its poor HF conditions compared to what you can find on 6 meters, the entryway to VHF operating, where the lack of sunspots has little or no effect on the summer E-skip season. But whatever the reason more and more of my radio club friends are actually putting up some kind of 6 meter antenna and some of them are venturing to the other bands, even the microwave bands.

It has been over 2 years since I discussed what goes into this column. So this month I want to review that information for those who have more recently started to use the VHF bands. And finally I want to finish my discussion of the summer season by describing some of the DXpeditions that spiced up those months and mentioning a couple of important events that I missed last month.

The Column Structure — What It Is and What It Isn't

This column is about a specific part of the spectrum above 50 MHz. It concerns operation on ssb, CW and weak signal digital modes, primarily members of the WSJT suite like JT65 and FSK441. There are discussions of the VHF spectrum in print that deal with all operational aspects of those frequencies: AM, FM, wideband TV, multimedia, wideband networking, terrestrial and satellite repeaters, model remote control, balloons, radio direction finding and even some fascinating receive only areas like radio astronomy and weather satellites. This column is not one of those. It is focused on weak signal VHF, so-called because the signals, while readable, are generally quite weak. The emphasis is primarily on operating and those aspects of the spectrum that affect operating as opposed to any primary technical discussions. Over the 6 years that I have been conductor of this column, I have heard some say that they wished the column contained the types of construction articles it once had when Ed Tilton, W1HDQ, was the original conductor. They forget that Ed was a full time ARRL employee, not a contributing editor, and that he was hired in great measure because of his primary technical knowledge as well as his operating ability. For at least the past 35 years the column emphasis has been what it is now, a column about VHF+ operating and a running record of band conditions month by month. It does cover microwave operating but normally leaves technical discussions to Paul Wade, W1GHZ, in his excellent "Microwavelengths" column.

The column has three distinct sections: a lead article; band activity (On the Bands); and events of general interest to VHFers (Here and There). I have several sources of information. First and foremost are my readers. To a great extent all VHF+ is local. I try very hard to include all parts of the country. If you don't communicate with me (**w3zz@arrl.org**) I won't know what's happening in other parts of the country. Sometimes I contact people for information about one or more sections of the column. Occasionally the feature article is prepared by a guest writer as it was most recently by Jan Bruinier, DL9KR, as he described his quest for the first 70 cm DXCC. I fill in details of band activity from a variety of Web sources, particularly **www.dxsummit.fi**, **http://dxworld.com** and DXSherlock (**www.vhfdx.net**). But there is no substitute for hearing directly from the people making the contacts. Nothing in this column is done in real time so everyone needs to know my deadlines. I write these columns more than 2 months in advance of the cover date: so for the November 2008 *QST* I write the column in August and my normal deadline for information is the end of August. I describe band activity in August and hold open a small amount of space for contacts made in the last week of the month that reach me the first few days of the following month. "Here and There" contains information about conferences, calls for papers and specialized contests. Sponsors need to take the deadlines into account: for a November conference or contest, information needs to reach me before the end of August; for a call for papers due in September, for instance, the notice must reach me by the end of June.

This Month

*November 9	Good EME conditions
November 13-15	ARRL International EME Contest 50-1296 MHz

*Moon data from W5LUU

What information is really valuable? To the extent possible, I will publish everything I can. But I have a strict limit of three pages per issue. Several of the monthly columns devote part of that space to Band Standings — this month will have the 432 MHz Standings 1 month late because there was insufficient space last month. What I want is information about activity which is unusual for that particular month. For example, single hop E-skip is rare in September and October but in busy months like May-July, some such reports might not get mentioned. Any E-skip contact on 2 meters and particularly 222 MHz should be reported even if it is a single contact. DX openings to far distant locations are always in vogue but pay attention to what is a long distance. The Caribbean is noteworthy from the west coast but not from the east coast. Europe is more newsworthy from the Midwest, Southwest or the West than it is from the East or the Southeast: for those who know the WAZ zone system from zones 3 and 4 than from zone 5. Reports of aurora on any band are welcome in this period of minimal geomagnetic activity. When conditions get better — and they will — aurora reports on 2 meters and above will be of more interest than those on 6 meters. Tropo reports are always welcome. How far? Those of 500-600 miles distant and more are the most

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interesting though slightly shorter distances not normally worked on the microwaves are still useful.

Summer Omissions

Last month's review of the summer of 2008 missed two important events. First, among all those wonderful East Coast contacts to Japan I failed to point out that on June 14 Russ, K4QI, worked JL8GFB for the first East Coast to JA contact. Russ is unaware of any earlier E_s contacts between North Carolina and JA. Secondly, contacts between the Pacific Northwest and Europe have only occurred a handful of times in the past. Steve, VE7SL, reports that he worked CT1HZE on July 7 this summer at 1743Z with fairly strong but very short-lived signals.

RICHARD HANSON, K5AND

Figure 1 — Sable Island is known for its wild horses. Notice the fog which extended the expedition's time on the island.

DXpeditions of Summer

Alaska W6JKV/KL7. Jimmy, W6JKV, activated BP65 with the prime purpose of working Europe. Conditions did not cooperate but Jimmy worked 83 JAs, three HLs, one AL7 and WZ8D for his only E_s US station. He worked W1JJ, ON4IQ and ON4GG on JT65a EME and heard IW5DHN, OH2BC and K3TKJ.

Belize V36M (EK57xr) and San Andres 5JØM (EK92dm). Dennis, K7BV, ran a very difficult series of DXpeditions to these locations this summer with a pair of FT-450s, an ACOM-1000 amplifier and a 7MJHV Yagi. At V36M June 20-26 he worked about 150 QSOs but only two Europeans. From 5JØM June 29-July 8 he worked 231 almost all on July 2. His performance was hampered by damage to his amplifier in customs and unusually poor conditions from that part of the Caribbean. Undeterred, he intends to return to 5JØ next summer.

Cayman Islands ZF2ZD (EK99gi). Mario, K2ZD, and Jim, ZF2BI, activated the Caymans at Jim's QTH from June 25 to July 7. They used an FT100 with an ACOM-1000 amplifier 1 kW to an M2 6M5X 5 element Yagi at 50 feet. They made 750 Qs in 29 DXCC countries including EME contacts with W7GJ, W1JJ and VK4ABW. They worked W5UWB on JT6M and N5SIX on FSK441. ODX was Hungary at 5700 miles (9173 km).

Sable Island CYØX (FN93). This isolated island off the east coast of Canada was activated in a big way from June 26 to July 12 by Dick, K5AND; Pete, VE3IKL, and Chris, W3CMP (Figure 1). Conditions to the US Midwest and far west were poor during the expected operating period but when fog delayed their departure past July 7, the entire US got to participate with July 8 the big day. They had 3941 Qs in 60 DXCC entities and 45 US states on 6 meters. HF yielded 3750 Qs in 880 countries but 2 meters was limited to 7 Qs, all in VE1,9/W1 except for W5UN on EME, because of local RFI and antenna problems.

Lichtenstein HBØ/HB9QQ (JN47tc). Pierre, HB9QQ, activated this rare European country from June 27 to July 6. While he found decent conditions within Europe, openings to W/VE and the Caribbean were rare and no JAs were heard. In all, Pierre worked 42 DXCC entities and 25 Ws in 13 US states.

Saba PJ6/K2KW (FK87jp). Kenny, K2KW, was active from Saba from July 2-8 while on a delayed honeymoon. Using an IC706MKII at 100 W and a 3 element homebrew Yagi that fit into a suitcase, he made 745 QSOs on 6 meters, about 60% with EU. He had 45 DXCC with 4X4DK, the best DX. The location was superb toward Europe and Africa but not good to the western US, although he did work MT and WA. Full details are at **http://pj6-k2kw.blogspot.com**.

Galapagos HC8N. Steve, K6AW, ran a beacon for several days while he was there from July 8-12 for the IARU contest. Nary a signal was heard.

St Barthelemy TO5E (FK87ov). Arliss, W7XU; Holly, NØQJM, and Ed, WØSD, led an expedition to this relatively new DXCC country from June 28 to July 6 (see Figure 2). With 500 W from an FT-897/ACOM 1000 combination to a 32 foot boom Yagi, they amassed 1759 Qs in 54 countries working all continents except Oceania. The ODX was 4X4DK at nearly 5000 miles. They worked all the (continental) 48 states except WY, ID, OR, NV, UT and CA including several in WA and two VE7s. On HF they made 1500+, principally RTTY, QSOs. Full information is at **www.w0sd.com/stbart/bart.htm**.

ON THE BANDS

Tropospheric Ducting. The big news this month is the first contact between South Africa (ZS) and Reunion Island (FR) on

ARLISS THOMPSON, W7XU

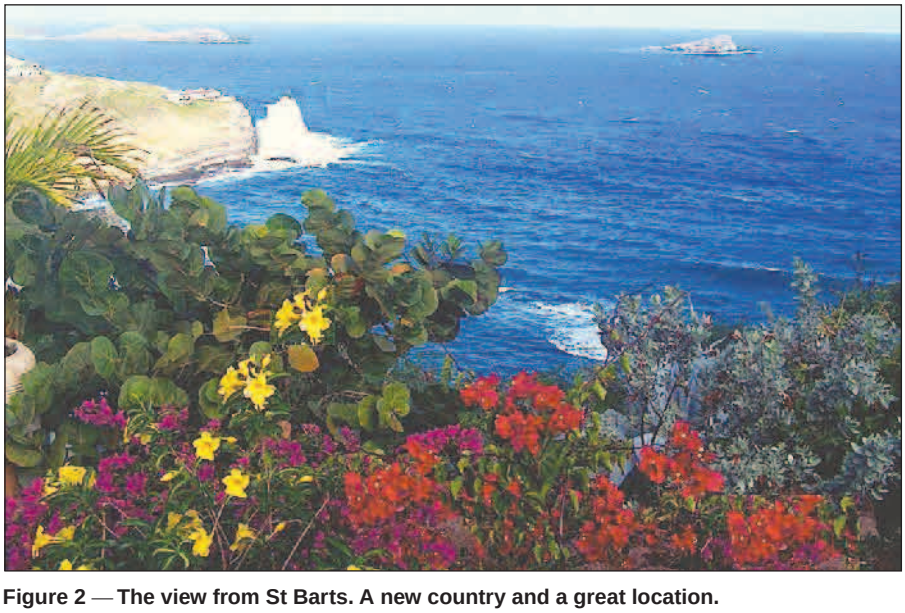


Figure 2 — The view from St Barts. A new country and a great location.

2 meters. As reported at **www.arrl.org/news/stories/2008/08/20/10269** on August 13 being encouraged by hearing the FR5DN beacon (now running 1800 W PEP), Glen Kraut, ZS2GK (KF74kt) worked Phil Mondon, FR5DN (LG78qs) via tropo via an over water path of 2892 km. Signals were weak but reasonably steady with tropo characteristics and no signs of meteor enhancement. Congratulations to Phil and Glen! [Thanks to N7BHC and W7GJ for the heads up.] Jon, NØJK (EM17) notes EM66 to EM29 on Aug 1. On August 26 Jon reports EN50-EN92 and EN50-EM09 but not EM09-EN92.

2 Meter E-Skip (US). What was probably the final 2 meter E_s opening in the US occurred on August 2/3. Jon, NØJK (EM17) worked into EL79. Sam, K5SW (EM25) worked stations in FM03, 04 and EM85. Clayton, W4KVW (EM80) worked into EM29. Reports from NØJK and DXSherlock indicated contacts west to EM12, south to EL19/EL87, east to FN10 and north to EN13/EN31,41.

2 Meter E-Skip (Europe). Europe had 5 more E_s openings in August totaling about 4 hours. The pattern continued to exclude the Iberian Peninsula except for the final opening. On the 9th there were two centers at different times: British Isles were into Central Europe and France worked EA8. August 12 featured PA, DL into SV and F into LZ and YO. The 14th was into eastern Europe: I, HB, F into UA, UB and OK. The 17th and 20th were both very short DL, I into LZ and UB in the former and southern DL into northern EA in the latter.

6 Meters. Like the month of March, August came in like a lion and went out like a lamb. Bob, K6QXY, reports E_s 15 of the first 16 days of the month then nothing. For the DXers Jay, KØGU (DN70) began the festivities with Qs into EA, CT, CT3 and EA8 on Aug 1. That same day Keith, K6GXO (DM04) worked CT3, only his second African contact.

On Aug 2 Vic, WB4SLM (EM82) worked EA6, CT, EA and CU3. On Aug 3 Dave, N7DB (CN85) worked into the Caribbean and reports contacts from the Pacific Northwest into PY. That day KØGU worked 6W1SE and Dave, N3DB (FM18) heard the D4C beacon. On Aug 4 KØGU worked EA8, CT, EA, CU2 and CN8 to the northeast and 11 JAs to the northwest. The same day K6QXY reports that KH7JJ heard the K6FV (CM87) beacon. On Aug 6 Chip, K7JA (DM04) worked Joe, CT1HZE, for his second European of the summer. Phil, NØKE (DM69); Ken, WØETT (DM79) and KØGU also worked Joe on the 6th. On the 7th NØJK reports a widespread European opening into the Caribbean. On the 9th John, W5UWB (EL17) worked EA on JT6M and Wes, WA5TKU, worked CT1HZE. John worked CT1HZE on the 10th. K6QXY worked KH7Y on the 13th. Several stations report double hop intercontinental E_s on several days. The second was especially good with Walt, AJ6T (CM87) hearing several southern CA stations on backscatter. WB4SLM worked into DM04/14 on the 2nd while Leo, KJ6HI (DM04) worked stations from NY to FL, Roger, K6LMN (DM04) worked into the Southeast and K6QXY worked into FL and GA. Paul, K7CW (CN87) worked into northern New England, VE1 and VE2 and stations along the Gulf coast. Lance, W7GJ (DN27) worked into Florida. On the 3rd K6QXY worked DE and all New England states but MA. W5UWB worked VT and VE2 on the 3rd and VE7 on the 4th. On Aug 4 Chuck, N6KW (CN87) worked from ME to GA. On the 9th K6QXY worked GA and FL.

HERE AND THERE

2007 ARRL International EME Contest. The final EME contest weekend will take place 0000Z to 2359Z Nov 15-16 for 50-1296 MHz. Please look at the previous two columns and at the detailed rules at **www.arrl.org/contests/rules/2008/eme.html**. Both digital and analog contacts are encouraged.

Leonids Meteor Shower. The Leonids are predicted to peak on November 17 at ~0900Z, with a rate (ZHR) of about 10/hr. Stream modeling predicts two enhanced periods but neither is visible from the US. Still, this shower has fast 71 km/s rocks and has produced big outbursts in the past, so it is worth a look.

432 MHz Standings by States Worked

Call Sign	State	States Worked	DXCC Entities Worked	Grids Worked	DX (km)
1					
K1TEO	CT	25	3	117	1,948
W1ZC	NH	20	2	71	1,984
W3EP/1	CT	20	2	61	1,760
W1AIM	VT	17	2	52	1,323
AA1YN	NH	11	2	22	821
K1VU	MA	11	1	16	814
WA1FVJ	CT	10	1	14	400
2					
W2CNS	NY	25	3	91	1,582
K2OVS *	NY	16	4	43	720
WB2AMU	NY	12	1	19	830
3					
W3ZZ	MD	26	2	93	1,526
K1RZ	MD	26	2	96	1,376
WA2FGK	PA	23	2	77	—
AE3T	PA	23	2	—	1,363
N3JNX	PA	11	1	25	786
4					
W4TJ *	VA	43	40	190	—
K4QI *	NC	39	51	261	—
AA4ZZ	NC	32	2	102	1,255
N4QWZ	TN	31	3	121	1,601
K4RF	GA	28	2	96	1,742
K4CSO	GA	25	1	114	1,582
W4WA	GA	25	1	83	—
K4XR	AL	22	3	91	1,550
K4RWP	TN	22	2	50	1,046
AA4H	TN	21	1	57	1,737
K4RTS	VA	20	2	68	1,078
N4MM	VA	18	3	58	—
KØVXM	FL	14	3	64	1,974
W4SW	VA	9	2	22	52
K4MM	FL	8	2	34	1,691
KE4WBO	FL	3	1	11	1,013
N9HF/4	FL	7	1	7	608
5					
W5LUA *	TX	50	—	—	—
W5RCI *	MS	47	22	234	2,992
WD5AGO *	OK	40	23	150	1,740
W5ZN *	AR	36	15	155	1,850
K5UR	AR	31	2	220	—
K5SW	OK	31	2	144	1,273
K5YPV	MS	23	3	103	1,327
W5HNK *	TX	20	1	—	1,651
W5UWB *	TX	14	3	39	2,167
W3UUM	TX	14	2	68	1,619
AA5AM	TX	9	1	52	1,728
AA5JG	OK	6	1	32	1,855
6					
K6QXY	CA	4	3	36	3,794
KC6ZWT	CA	4	2	50	3,934
KR7O	CA	2	1	39	582
N6ZE	CA	1	2	18	1,265
7					
W7MEM *	ID	19	10	55	—
K7XC *	NV	9	5	55	945
KI7JA	OR	4	2	21	683
WA7GSK	ID	3	1	12	—
8					
K2YAZ	MI	28	2	108	2,167
WA8RJF *	OH	22	3	80	1,287
N8PUM	MI	11	2	44	1,368
KB8O	OH	11	2	27	707
9					
N9LR	IL	34	3	136	1,562
K3SIW/9	IL	32	2	134	1,469
K9SM	IL	30	3	106	1,447
KA9UVY	IL	27	2	77	1,409
AA9MY *	IL	25	3	68	1,567
W9RPM	WI	9	2	75	983
KB9TLV	WI	7	2	30	782
Ø					
WØSD *	SD	50	25	138	—
KØRZ *	CO	46	48	271	1,083
KØALL *	ND	42	13	—	—
WØRT	KS	30	2	105	1,940
NØPB	MO	27	1	115	1,936
NØLL	KS	21	1	113	1,690
KØFF	MO	20	1	74	1,189
KØAWU	MN	15	2	67	1,474
Canada					
VE3TMG	ON	23	2	76	1,319
VE3KH	ON	18	—	54	1,174
VE2PIJ	PQ	9	2	37	694
International					
GW3HWR		—	15	36	2,760
F5DE	INT	—	9	58	752
NP3CW	PR	—	1	2	114

* Includes EME contacts
— Not given

SPECIAL EVENTS

Contact these stations and help commemorate history. Many provide a special QSL card or certificate!

Oct 1-Oct 31, 0100Z-2359Z, All call areas. North American QRP CW Club, N3A. North American QRP CW Club Fourth Anniversary. All QRP frequencies. Certificate and QSL. Tom Mitchell, WY3H, 210 Garretts Run Rd, Kittanning, PA 16201. **wy3h@arrl.net** *or* **www.arm-tek.net/~yoel**

Oct 3-Oct 13, 1500Z-0000Z, Albuquerque, NM. High Desert Amateur Radio Club of New Mexico, Inc, W5B. Albuquerque International Balloon Fiesta 2008. 21.300 14.260 7.235. QSL. High Desert Amateur Radio Club of New Mexico Inc, 6299 Wildflower Pass Dr NE, Rio Rancho, NM 87144. **www.nm5hd.com**

Oct 10-Oct 12, 1200Z-2200Z daily, Tuskegee, AL. Tuskegee Airmen Amateur Radio Net, W4T. Grand Opening of Tuskegee Airmen National Historic Site. 7.228 7.100 CW 14.290. QSL. Tuskegee Airmen ARS, 2220 West Coil St, Indianapolis, IN 46260. **na9y@arrl.net**

Oct 11-Oct 12, 1500Z-2100Z, Warren, CT. Northville Amateur Radio Association, W1W. The 47th Warren Fall Festival in Northwest Connecticut. 21.300 14.225. Certificate. W8ZY, 32 Chapin Rd, New Milford, CT 06776. **www.litchfieldhills.com/app/events/index.jsp?date=10/01/2008**

Oct 13-Oct 19, 0900Z-1600Z daily, Farnborough, Hampshire, England. Farnborough and District Amateur Radio Society, GB1CODY. 100th Anniversary of the First Powered Flight in England. 14.250 7.050. QSL. All QSOs will be acknowledged. *0900-1200Z 7.050; 1200-1600Z, 14.250.* **www.qrz.com/gb1cody**

Oct 16-Nov 1, 0600Z-0459Z, Uniontown, OH. Green Amateur Radio Experimenters, W8W. 25th Anniversary of New Wilderness Areas in West Virginia. 14.290 7.235 7.178 3.902. QSL. Miles Marsh, 2034 Dornoch Dr, Uniontown, OH 44685. *Station will be operating portable from several states.* **marshm@anycast.net**

Oct 18, 1300Z-2100Z, Trenton, MI. US Coast Guard Auxiliary District 9CR Div. 10, N8A. 69th Anniversary of USCG Auxiliary. 14.273. QSL. Bill Meahan K8QN, 1951 S Globe St, Westland, MI 48186-3930. **cgauxie@wa8tzg.org**

Oct 18-Oct 19, 1600Z-2200Z, Fort Worth, TX. Tri-County Amateur Radio Club of North Texas, WC5C. Greer Island Activation US Island TX058L. 14.330 7.280. QSL. Tri-County ARC WC5C, 820 Wood Ln, Azle, TX 76020.

Oct 25-Nov 2, 1500Z-2000Z, Punta Gorda, FL. Octagon Wildlife Sanctuary, W8OWS. 30 years of care for abused, injured or abandoned animals. 21.330 18.130 14.330 7.230. QSL. Tad Burik, K3QC, 2235 Virginia Ave, Fort Myers, FL 33905. **www.octagonwildlife.org**

Oct 31-Nov 1, 0600Z-0600Z, Frankenstein, MO. Warrensburg Area Amateur Radio Club, WØO. Frankenstein FunXpedition 2008. 28.370 21.378 14.265 7.255 3.945. QSL. WØAW, PO Box 1364, Warrensburg, MO 64093. **www.waarci.org**

Oct 31-Nov 1, 1800Z-1400Z, Frankenstein, MO. Mid-MO Amateur Radio Club, WØO. Frankenstein FunXpedition 2008. 21.040 14.040 10.113 7.040 3.540. QSL. 100% QSL—do not send QSL. **n0ss@embarqmail.com** *or* **www.mmccs.com/mmarc**

Nov 1, 1200Z-2100Z, Fire Island, NY. Great South Bay Amateur Radio Club, W2GSB/LH. Celebrating the 150th year of the Fire Island Lighthouse. SSB 14.260 7.250 3.755 CW 14.040 7.030 3.530 PSK 14.070. QSL. W2GSB/LH, PO Box 1356, West Babylon, NY 11704. **www.gsbarc.org**

Nov 1, 1400Z-2200Z, Asheville, NC. Western Carolina Amateur Radio Society, W4MOE. 30th Annual Shut-In Ridge Trail Run — A 17.8-mile trail race. 14.285 7.280 146.910 146.520. QSL. W4MOE Shut-In Race, PO Box 1488, Asheville, NC 28802. **w4moe@bellsouth.net**

Nov 1-Nov 3, 1500Z-0100Z, Split Rock, MN. Stillwater Amateur Radio Association, WØJH. Remembering the *Edmund Fitzgerald* at Split Rock Lighthouse. 14.260 14.070 7.260 3.860. Certificate. SARA — WØJH, Attn: Shel, NØDRX, 1618 West Pine St, Stillwater, MN 55082. **www.radioham.org**

Nov 1-Nov 15, 1800Z-0200Z, Sevierville, TN. 470 Amateur Radio Group, W4H. 470 Amateur Radio Group 1st Anniversary. 28.350 14.250 7.250 3.850. QSL. Rick Sawaya Sr, 2005 Spence Mountain Loop, Sevierville, TN 37876. **n4jtqrms@gmail.com**

Nov 1-Mar 1, 0000Z-0000Z, Reading, PA. The Great Outdoors Radio Club, WA3WSJ. The GORC Iditarod 2009 Challenge. 80 40 20 15 10 m CW/SSB/PSK. QSL. GIC-2009, 775 Moonflower Ave, Reading, PA 19606-3447. **www.wa3wsj.org/GORC_Iditraod2009.html**

Nov 7-Nov 9, 1800Z-1800Z, Whitefish Point, MI. Stu Rockafellow Amateur Radio Society, N8F and K8F. Remembering the *Edmund Fitzgerald*. 18.160 14.260 7.260 3.860. Certificate. Richard Barker, W8VS, 264 N East St, Brighton, MI 48116. **www.qsl.net/w8njh**

Nov 8, 1200Z-1900Z, Azle, TX. Tri-County Amateur Radio Club of North Texas, WC5C. NCTECH Honoring USA Veterans. 147.160 14.270 7.270 3.870. QSL. Tri-County ARC North Texas WC5C, 820 Wood Ln, Azle, TX 76020.

Nov 8, 1200Z-2359Z, Nutley, NJ. Robert D. Grant United Labor Amateur Radio Association, N2UL. Labor remembers those who served our nation. 28.420 21.360 14.260 449.975/ W2LI. Certificate. RDGULARA c/o WA2VJA, 112 Prospect St, Nutley, NJ 07110-0716.

Nov 8, 1500Z-2000Z, Detroit, MI. Livonia Amateur Radio Club, W8F. To commemorate the loss of the *Edmund Fitzgerald*. 28.400 28.200 7.250 7.125 CW SSB 10 15 20 40 80 m as conditions permit. Certificate. LARC Special Event, PO Box 51532, Livonia, MI 48151-5532. **www.livoniaarc.com**

Nov 8, 1500Z-2100Z, West Palm Beach, FL. West Palm Beach Amateur Radio Club, W4PBH. Palm Beach High School 100th Anniversary Celebration. 14.260 7.235. Certificate. David Fowler, 2702 Starwood Ct, West Palm Beach, FL 33406-5145. **www.wpbarc.org**

Nov 8, 1700Z-2359Z, San Diego, CA. USS *Midway* CV-41 Museum Radio Room, NI6IW. Veterans Day and the US Marine Corps Birthday (1775). SSB 14.325 7.250 CW 14.060 7.040 BPSK 7.070-7.080 MT63 14.109 7.037 RTTY 14.080 7.080. QSL. USS *Midway* CV-41 Museum Radio Room, 910 N Harbor Dr, San Diego, CA 92101. **af6ha@yahoo.com**

Nov 8-Nov 11, 1300Z-2100Z, Iron Mountain, MI. Mich-A-Con Amateur Radio Club, K8V. UP Veterans Memorial atop Pine Mountain. 14.060 14.280 7.060 7.230. Certificate. Thomas Martin, 812 West B St, Iron Mountain, MI 49801. **w8jwn@arrl.net**

Nov 9, 1400Z-2000Z, Rocky Point, NY. Radio Central Amateur Radio Club, W2RC. Anniversary of Opening of RCA's Radio Central. 14.270 14.050 7.270 7.050. QSL. W2RC — Radio Central ARC, PO Box 396, Centereach, NY 11720. *QSL Info: No envelope — just send your card and two stamps.* **www.rcarc.org**

Nov 9, 1700Z-2100Z, Butler, PA. Butler County Amateur Radio Association, W3UDX. Veterans Day from Butler, PA, Veterans Hospital. SSB gen bands 40 20 m. QSL. BCARA W3UDX, Box 1787, Butler, PA 16003-1787. **www.w3udx.org**

Nov 9-Nov 10, 0459Z-0459Z daily, Grand Rapids, MI. Michigan Amateur Radio Alliance, W8USA. Veterans Day. 14.250 14.040 7.250 7.040. Certificate. MARA Attn: Larry Dells, PO Box 670, Comstock Park, MI 49321-0670. *Do not send envelope.** **www.w8usa.org**

Nov 9-Nov 11, 1600Z-2000Z, Arlington Heights, IL. Armored Force Amateur Radio Net, KA9NLX. Veterans Day, in honor of all military veterans. 14.325 7.283 7.030 3.985. Certificate. John Paskevicz, 1423 North Ridge Ave, Arlington Heights, IL 60004. *AFAR members will also work 2 meters simplex and open repeaters in their home towns.* **john.paskevicz@us.army.mil**

Nov 9-Nov 12, 1300Z-2359Z, Spiro, OK. D. W. Greenwood, W5M. Celebrating Marine Corps Birthday. 28.460 21.350 14.250 7.238. QSL. D. W. Greenwood, K5DLO, 19299 Greenwood Rd, Spiro, OK 74959.

Nov 9-Nov 15, 0000Z-2359Z, Isabela, PR. Veterans Amateur Radio Group of Puerto Rico, WP4NYD. Veterans Day Salute. 18.130 14.285 7.183 3.890. QSL. Carlos R. Rodriguez, KP3S, Rte 5 Box 71A, Isabela, PR 00662-4509. **kp3s@arrl.net**

Nov 11, 1500Z-2245Z, Baton Rouge, LA. Baton Rouge and USS *Kidd* Amateur Radio Clubs, W5KID. Veterans Day. 15 20 40 m Gen bands. QSL. USS *Kidd* Special Event, 305 S River Rd, Baton Rouge, LA 70802. **www.lsu.edu/brarc/uss_kidd.htm**

Nov 11-Nov 12, 1100Z-0400Z, Charles Town, WV. Eastern Panhandle Amateur Radio Club, WW1FWB. WW-I 90th armistice anniversary at home of last surviving US vet. 14.290 7.190. Certificate. Mark Kraham, WW1FWB, 3370 Charles Town Rd, Kearneysville, WV 25430. **k8ep.net/ww1fwb**

Maty Weinberg, KB1EIB ♦ Special Events ♦ events@arrl.org

Nov 15, 1400Z-2000Z, Guthrie, OK. Edmond Amateur Radio Society, K5EOK. Oklahoma Statehood Day from Territorial Capital Building. 21.350 14.250 7.250. Certificate. EARS, PO Box 48, Edmond, OK 73083. **www.k5eok.org**

Nov 16, 1300Z-2000Z, Arecibo, Puerto Rico. Arecibo Observatory Radio Club, KP4AO. Commemorating 45 years of operations. 14.250 14.035. Certificate. Joseph Acure Jr, W3HNK, 115 Buck Run Rd, Lincoln University, PA 19352. **angel@naic.edu**

Nov 17, 1500Z-2300Z, Paulden, AZ. Yavapai Amateur Radio Club, K7NRA. Celebration of the NRA's 137th birthday. 21.335 14.250 7.250. Certificate. Michael Campbell, K7NRA, 404 Lampliter Village, Clarkdale, AZ 86324. **wb9vgj@arrl.net** *or* **www.w7yrc.org**

Nov 28, 1200Z-2000Z, Truro, MA. Marconi Cape Cod Radio Club, W1P. 110th Anniversary of Sinking of Steamship *Portland*. 18.160 14.260 7.260 3.997. QSL. Henry Brown, 19 Sao Paulo Dr, East Falmouth, MA 02536. **k1wcc@comcast.net**

Nov 29-Nov 30, 1500Z-2000Z daily, The Villages, FL. The Villages Amateur Radio Club, K4VRC. Thirteenth anniversary of club, from Sumter Landing Square. 14.310 7.250 3.940 146.925. Certificate. Ed Crowell, 1570 St James Cir, The Villages, FL 32162. **secretary@tvarc.net**

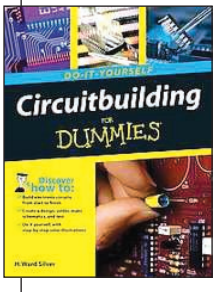
Certificates and QSL cards: To obtain a certificate from any of the special-event stations offering them, send your QSO information along with a 9×12 inch self-addressed, stamped envelope to the address listed in the announcement. To receive a special event QSL card (when offered), be sure to include a self-addressed, stamped business envelope along with your QSL card and QSO information.

***Note:** Some clubs may ask for a nominal fee to cover the cost of the certificate or QSL. Request will be made on air during the event or on the club's Web site.

Special Events Announcements: For items to be listed in this column, you must be an Amateur Radio club, and use the ARRL Special Events Listing Form, at **www.arrl.org/contests/spevform.html**, or if you prefer, forms are available via the Internet (**info@arrl.org**), or for an SASE (send to Special Requests, ARRL, 225 Main St, Newington, CT 06111, and write "Special Events Form" in the lower left-hand corner). Off-line completed forms may be mailed, faxed or e-mailed to ARRL, Attn: Special Events. Submissions must be received by ARRL HQ no later than the 1st of the second month preceding the publication date; that is, a special event listing for **Jan** *QST* would have to be received by **Nov 1**. In addition to being listed in *QST*, your event will be listed on the ARRLWeb Special Event page.

New Products

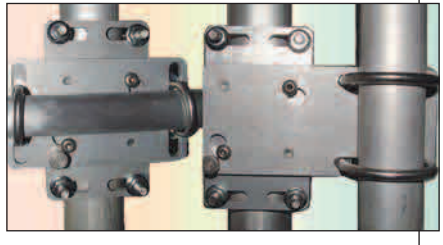
DO-IT-YOURSELF CIRCUITBUILDING FOR DUMMIES



◊ Have you ever wanted to build your own electronic device? This latest book by *QST* Contributing Editor Ward Silver, NØAX, will give you the background and techniques needed to build circuits. Illustrated, step-by-step directions help you accomplish tasks, and you'll construct many projects while learning the key circuit building principles and techniques. Topics include measuring and testing, maintenance and troubleshooting, cables, connectors, how to test your work, and more. With the author's help, you'll soon be able to build electronic circuits from start to finish — from working with schematics, to soldering and assembly, to testing and operation. 390 pages. Published by John Wiley & Sons, Inc, ISBN 0-4701-7342-4. Price: $24.99. For more information or to order, visit the ARRL Bookstore, **www.arrl.org/shop**.

CONNECT QUICK ANTENNA MOUNTS

◊ Connect Quick antenna mounting plates from Ironworks Design are designed to make antenna installation faster and easier during portable operation. Before leaving home, mount one plate on your antenna boom and the mating plate on your mast. In the field, the parts clip together quickly, without the need to use traditional U-bolts, loose hardware and wrenches in less-than-optimum conditions. Developed for the KT1J multi-op contest group, they are also of special interest to VHF/UHF contest "rovers," emergency communications teams and others needing to simplify portable antenna installation. The CQ-1 allows you to mount a horizontal boom to a vertical mast, and the CQ-V mounts a vertical antenna or mast to the main vertical mast. The plates are interchangeable. Price: $35. For more information, visit **www.connectquick.net**.



Strays

SPECIAL EVENT IDEAS, SUGGESTIONS NEEDED

◊ Have you helped organize some type of event? Your expertise is needed!

We're more than occasionally asked for guidelines in setting up special event stations. Some information is available on our contest and publicity sites, but we don't have anything specific.

So, we're asking you to help us gather some information on how you set up your events — whether it's a special event station, Field Day, a club event or activity or some other type of event. Some details that come to mind are logistics, volunteers, publicity, activities, materials and cameras.

If you have any ideas or words of wisdom you'd like to share (good, bad, dos, don'ts, short anecdotes), please e-mail them to **maty@arrl.org** (or send it by postal mail to my attention c/o ARRL Headquarters). Thanks for your help. —*Maty Weinberg, Special Events, ARRL Headquarters*

OREGON SLED RACE COMM SUPPORT NEEDED

◊ Organizers of January's Eagle Cap Extreme Sled Dog Race in Oregon are looking for ham radio volunteers. To learn more, please e-mail me at **president@eaglecapextreme.com** for a detailed job description, proposed Network overview, Volunteer opportunities and a Volunteer application. Our Web site is at **www.eaglecapextreme.com**. — *Clyde Raymer Jr, KLØCW*

S. KHRYSTYNE KEANE, K1SFA

75 years and counting: **In August, a group representing the Norfolk County Amateur Radio Association, W1AGR, of Westwood, Massachusetts, visited ARRL Headquarters. New England Division Director Tom Frenaye, K1KI (left), was on hand to present the club with a plaque commemorating the club's 75 years of affiliation with the ARRL. Richard Bean, K1HC (standing to the right of the "R") is the club president.**

K2TQN

OLD RADIO

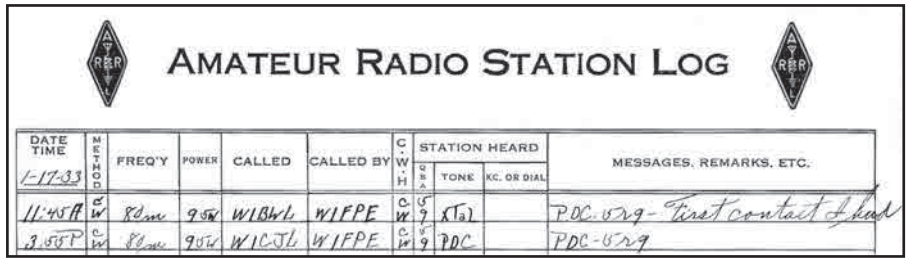
A Classic 1930 Transmitter

I arrived at the 1998 Antique Wireless Association conference in Rochester, New York early so I could get my car set up the evening before the meet started, as I was planning to sell a few extra items. One of my friends gave me a tip — there was a real nice old transmitter in the back of a station wagon parked not too far from me. I immediately went over and peeked in the windows, as no one was there setting up. I saw two tubes and parts of the transmitter's copper coils sitting inside a wooden box. It looked interesting and I promised myself that I would find the owner and inquire if it was for sale. (Not everything there is for sale. There is a large, old equipment contest at the conference and it could have been brought for that.) Nothing happened for the rest of the day; I didn't see the owner at the car.

The next morning I was up before sunrise, flashlight in hand, and out the motel door I went. This was the opening of the flea market and I know the early bird gets the worm. My first stop was that station wagon. Still no owner was in sight. I figured he was doing his early shopping like me. I walked around and found a few items, but I kept watching the station wagon. Eventually I bumped into a collector I knew from Connecticut and asked him if he knew whose car that was. (It had Connecticut tags.) He told me it was his car. I inquired about the transmitter and was told it was for sale — and the price was high. He promised me first look, but that would be a little later on in the morning, as he wanted to continue shopping.

Later I went with him to his car and we looked inside. Luckily, no one else noticed us. As we looked he told me this story. He had found it at a house sale in the attic. The family told him the builder had made it a long time ago. Before going into the service, he built two wooden crates for it and placed it in the attic. Inside was a beautiful Push-Pull CW transmitter whose design was taken from the November 1930 *QST* magazine. In fact it was on the cover. I wanted it bad, but the price was a lot more than I wanted to spend. He pushed it back inside the car and told me he'd think about my offer. Off and on during the day, I would up my offer a little and he would come down some, but we were still far apart. Eventually we were only $25 apart. I held out and soon he had a higher offer from another one of my friends and it sold to him. It was gone and I had made a mistake being cheap; I was so sure he would come down that last $25. I would learn that the $25 that stood between us would cost me more than $100 later and a side trip to New York State.

K2TQN



AMATEUR RADIO STATION LOG

DATE TIME	METHOD	FREQ'Y	POWER	CALLED	CALLED BY	C W H	STATION HEARD		MESSAGES, REMARKS, ETC.
							QRA	TONE	KC. OR DIAL	
1-17-33										
11:45A	CW	80m	95W	W1BWL	W1FPE	CW	579	XTal		PDC-579 - First contact I had
3:55P	CW	80m	95W	W1CJL	W1FPE	CW	579	PDC		PDC-579

Years Later

Years passed and last winter I saw an advertisement, from the lucky buyer that day, in *Antique Radio Classified* magazine for the same transmitter. The price was higher now, but I still wanted it. I contacted the seller and made arrangements to pick it up at his home in New York on my way to the Boston Radio Show last February. It was the same beauty I remembered, but one packing crate was now missing as were the two Type 45 tubes. But I was still happy to be reunited with it again.

The most exciting thing was that it still had the builder's original 1933 license, log book and one QSL card with it. This doesn't happen very often. They had been packed in the crate along with the radio. Knowing who built and owned the radio is very important to me. In reading the log book I discovered

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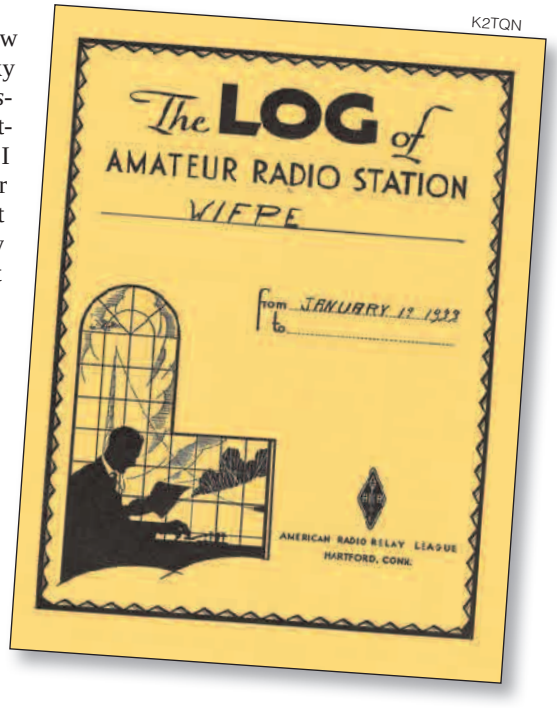
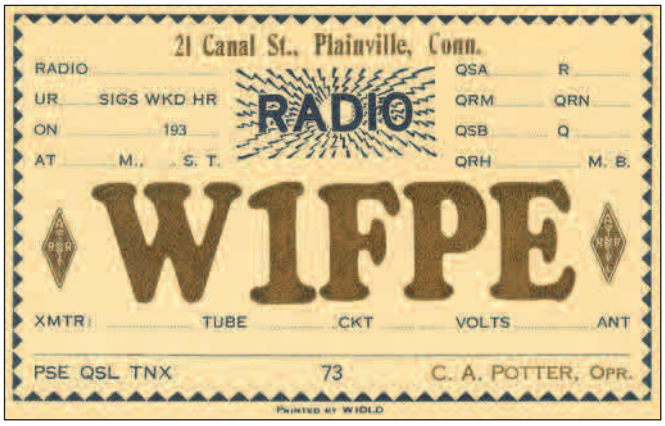
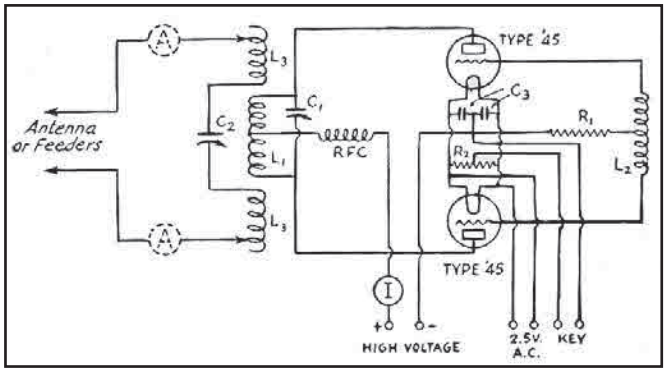


John Dilks, K2TQN ♦ 125 Wharf Rd, Egg Harbor Township, NJ 08234-8501 ♦ k2tqn@arrl.org





The transmitter's schematic taken from the November 1930 *QST* magazine.

K2TQN

The power supply and transmitter as they might have been set up for use.

K2TQN

K2TQN

The power supply still contained in the original wooden crate.

that the builder went on the air on January 17, 1933 and made his first contact with W1BWL. His first two contacts were probably with friends, as they were both located in his home town. He continued operating several times a week until his last contact on May 4, 1933. This is where the log ends, and I assume the rig was packed and put away, until 1998 when my Connecticut friend purchased it.

I would be interested in hearing what happened to W1FPE, Clinton Albert Potter, who lived at 21 Canal Street, in Plainville, Connecticut. (If anyone knows of him, please tell me and I'll add the information to my Web page.) I would think if he came back and took up ham radio again he would have picked up his rig, if for nothing else, for the parts. Lucky though for us he didn't part it out. Now we can enjoy his fine work.

Transmitter Design by George Grammer

Historically, one of the best circuit designers, ARRL Technical Editor George Grammer, W1DF, came up a winner with this transmitter. The proof being that it is still a popular design today, with many collectors building and using replicas of this exact rig in the old radio contests.

There is a big reason it was popular then. In his 1930 *QST* article, Grammer said this transmitter is built almost entirely of receiving equipment that was readily obtainable and the cost of all the necessary parts, including the key, was approximately $45. He recommended a milliammeter be added to read plate current, which would add $7 or $8 to the cost. Today parts are still available from old radios, at hamfests and old radio swap meets. I'll put Grammer's original article and more photos on my Web site, **www.k2tqn.com** in case you want to build a replica. His article has every detail you will need to do so.

The original builder of this transmitter, which I assume was W1FPE, did such an outstanding job that it won a blue ribbon in a recent contest at the Carolinas Chapter of the Antique Wireless Association. This was in the "as found" condition. Nothing was done to it for the contest, except to dust it off. — *K2TQN*

Strays

***QST* congratulates...**

◊ Norman H. Pond, K6NHP, of Los Altos Hills, California, whose book, *The Tube Guys*, published by Russ Cochran Publishing, recounts the history of the microwave tube business.

◊ Meredith Peruzzi, W4BVV, of Vienna, Virginia, a member of the Gallaudet University team that won its third consecutive championship in the National Association of the Deaf College Bowl, held July 9, 2008 during the 49th biennial NAD conference in New Orleans, Louisiana. Robert Weinstock, W3RQ, is team coach. — *Tnx W3RQ*

AT THE FOUNDATION

More Than 55 Foundation-Sponsored Scholarships Available

The official opening of the application period of ARRL Foundation Scholarships is October 1, 2008. All members are encouraged to spread the word that more than 55 scholarships will be awarded to qualified FCC-licensed hams who are pursuing higher education.

The most prestigious award is the four year William R. Goldfarb Memorial Scholarship, awarded to a high school senior to ensure funding of the student's pursuit of studies in business, medicine, computer science, engineering or other science disciplines. Other scholarships range from $500 a year to $2500 a year.

All information about available scholarships can be found on the ARRL Web at **www.arrl.org/arrlf/scholgen**, including descriptions and selection criteria, application instructions and forms.

Important note: The application period for the 2008 ARRL Foundation Scholarships opens October 1, 2008 and closes promptly February 1, 2009. Applicants must arrange for current transcripts as part of the application process. The Goldfarb Scholarship requires a separate application and a FAFSA/SAR in addition to a complete high school transcript. QST

Mary M. Hobart, K1MMH ♦ Secretary, ARRL Foundation Inc ♦ mhobart@arrl.org

COMING CONVENTIONS

INDIANA STATE CONVENTION

November 15-16, Fort Wayne

F D V S

The Indiana State Convention (36th Annual Fort Wayne Hamfest and Computer Expo), sponsored by the Allen County AR Technical Society, will be held at the Allen County War Memorial Coliseum, 4000 Parnell Ave (corner of Coliseum Blvd). Doors are open for setup on Friday evening and Saturday morning; public Saturday 9 AM-4 PM, Sunday 9 AM-3 PM. Features include over 750 commercial and flea market tables; new and used radio, computer, and general electronics items; vendors; several international ham equipment manufacturers; many forums and meetings; VE sessions (Saturday); parking ($4). Talk-in on 146.88. Admission is $6 for both days or $4 for just Sunday (at the door only); under 12 free when accompanied by an adult. Flea market tables are $25, premium tables are $50; $27.50 for electricity (advance reservations required; no table sales at the door). Send SASE to AC-ARTS/Fort Wayne Hamfest, Box 10342, Fort Wayne, IN 46851-0342; or contact James Boyer, KB9IH, 260-579-2196; **chairman@fortwaynehamfest.com**; **www.fortwaynehamfest.com**.

WEST CENTRAL FLORIDA SECTION CONVENTION

December 6-7, Palmetto

F D H V S

The West Central Florida Section Convention (33rd Annual Tampa Bay Hamfest), sponsored by the Florida Gulf Coast AR Council, will be held at the Manatee Civic Center, US 301 and Haben Blvd. Doors are open Saturday 8 AM-5 PM, Sunday 9 AM-2 PM. Features include large electronics flea market, paved tailgating ($15 per space plus admission for the entire weekend; opens Saturday at 7 AM, Sunday at 8 AM; **tailgate@fgcarc.org**), commercial exhibit booths ($175 each; **commercial_booths@fgcarc.org**), vendors, forums and programs, VE sessions (Saturday 9-11 AM, 11:30 AM-2 PM, and 3-5 PM; Sunday 9 AM-2 PM; $14 fee, walk-ins accepted on Saturday but reserved basis only on Sunday; **testing@fgcarc.org**), ARECC Testing (Saturday 2-3 PM; $10 fee), card checking (DXCC, WAS, VUCC; both days), handicapped accessible, free parking. Talk-in on 146.955 (100 Hz). Admission is $6 in advance, $8 at the door (good all weekend; **tickets@fgcarc.org**). Tables are $20 each for the weekend, plus admission (electricity available for $32 per outlet for the weekend; **tables@fgcarc.org**). Contact Keating Floyd, KC4HSI, c/o FGCARC, Box 22042, Tampa, FL 33622-2042; 813-765-8916; fax 866-684-7478; **chairman@fgcarc.org**; **www.tampabayhamfest.org**.

October 17-18
Amateur Radio Lighthouse Society, St Simons Island, GA*

October 17-19
Pacific Division, San Ramon, CA*

November 1-2
Georgia State, Lawrenceville*

November 8
Alabama Section, Montgomery*

January 10
SWOH Digital and Technical Symposium, Middletown, OH

*See October *QST* for details.

F = FLEA MARKET
D = DEALERS / VENDORS
H = HANDICAP ACCESS
V = VE SESSIONS
S = SEMINARS / PRESENTATIONS

Attention Hamfest and Convention Sponsors:

ARRL HQ maintains a date register of scheduled events that may assist you in picking a suitable date for your event. You're encouraged to register your event with HQ as far in advance as your planning permits. Hamfest and convention approval procedures for ARRL sanction are separate and distinct from the date register. Registering dates with ARRL HQ doesn't constitute League sanction, nor does it guarantee there will not be a conflict with another established event in the same area.

We at ARRL HQ are not able to approve dates for sanctioned hamfests and conventions. For hamfests, this must be done by your division director. For conventions, approval must be made by your director and by the executive committee. Application forms can be filled out online at **www.arrl.org/FandES/field/hamfests/regform.html**.

Note: Sponsors of large gatherings should check with League HQ for an advisory on possible date conflicts before contracting for meeting space. Dates may be recorded at ARRL HQ for up to two years in advance. QST

Gail Iannone ♦ Convention and Hamfest Program Manager ♦ giannone@arrl.org

HAMFEST CALENDAR

Attention: The deadline for receipt of items for this column is the **1st of the second month preceding publication date**. For example, your information must arrive at HQ by **November 1** to be listed in the **January** issue. Hamfest information is accurate as of our deadline; contact sponsor for possible late changes. For detailed directions to the event, see the event Web site or contact sponsor. For those who send in items for Hamfest Calendar and Coming Conventions: Postal regulations prohibit mention in *QST* of prizes or any kind of games of chance such as raffles or bingo.

Abbreviations: *Spr* = Sponsor, *TI* = Talk-in frequency, *Adm* = Admission.

Arizona (Mesa)—Dec 6 F D H V S
6:30 AM-3:30 PM. *Spr:* Superstition ARC. Mesa Community College, 1833 W Southern Ave (at corner of Dobson Rd). Flea market, dealer and vendor tables, seminars, VE sessions, handicapped accessible. *TI:* 147.12 (162.2 Hz). *Adm:* Free. Tables: $10. Judy Ferrara, K7JLF, 1058 S 97th St, Mesa, AZ 85208; 480-354-0782; **www.wb7tjd.org; rainbowskies@bigstring.com**; .

Connecticut (Waterford)—Oct 25. Darryl Del Grosso, WA1DD, 860-443-7799, **ddelgrosso@sbcglobal.net**; **www.tricityarc.com**. (Auction)

Florida (Coral Gables)—Nov 15. Bill Moore, WA4TEJ, 305-264-4465; **wa4tej@juno.com**; **www.FlamingoNet.8m.net**.

Florida (Fort Lauderdale)—Nov 22 F V
7 AM-1 PM. *Spr:* Broward ARC. Collins Center, 3900 NE 3rd Ave. "Cy Harris W4MAQ Memorial Free Flea," VE sessions, ARECC Exams. *TI:* 146.79. *Adm:* Free. Marty Falk, KI4IQZ, 4860 NE 1st Terr, Oakland Park, FL 33334; 954-632-1667; **martfalk@bellsouth.net**; **www.eagle3.net/barc**.

Florida (Okeechobee)—Nov 29 F V
Set up 6 AM; public 8 AM-4 PM. *Spr:* Okeechobee ARC. Freedom Ranch, 11655 Hwy 441 SE. "Hamfest in the Woods," free tailgating with paid admission, VE sessions, free parking, big breakfast, catfish lunch. *TI:* 147.195 and 147.09 (both 100 Hz). *Adm:* $5. Tables: Limited table space (bring your own, included with gate fee). Dennis Hamilton, AD4PS, 5000 NE 122nd Dr, Okeechobee, FL 34972; 863-578-0220; fax 863-578-0221; **ad4ps@bellsouth.net**; **www.k4oke.com**.

Florida (Palmetto)—Dec 6-7, West Central Florida Section Convention. See "Coming Conventions."

Illinois (Litchfield)—Nov 9. Scott Millick, K9SM, 217-324-2412; **smillick@wamusa.com** (Banquet/Swap).

Indiana (Evansville)—Nov 29 F V
8 AM-1 PM. *Sprs:* Electronic Applications Radio Service (EARS) and The Ham Station. Vanderburgh County 4-H Fairgrounds, 201 E Boonville-New Harmony Rd. 17th Annual Hamfest, pre-hamfest biscuits and gravy breakfast, free tailgating (weather permitting), VE sessions, ham and beans lunch. *TI:* 145.15, 146.925, 443.925, (107.2 Hz on all frequencies); backup 145.11. *Adm:* $7. Tables: advance $10 (if paid by Nov 15), $12 (after Nov 15). Neil Rapp, WB9VPG, 2744 Pinehurst Dr, Bloomington, IN 47403; 812-333-4116; **wb9vpg@w9ear.org**; **w9ear.org/hamfest.htm**.

Indiana (Fort Wayne)—Nov 15-16, Indiana State Convention. See "Coming Conventions."

Michigan (Mount Clemens)—Dec 7 F V
8 AM-noon. *Spr:* L'Anse Creuse ARC. L'Anse Creuse High School, 38495 L'Anse Creuse St. 36th Annual Amateur Radio/Computer Swap, VE sessions, free parking. *TI:* 147.08 (100 Hz). *Adm:* $5. Tables: $14. Marty Folz, K8HVI, 40360 Ryan Rd, Sterling Heights, MI 48310; 586-268-0544; **k8hvi@arrl.net**; **www.n8lc.org**.

Mississippi (Ocean Springs)—Nov 14-15 F H V
Friday 5-9 PM, Saturday 8 AM-2 PM. *Spr:* Jackson County ARA. St Martin Community Center, Lemoyne Blvd. Fall Hamfest, VE sessions (Saturday, 9 AM), handicapped accessible. *TI:* 145.11. *Adm:* $4. Tables: $10. Wendell McCollom, WM5W, 14017 Suburban Dr, Vancleave, MS 39565; 228-875-4720; **wm5w@bellsouth.net**; **www.jcmsara.org**.

Mississippi (Poplarville)—Dec 6 F D V
8 AM-3 PM. *Spr:* Pearl River County ARC. Pearl River County Fairgrounds, Hwy 26. Friendly Hamfest, vendors, VE sessions. *TI:* 145.21 (136.5 Hz), 146.52. *Adm:* $1. Tables: $12. Larry Wagoner, N5WLW, 40 Pinetucky Rd, Carriere, MS 39426; 601-590-0553; **n5wlw@arrl.net**; **www.prcarc.com**.

New Hampshire (Londonderry)—Nov 1 F D H V
8 AM sharp-noon. *Spr*: Interstate Repeater Society. Londonderry Lions Hall, 256 Mammoth Rd. Flea market, indoor and outdoor vendors, VE sessions, free parking, handicapped accessible. *TI:* 146.85 (85.4 Hz). *Adm:* $3. Tables: $15. George Moranian, N1NAZ, 603-421-0940; **n1naz@yahoo.com**; **www.irs.nhradio.org.**

New Mexico (Roswell)—Oct 18 F
7 AM-2 PM. *Spr:* Pecos Valley ARC. PVARC Clubhouse, corner of N Ohio Ave and W Riverside Dr (at Cahoon Park). Tailgating, free breakfast and lunch. *TI:* 146.94. *Adm:* Free. Rich Brown, KE5IAY, 152 Bittersweet Rd, Lake Arthur, NM 88253; 575-703-0204; **ke5iay@swwmail.net**; **www.dfn.com/pvarc**.

North Carolina (Benson)—Nov 16 F D V
8 AM-4 PM. *Spr:* Johnston ARS. American Legion Complex, 601 N Wall St. 21st Annual "JARSFEST," tailgating, indoor tables, dealers, VE sessions. *TI:* 147.27. *Adm:* advance $5, door $6. Tables: $10. Bill Lambert, AK4H, 8917 NC 50 N, Benson, NC 27504; 919-894-3352; fax 919-894-3219; **blambert1@mindspring.com**; **www.jars.net**.

South Carolina (Garden City Beach)—Nov 15 F D V
8 AM-2 PM. *Spr:* Grand Strand ARC. St Michael's Church Duffy Center, 542 Cypress Ave. 16th Annual BeachFest 2008, outside tailgating, inside vendors, VE sessions, refreshments. *TI:* 147.33 (85.4 Hz). *Adm:* $6. Tables: $10. Jim Roble, N4GSA, Box 2135, Myrtle Beach, SC 29578; 843-903-5025; **n4gsa@w4gs.org**; **www.w4gs.org/beachfest/**.

Texas (Azle)—Nov 8 F V S
8 AM-1 PM. *Spr:* Tri-County ARC of North Texas. Azle Community Center, 404 W Main St. Flea market, presentations, demos, VE sessions. *TI:* 147.16 (110.9 Hz). *Adm:* $5. Tables: $10. David Johnson, KB5YLG, 820 Wood Ln, Azle, TX 76020; 817-444-5165; **kb5ylg@yahoo.com**; **www.wc5c.org**.

Texas (Corpus Christi)—Nov 8 F V S
8 AM-4 PM. *Spr:* South Texas ARC. Hilltop Community Center, 11425 Leopard St. 10th Annual Coastal Bend Hamfest, tailgating, vendors, forums, VE sessions. *TI:* 146.82 (107.2 Hz). *Adm:* advance $5 (online); door $7. Tables: Free. Linda Shell, W5LSS, 3533 S Alameda St, Corpus Christi, TX 78411; 361-442-9852; fax 361-808-2122; **Linda.Shell@dchstx.org**; **www.starc-corpuschristi.org/**.

Wisconsin (Appleton) –– Nov 2 F D V
Set up 6 AM; public 8 AM. *Spr*: Fox Cities ARC. The Wave Ballroom, 2350 N Casaloma Dr. Swapfest, vendors, VE sessions. *TI*: 146.76 (100 Hz). *Adm*: advance $5, door $6. Tables: $10. Anthony Mach, AB9IO, 773 Yorkshire Rd, Neenah, WI 54956; 920-722-0482; **hamfest@fcarc.us; www.fcarc.us/hamfest.php**.

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Attention All Hamfest Committees!
Get official ARRL sanction for your event and receive special benefits such as an announcement in these listings, donated ARRL publications, handouts, discounted rates for display advertising, and other support.

It's easy to become sanctioned. Contact the Convention and Hamfest Branch at ARRL Headquarters, 225 Main St, Newington, CT 06111, 860-594-0262, or send e-mail to **giannone@arrl.org**. The application form can be filled out online at **www.arrl.org/FandES/field/hamfests/regform.html**.

Promoting your event is guaranteed to increase attendance. As an approved event sponsor, you are entitled to special discounted rates on *QST* display advertising and *ARRL Web* banner advertising. Call the ARRL Advertising Desk at 860-594-0207, or e-mail **ads@arrl.org**.

New Products

RADIO MATE KEYPAD FROM BHI LTD

♢The bhi Radio Mate for Yaesu FT-817, FT-857 and FT-897 transceivers is a compact remote keypad that allows easier access to many common radio functions. Designed for portable and mobile operation or use by disabled operators, the keypad provides shortcuts for changing band and mode, accessing memories, changing frequency and VFO, transmitting a short tune-up carrier, and other functions. The Radio Mate requires no external power and connects to the transceiver ACC socket/CAT interface. Keypad dimensions are approximately 6 × 4 × 1 inches. The Radio Mate is manufactured in the UK by bhi Ltd and distributed in the US by W4RT Electronics. Price: $199.95. For more information or to order, visit **www.w4rt.com**.

SILENT KEYS

It is with deep regret that we record the passing of these amateurs:

♦K1CEC **Basso**, Thomas L., Port Saint Lucie, FL
KA1CEC **Chain**, James H., Suffield, CT
WA1EDR **Witkowski**, M. Lorraine L., Manchester, CT
KC1GP **Oliva**, Samuel A., Canton, OH
N1KBI **Medeiros**, Jesse N., Somerset, MA
KY1O **Bulkley**, David D., Chatham, MA
KA1TQZ **Smith**, Raymond D., Waterville, ME
KC2CBU **Tanner**, James F., Sanborn, NY
KB2FBI **Miller**, Jeffrey P., Austin, TX
W2GX **Brooks**, George W., Newburgh, NY
KC2HFX **Angrick**, Kenneth A., Camillus, NY
♦W2IIC **Hepburn**, James C., S Plainfield, NJ
W2QIQ **Andzer**, Abraham, Rochester, NY
K2RXN **Searles**, Charles A., Brick, NJ
♦WA2WWP **Gallagher**, Vance C., Somers Point, NJ
KA2ZPQ **Harris**, Floyd D., Medina, NY
KO3D **Pentland**, James, Lancaster, PA
W3FLD **Zett**, John A., Dover, PA
W3LFN **Shenton**, Robert E., Bethesda, MD
K3MRT **Valasek**, Joseph A., Ford City, PA
N3PYI **Penman**, Lewis P., Erie, PA
♦K3UKW **Musero**, Anthony N., Philadelphia, PA
♦W3WIY **Hutchinson**, Richard A., Mount Bethel, PA
WA3WKC **Bevard**, Ronald K., Newark, MD
KU4BT **Stark**, John J., St Petersburg, FL
W4CNZ **Witham**, Burton B. Jr, Englewood, FL
KE4EYI **Wagner**, Cecil L., Saint Petersburg, FL
W4GBL **Lovelace**, Geraldine B., Shelby, NC
K4GCQ **Frizzell**, William F., Washington, VA
K4HU **Mills**, Harry J., Hendersonville, NC
KG4IKG **Sipek**, Steven J., Indianapolis, IN
K4JHR **Fehler**, Byron G. Jr, Fort Thomas, KY
W4JSU **Reaves**, Clarence W., Jacksonville, AL
KC4KOL **Moseley**, Rosaleon M., Fairfax, VA
K4MNN **Womack**, Robert D., Nashville, TN
N4MXG **Ginsburg**, Martin, Canoga Park, CA
N4MYZ **Ginsburg**, Alice G., Canoga Park, CA
W4NOP **Marler**, Frank C., Cartersville, GA
KB4OGI **Skinner**, James R., Jacksonville, NC
W4PMR **Greene**, Conrad L., Escondido, CA
W4RGM **Smith**, Fletcher B. Jr, Huntsville, AL
WB4RYK **Hazelrigg**, Charles H., Asheville, NC
♦N4TO **Dubois**, Victor A., Sebring, FL
KQ4TR **Sammons**, Colleen G., Fort Myers, FL
W4VGZ **Buffington**, Edward E., McLeansville, NC
N4VOX **Lineberry**, Gilliam T., New Braunfels, TX
W4VXM **Wayne**, John W. III, Fort Walton Beach, FL
W4XAA **Kneitel**, Tom, DeLand, FL
NU4X **Bergan**, William R., Stuart, FL
AE5AJ **Cormier**, Kermit J., Lafayette, LA
W5CEU **Goodwin**, Terry L., Payson, UT
K5HBP **Hutchinson**, Glenn C., Charlotte, NC
WD5HPU **Greenshields**, James B., Norman, OK
KB5HRR **Gorman**, John R., Albuquerque, NM
N5MBF **Whatley**, Sherman M., Mineola, TX
W5OWS **Ritchey**, Lowie C. Jr, Seguin, TX
W5RHN **Noss**, Robert H., Hot Springs, AR
K5SIE **Roe**, Sie A., Catoosa, OK
♦NM5WL **Lightsey**, Wayne A., Albuquerque, NM
W5YDA **Scarborough**, M. H., Teague, TX
KD5ZPS **Barrow**, Robert D., Rio Rancho, NM
♦WA6ABD **Smith**, Norman P., Severn, MD
WA6DPL **Cowl**, Carlo, Everett, WA
W6GPK **Bonner**, George A., Roseville, CA
K6IBY **Burke**, Joseph F., Costa Mesa, CA
K6ICG **Carry**, Edward J., San Diego, CA
K6KVL **Root**, Manford L., Burney, CA
KF6NFC **Hicks**, Jim, Huntington Beach, CA
AA6O **Schneider**, Ed, Charlottesville, VA
W6OAE **Hess**, Vicki L., Eau Claire, WI
♦WB6QAB **Shelton**, John B., Englewood, CO
N6QWS **Landrum**, Billy F., Gainesville, FL
WA6RAK **Stewart**, Floyd G., Fresno, CA
KD6SA **La Pointe**, Gerald T., Etiwanda, CA
N6TNN **Savage**, Eric D., Fremont, CA
K6TZN **McCormack**, Loudon B., Fortuna, CA
WB6WQX **Glispie**, Oliver, Bristol, TN
W6YKE **Miller**, Frederick R., Santa Rosa, CA
KA7ABR **McGillvrey**, Edward L. Jr, Springfield, OR
W7ANV **Graf**, Donald W., Milwaukie, OR
♦N7BF **Burgstahler**, Alan P., Bonney Lake, WA
W7BYB **Hash**, Alma R., Elk Grove, CA
K7CET **McCaughey**, William F., Tucson, AZ
W7DBO **Jacobs**, James A., Tooele, UT
KE7DOL **Elder**, Edwin, Portland, OR
♦AL7FH **Fromm**, Julia A., "Jan," Bartlesville, OK
WA7HJR **Simpson**, Barry W., Tacoma, WA
W7KOI **Shobe**, Earl P., Elko, NV
AD7PH **Storer**, Bruce, Silverdale, WA
WB7PKW **Purcell**, Lloyd M., Litchfield Park, AZ
♦W7QMW **Zoll**, Harold G., Seattle, WA
KC7YNT **Coe**, Hollis E., Port Angeles, WA
♦WA8AFV **Csondor**, Dennis E., Lansing, MI
NS8B **Ihle**, Luther, Youngstown, OH
KI8CW **Beard**, William J. Jr, Welch, WV
W8GBJ **Berbari**, Thomas N. Sr, Massillon, OH
W8GLV **Zeigler**, Charles F., Vero Beach, FL
W8JJD **Martin**, George E., Coopersville, MI
W8KVU **Moore**, William R., Hamilton, OH
♦W8QOI **Wert**, Raleigh L., Midland, MI
KB8TAG **Hark**, Thomas, Charleston, WV
K8TXS **Henderson**, Alex J., Almont, MI
N8WPH **Shaffer**, Roy P., Toledo, OH
WA8YQR **Harding**, O. B. Jr, Ashland, OH
K9AKI **Lund**, John H., New Berlin, WI
♦W9ICZ **Stier**, Ronald L., Richmond, IN
KB9NG **Manke**, William, Madison, WI
W9OV **Shoemaker**, Donald W., Channahon, IL
WA9PZU **Amidzich**, Mel L., Franklin, WI
KF9QA **Deitz**, Clyde H., Wisconsin Rapids, WI
N9RU **Brown**, Charles J., San Antonio, TX
♦W9SFY **Ray**, A. L., Vandalia, IL
W9TPO **Scholz**, Gilbert G., San Antonio, TX
KB9YHD **Brown**, Edward R., Floyds Knobs, IN
W9ZLN **Grau**, Phillip D., Rochester, IN
KC0CIA **Schumacher**, Donald S., Badger, SD
WD0DQJ **Sandlin**, James R., Overland Park, KS
K0DXF **Lipinski**, Christopher E., Saint Paul, MN
WD0HRH **Bjornstad**, Neil R., Two Harbors, MN
KB0JXU **Capps**, Gary B., Bloomfield, MO
KC0LES **Waits**, Ronald J., Wichita, KS
KX0L **Buehler**, Norman C., Scott City, KS
W0QMY **Olseen**, William R., Rochester, MN
N0TLR **Rankin**, Marvin W., Fort Scott, KS
KB0YBH **Callahan**, Mike P., Dickinson, ND
WB0ZJH **Rolf**, Erwin H., Shenandoah, IA
VE3TFD **Leek**, Robert, Witby, ON Canada
LA1TJ **Ringnes**, Helge , Klofta, Norway
LA4CM **Forland**, Thorleif, Akrehamn, Norway
EI9CB **McNamara**, Patrick J., Limerick City, Ireland

♦ Life Member, ARRL

Note: Silent Key reports must confirm the death by one of the following means: a letter or note from a family member, a copy of a newspaper obituary notice, a copy of the death certificate, or a letter from the family lawyer or the executor. Please be sure to include the amateur's name, address and call sign. Allow several months for the listing to appear in this column.

Many hams remember a Silent Key with a memorial contribution to the ARRL Foundation or to ARRL. If you wish to make a contribution in a friend or relative's memory, you can designate it for an existing youth scholarship, the Jesse A. Bieberman Meritorious Membership Fund, the Victor C. Clark Youth Incentive Program Fund, or the General Fund. Contributions to the Foundation are tax-deductible to the extent permitted under current tax law. Our address is: The ARRL Foundation Inc, 225 Main St, Newington, CT 06111. QST

Amy Hurtado, KB1NXO ♦ Silent Keys Administrator ♦ sk@arrl.org

Field Organization Reports

Public Service Honor Roll
August 2008

This listing recognizes radio amateurs whose public service performance during the month indicated 70 or more points in six categories. Details on the program are at this Web page: **www.arrl.org/FandES/field/pshr/**.

615 WB7WOW
174 WD9FLJ
W5DY W3YVQ
114 AA4BN
N2GS AA3SB WB4FDT
N8NMA
560 W7TVA
173 KB2ETO
131 KI4QAU
113 KT5SR N7IE
K2AN KM1N
KC2ANN 83
349 KI4GWC
170 KB2RTZ
130 N2QZ W0SJS
110 N0MEA
98 KS3Z
W5ESE NA7G
325 N2LTC
168 KA8ZGY
128 K7BC
N7XG N7YSS N4ABM WB4GHU
97 KB5PGY
82 KD7OED WD0GUF KG2D
321 KI4KWR
165 KI4GEM
125 N8IO
95 W7QM W7GB
KF7GC WG8Z
N1CKM
296 KA2ZNZ
160 KG0GG
NN7H W7EKB N2GJ N1UMJ
KE5DKV W6DOB N1JX N1IQI K1YCQ
KB3LFG K2GW
81 KC4PZA
278 W2MTA
155 K9LGU
94 N7EIE
80 W1SGC KE7DVV
270 W2LC
151 W2SFD
124 KJ4FCH
107 WB2KNS
93 W7VSE W5CU
KB2BAA WA2NDA
255 N7CM
150 KB5KKT KK3F
123 W3CB W5XX
106 K2UL
WB8OIF
78 WA1JVV
240 K7EAJ
149 K4SFM
122 AD5CQ
105 W3GQJ KE4CB
92 W2CC
91 N2KPR
77 KI4PRX
200 WA2WMJ WB5ZED
146 KK1X
120 W8UL KA4FZI K6JT AG9G KB9KEG N3RB KK5GY KB3LNM W4ZJY N1LKJ W1GMF K1YCQ KD1LE
104 KK7DEB
76 K4HUB
90 KK7TN KI4JQB K1JPG KF4WIJ N8DD WD8Q WA2CUW N3ZOC K3IN KA8WNO WD8DHC
75 KA3NZR AL7N 73 KC2SKI 71 W5GKH 70 W0ADZ N0DUW N0DUX NU0F KA0FUI N0MHJ K0RXC N0UKO WA0VKC KD7ZUP
196 AC6C
145 W0LAW K3CSX
195 KE5HYW
W8CPG
143 AD4BL
192 K4DND
140 K7BFL KC5OZT
190 WA2BSS
118 W2DWR
188 W4CAC
139 WB2LEZ
115 W4NBF WX4H N9DGK
100 NN7D W7JSW N9MN WB8SIQ N8OD K4SCL W7GHT N2VC WB6UZX W3TWV
89 K6RAU KM5VM KN7NO
87 N2VQA K7MQF
180 K0IBS AK2Z
138 KD7THV
135 W8IM

The following stations qualified for PSHR in previous months but were not recognized in this column: (Jul) KF7GC, NN7D, W7JSW 94, KD7OED 82. (Jun) W5DY 110. (Aug 2007) K3CSX 130.

Section Traffic Manager Reports
August 2008

The following ARRL Section Traffic Managers reported: AK, AL, AZ, CO, CT, EB, EMA, ENY, EWA, GA, ID, IL, KS, KY, LA, MDC, MI, MN, MO, MS, NC, NFL, NH, NLI, NNJ, NNY, NTX, OH, OK, OR, SC, SD, SFL, SJV, SNJ, STX, TN, UT, VA, WCF, WI, WMA, WNY, WTX, WV, WWA, WY.

Section Emergency Coordinator Reports
August 2008

The following ARRL Section Emergency Coordinators reported: CT, IN, KS, LA, MDC, MO, MS, NM, NTX, NV, SNJ, STX, SV, WPA, WTX, WV.

Brass Pounders League
August 2008

The BPL is open to all amateurs in the US, Canada and US possessions who report to their SMs a total of 500 or more points or a sum of 100 or more origination and delivery points for any calendar month. Messages must be handled on amateur radio frequencies within 48 hours of receipt in standard ARRL radiogram format.

Call	*Orig*	*Rcvd*	*Sent*	*Dlvd*	*Total*
WB5ZED	18	504	683	0	1187
KK3F	15	1142	1112	30	2299
KA9EKG	46	641	563	35	1285
WB5NKD	2	180	1084	0	1266
N1IQI	0	266	949	0	1215
W4ZJY	0	504	683	0	1183
WB5NKC	52	76	761	43	932
W8UL	0	481	445	3	926
W1GMF	0	155	500	0	655
WX4H	2	325	278	8	613
K7BDU	10	267	277	4	558

The following station achieved BPL with originations plus deliveries: K8LJG 119.
The following station achieved BPL in July, but was not recognized last month: K7BDU 1199. QST

75, 50, AND 25 YEARS AGO

November 1933

- The cover photo shows a ham working out the calculations for a transmitting inductor.
- The editorial discusses the ever-increasing problem of interference to ham stations from automobile ignition systems, especially on 28 Mc. and above.
- George Grammer describes "A Simplified Five-Band Exciter Unit" that uses a type '59 crystal oscillator and a '59 amplifier.
- Richard Hilferty, W1AFC, in "A New Regenerative Detector Circuit for Ultra-Short Waves," describes his new "super-regenerative" circuit.
- Technical Editor James Lamb writes about "Developments in Crystal Filters for S.S. Superhets."
- "Byrd Expedition Gets Under Way" reports on the important role ham radio will play in Antarctic exploration.
- In "C. C. C. and the Amateur," Garland Black describes Amateur Radio in the Civilian Conservation Corps, established this past spring.
- Communications Manager F. E. Handy, W1BDI, announces the new field organization appointment, "The A.R.R.L. Official Phone Station Appointment."
- "When the World's Radio Speed Title Changed Hands," by I. S. Coggeshall, reports on the high-speed Morse contest held at the recent World-Wide Amateur Convention in Chicago. Joseph Chaplin was declared the winner, copying 57.3 wpm. Chaplin set a new world record, barely beating second-place winner Ted McElroy. Ted had held the world's record of 56.5 wpm for the past 11 years.

November 1958

- The cover photo shows an inside view of a homebrew HF kilowatt amplifier by W9MC, to be described in a forthcoming issue of *QST*.
- The editorial discusses "balance" in the amateur, and also offers suggestions to help the newcomer figure out what to say when he or she first gets on the air.
- John Simmons, W6MDI, tells how to get "Medium- to High-Power Audio from 813s."
- Lew McCoy, W1ICP, describes "Cheap and Simple R.F. Indicators" made from dial lamps.
- Lee Aurick, W2QEX, and Paul Boivin, W1ZKA, present "Recommended Tube Types for Amateur Short-Wave Receivers."
- Calvin Graf, W5LFM, discusses a novel beam-matching system he calls "A Concentric-Feed Yagi."
- Bob Bunce, K6QHZ, presents "The 'Mickey-Match,'" a combined S.W.R. indicator and output monitor.
- Managing Editor Dick Baldwin, W1IKE, tells about "A Variable Frequency Oscillator" that combines operating convenience and good keying characteristics.
- In "A Five-Way Antenna Coupler," Al Brogdon, W4UWA/DL4, describes his coupler that can be switched to any of five tuning circuits via a rotary switch. While operating on the oceanfront in New Jersey using the coupler with a Viking Ranger, Al made lots of contacts, including one with W6WNI — using a wet cotton kite string as an antenna!
- A full-color ad introduces the ham's latest dream station — Collins 32S-1, 75S-1 and 30S-1 kilowatt amplifier.

November 1983

- The cover photo shows the rollout of space shuttle *Columbia*, and asks, "Are you ready for STS-9?"
- The editorial addresses the oft-voiced complaint that it's too expensive to get started in ham radio, and gives suggestions about how to get on the air with a small budget.
- "The Personal Computer," Part 1 (adapted from *Personal Computing* magazine) helps the reader understand these new-fangled gadgets, and how he or she might use one.
- "Looking Down on the Aurora," by Tom Frenaye, K1KI, shows the first satellite photo of the entire auroral oval, taken from the recently launched DE-1 satellite.
- Phil Czerkies, WA8KPY, describes "A DTMF Easy-Controller — with Security."
- Bob Johns, W3JIP, discusses "Dual-Frequency Antenna Traps."
- Doug DeMaw, W1FB, tells about "A VXO CW Rig for 30 Meters."
- W1FB goes on to present "Simple Ways to Test Your Transmitter," using simple and inexpensive test equipment.
- "AMSAT-OSCAR 10 — A Tribute" shows a gallery of prelaunch photos of the satellite.
- Steve Place, WB1EYI, reports that the "FCC Approves Volunteer Examining."

Al Brogdon, W1AB ♦ Contributing Editor

W1AW Schedule

W1AW's schedule is at the same local time throughout the year. From the second Sunday in March to the first Sunday in November, UTC = Eastern US Time + 4 hours. For the rest of the year, UTC = Eastern US Time + 5 hours.

♦ **Morse code transmissions:** Frequencies are 1.8175, 3.5815, 7.0475, 14.0475, 18.0975, 21.0675, 28.0675 and 147.555 MHz.

Slow Code = practice sent at 5, 7½, 10, 13 and 15 WPM.

Fast Code = practice sent at 35, 30, 25, 20, 15, 13 and 10 WPM.

Code bulletins are sent at 18 WPM.

♦ **W1AW Qualifying Runs** are sent on the same frequencies as the Morse code transmissions. West Coast Qualifying Runs are also transmitted monthly. See "This Month in Contesting" in this issue for further details on the Qualifying Runs. Underline one minute of the highest speed you copied, certify that your copy was made without aid, and send it to ARRL for grading. Please include your name, call sign (if any) and complete mailing address. The initial certificate is available for a $10 fee. Subsequent endorsement stickers are available for a $7.50 fee.

♦ **Digital transmissions:** Frequencies are 3.5975, 7.095, 14.095, 18.1025, 21.095, 28.095 and 147.555 MHz.

Bulletins are sent at 45.45-baud Baudot and 100-baud AMTOR, FEC Mode B. 110-baud ASCII will be sent only as time allows.

On Tuesdays and Fridays at 6:30 PM Eastern Time, Keplerian elements for many amateur satellites are sent on the regular teleprinter frequencies.

♦ **Voice transmissions:** Frequencies are 1.855, 3.99, 7.29, 14.29, 18.16, 21.39, 28.59 and 147.555 MHz.

♦ **Notes:** On Fridays, UTC, a DX bulletin replaces the regular bulletins. W1AW is open to visitors 10 AM to noon and 1 PM to 3:45 PM on Monday through Friday. FCC licensed amateurs may operate the station during that time. Be sure to bring your current FCC amateur license or a photocopy. In a communication emergency, monitor W1AW for special bulletins as follows: voice on the hour, teleprinter at 15 minutes past the hour, and CW on the half hour.

During 2008, Headquarters and W1AW are closed on New Year's Eve Day and New Year's Day (Dec 31 and Jan 1), Presidents Day (Feb 18), Good Friday (Mar 21), Memorial Day (May 26), Independence Day (Jul 4), Labor Day (Sep 1), Thanksgiving and the following day (Nov 27 and 28) and Christmas (Dec 25).

For more information, see **www.arrl.org/w1aw.html**.

PACIFIC	MTN	CENT	EAST	MON	TUE	WED	THU	FRI
6 AM	7 AM	8 AM	9 AM		FAST CODE	SLOW CODE	FAST CODE	SLOW CODE
7 AM-1 PM	8 AM-2 PM	9 AM-3 PM	10 AM-4 PM	VISITING OPERATOR TIME (12 PM-1 PM CLOSED FOR LUNCH)				
1 PM	2 PM	3 PM	4 PM	FAST CODE	SLOW CODE	FAST CODE	SLOW CODE	FAST CODE
2 PM	3 PM	4 PM	5 PM	CODE BULLETIN				
3 PM	4 PM	5 PM	6 PM	DIGITAL BULLETIN				
4 PM	5 PM	6 PM	7 PM	SLOW CODE	FAST CODE	SLOW CODE	FAST CODE	SLOW CODE
5 PM	6 PM	7 PM	8 PM	CODE BULLETIN				
6 PM	7 PM	8 PM	9 PM	DIGITAL BULLETIN				
6:45 PM	7:45 PM	8:45 PM	9:45 PM	VOICE BULLETIN				
7 PM	8 PM	9 PM	10 PM	FAST CODE	SLOW CODE	FAST CODE	SLOW CODE	FAST CODE
8 PM	9 PM	10 PM	11 PM	CODE BULLETIN				

HAMSPEAK

The following are brief descriptions of Amateur Radio related terms found in this month's issue of *QST*. More information on most can be found in *The ARRL Handbook*, or other specialized ARRL publications.[1] See also **www.arrl.org/qst/glossary.html**.

The Anatomy of a Homebrew Project

Cathode band — Mark on semiconductor diode indicating which terminal is the cathode.

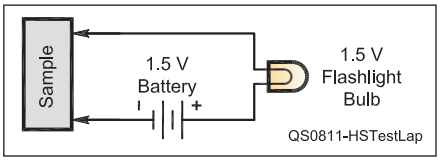
Diode — Two element electronic device that passes current in one direction only. See **www.arrl.org/tis/info/pdf/8407030.pdf** for more information.

LED indicator — Light emitting diode used as a replacement for an indicator bulb.

Ohmmeter — Test instrument used to measure electrical resistance.

Relay — Electromechanical device in which a voltage to a coil produces a magnetic field that pulls electrical contacts together or apart. It serves as a remote control switch.

Test lamp — Simple low voltage circuit used to indicate electrical connectivity. As shown in the circuit diagram, if the test object has low resistance, the light illuminates. If the test object has high resistance or no connectivity, the light will not illuminate.



An All-Weather Coax Bulkhead

Azimuth/elevation rotators — Antenna position shifting system in which the antenna can be pointed up or down as well as side to side. This is useful for communicating or tracking aircraft and space vehicles.

Bulkhead connectors — Connectors designed to mount on a panel rather than on the end of a cable.

Octal tube socket — Socket for an octal base vacuum tube. The octal socket had positions for eight pins equally spaced around a circular socket. The orientation was defined by a center post with an indexing ridge.

PL-259 — So-called UHF (actually more appropriate at HF) type coaxial plug, perhaps the most common Amateur Radio RF connector since WWII.

Satellite antennas — Antennas designed for communication through artificial satellites.

SO-239 — Matching bulkhead type UHF socket for PL-259 coax plug.

Greening Up Your Station

kWh — Unit of energy or power used over time. 1 kWh represents the consumption of 1 kW for 1 hour, or 100 W for 10 hours. This is the unit upon which electric utilities base their usage charges.

Low power (QRP) — *QRP* is the Q-signal meaning: *QRP? — can you reduce power?* or *QRP — I have reduced power*. It now refers to operators who enjoy trying to operate successfully using the minimum power possible, typically less than 5 W output. See **www.arrl.org/tis/info/qrpwhtwy.html** for more information.

Making that DC Distribution System Uninterruptible

Battery charger — Type of electrical power supply designed to recharge storage batteries.

Key clicks — Spurious signals generated from radiotelegraph transmitters if the rise or fall time of the keying is too fast.

RTTY — Radioteletype. Radio emission type used to support automatic teleprinters or text display on computers using sound detection equipment and special software.

A Modular Receiver for Exploring the LF/VLF Bands

Active mixer — Device that forms the sum and difference frequencies in a converter stage. The active mixer includes an amplification function as well as the frequency conversion process.

Dynamic range — Difference between the maximum and minimum amplitude a subsystem can process. The minimum is generally based on the subsystem internal noise level while the maximum is generally determined by the linear range before distortion.

Elliptic low-pass filter — One configuration of relationship between component values in a low-pass filter design. The elliptic filter is characterized by equal ripple in passband and stopband as well as rapid transition between them.

Frequency converter — Combination of a *mixer* and a *local oscillator* used to change the center frequency of a signal through the heterodyning process.

I-Q detector — Device that recovers signal information in two components, one *in-phase* (the *I* component), and one with a 90° phase difference (the *Q*, or quadrature component). With these two components, any information content in the signal can be extracted.

JFET — Junction field effect transistor. Transistor type characterized by high input and output impedances.

Local oscillator (LO) — The oscillator in a frequency converter stage used to shift the input signal through the heterodyning process.

Pierce oscillator — Circuit that produces a sinusoidal signal based on the resonant frequency of a piezoelectric crystal. Can be implanted with the fewest components of any oscillator.

Preselector — Usually a very early stage in a receiver in which the first pass at reducing the bandwidth is made. It is generally accomplished through the manual adjustment of multiple inductive/capacitive resonant circuits.

Software-defined radio (SDR) — Radio in which the signals are largely processed in a computer. See J. Hallas, W1ZR, "Getting on the Air—How About a Software Defined Radio," *QST*, Sep 2008, pp 68-69.

Some Thoughts on Solar Trackers

Photovoltaic (PV) panel — Semiconductor based device that produces electrical power if illuminated, typically by sunlight. See **www1.eere.energy.gov/solar/photovoltaics.html.**

The Universal Keying Module

Buffer — Amplifier circuit typically used between two stages to isolate them from each other.

Cathode — Element of a semiconductor diode or a vacuum tube. The cathode is the terminal from which electrons flow — generally toward an anode, where they are collected.

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

Dead bug — Term for a construction technique in which devices are glued to a circuit board with their leads sticking up. The leads give the appearance of deceased insects with their legs raised, hence the name.

Keyer — Electronic circuitry that is used to automatically generate the dots and dashes of Morse code. Actuated by switch contacts, usually from a mechanical device know as *paddles*. Most keyers provide dots and dashes of appropriate length and force proper spacing between them to result in perfectly formed characters.

LED — Light emitting diode. Semiconductor device that generates light if supplied with a forward biased current.

MOSFET — Metal oxide semiconductor field effect transistor.

Official Observers — Volunteer ARRL appointed position. OOs monitor the amateur bands for rules violations and notify amateurs of the problems so they can be corrected before being officially sanctioned by the FCC.

PCB — Printed circuit board. Technique for wiring circuits in which the connections are made by etching away unneeded copper from a lamination of copper and insulating material, typically fiberglass or phenolic. The remaining *traces* of copper form the connections between components.

VOM — Basic multifunction test instrument that measures volts, ohms and milliamperes.

A Wireless PTT Switch for Mobile Operations

A-B data switch — Switch box with three data connectors, typically 25 pin type. The two position switch selects and connects one of the two sources (A or B) to the common output.

Ear set — Combination earphone and microphone that is mounted and supported by a single ear of the user.

PTT — Push-to-talk. Arrangement by which the activation of a single button, typically on a mic or handset switches a radio from receive to transmit mode. See J. Hallas, W1ZR, "Getting to Know Your Radio — Over to You — Transmit/Receive Switching," *QST*, Feb 2006, pp 65-66.

VOX — Voice operated transmit. Radio subsystem that causes a radio to transition from receive mode to transmit mode upon audio reaching the mic. See reference above.

[1]*The ARRL Handbook for Radio Communications,* 2008 Edition. Available from your ARRL dealer or the ARRL Bookstore, ARRL order no. 1018. Telephone 860-594-0355, or toll-free in the US 888-277-5289; **www.arrl.org/shop/**; **pubsales@arrl.org**.

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- 1000 Memory channels
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- CTCSS/DCS Built-in
- Emergency Auto ID

Low Price!

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- 5W TX (300mw 220Mhz)
- Li-Ion Battery
- Fully Submersible to 3 ft.
- Built-in CTCSS/DCS
- Internet WIRES compatible

Now available in Black!

VX-6R

2M/220/440HT

- wideband RX – 900 memories
- 5W 2/440 , 1.5W 220 MHz TX
- Li-ION Battery - EAI system
- Fully submersible to 3 ft.
- CW trainer built-in

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VX-150

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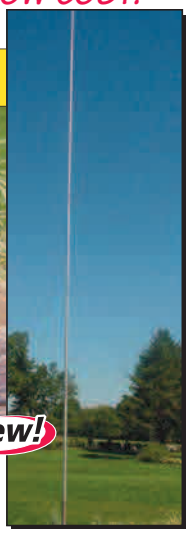

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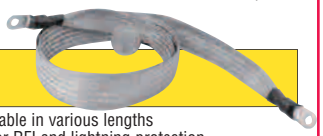

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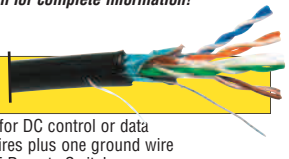


- Cat5e **shielded** cable for DC control or data
- Eight insulated #24 wires plus one ground wire
- Ideal for use with DXE Remote Switches

DXE-CW9-1K	1000 ft. reel	$214.00
DXE-CW9	Order by the foot	$0.29/ft.

BUILD YOUR OWN ANTENNAS!

New!

6063 Aluminum Tubing

- High strength Type 6063-T832 drawn aluminum tubing
- Sections with 0.058 inch wall thickness are perfect for telescoping antenna elements
- Most sizes are pre-slit on one end for element clamps
- Available in 3 and 6 foot lengths

Aluminum Tubing, 0.058" Wall, 3 Foot Length

Part Number	Diameter/End Type	Price	Cost/Foot
DXE-AT1240	0.375", no slit	$2.70	$0.90
DXE-AT1241	0.500", one end slit	$3.30	$1.10
DXE-AT1242	0.625", one end slit	$3.60	$1.20
DXE-AT1243	0.750", one end slit	$3.90	$1.30
DXE-AT1244	0.875", one end slit	$4.20	$1.40
DXE-AT1245	1.000", one end slit	$4.50	$1.50
DXE-AT1246	1.125", one end slit	$4.95	$1.65
DXE-AT1247	1.250", one end slit	$5.55	$1.85
DXE-AT1248	1.375", one end slit	$6.15	$2.05
DXE-AT1249	1.500", one end slit	$6.75	$2.25
DXE-AT1250	1.625", one end slit	$7.65	$2.55
DXE-AT1251	1.750", one end slit	$8.40	$2.80
DXE-AT1252	1.875", one end slit	$9.15	$3.05
DXE-AT1253	2.000", one end slit	$9.90	$3.30
DXE-AT1254	2.125", one end slit	$11.40	$3.80

Aluminum Tubing, 0.058" Wall, 6 Foot Length

Part Number	Diameter/End Type	Price	Cost/Foot
DXE-AT1189	0.375", no slit	$5.40	$0.90
DXE-AT1205	0.500", one end slit	$6.60	$1.10
DXE-AT1206	0.625", one end slit	$7.20	$1.20
DXE-AT1207	0.750", one end slit	$7.80	$1.30
DXE-AT1208	0.875", one end slit	$8.40	$1.40
DXE-AT1209	1.000", one end slit	$9.00	$1.50
DXE-AT1210	1.125", one end slit	$9.90	$1.65
DXE-AT1211	1.250", one end slit	$11.10	$1.85
DXE-AT1212	1.375", one end slit	$12.30	$2.05
DXE-AT1213	1.500", one end slit	$13.50	$2.25
DXE-AT1214	1.625", one end slit	$15.30	$2.55
DXE-AT1215	1.750", one end slit	$16.80	$2.80
DXE-AT1216	1.875", one end slit	$18.30	$3.05
DXE-AT1217	2.000", one end slit	$19.80	$3.30
DXE-AT1218	2.125", one end slit	$22.80	$3.80

Aluminum Tubing, 2.000" Diameter, 0.125" Heavy Wall

Part Number	Length/End Type	Price	Cost/Foot
DXE-AT1255	3', no slit	$14.85	$4.95
DXE-AT1204	6', no slit	$29.70	$4.95

All Stainless Steel Element Clamps

DXE-ECL-020	1/2" and smaller tubing	$1.90
DXE-ECL-040	5/8" tubing	$1.90
DXE-ECL-060	3/4" and 7/8" tubing	$1.90
DXE-ECL-10SS	1" and 1 1/8" tubing	$1.90
DXE-ECL-12SS	1 1/4" tubing	$1.90
DXE-ECL-16SS	1 3/8" and 1 1/2" tubing	$1.90
DXE-ECL-20SS	1 5/8" and 1 3/4" tubing	$1.90
DXE-ECL-24SS	1 7/8" and 2" tubing	$1.90
DXE-ECL-28SS	2 1/8" and 2 1/4" tubing	$1.90
DXE-ECL-32SS	2 3/8" and 2 1/2" tubing	$1.90
DXE-ECL-36SS	2 5/8" and 2 3/4" tubing	$1.90
DXE-ECL-40SS	2 7/8" and 3" tubing	$1.90
DXE-ECL-44SS	3 1/4" maximum tubing	$1.95

65 ft. Telescopic Aluminum Tubing Kit

- 65 ft. slow taper from HD 2" O.D. base to 7/8" O.D. top
- Build your own vertical antennas or arrays
- Use with DXE Insulated Base Assemblies

DXE-ATK65 .....**$194.50**

Insulated Vertical Base Assemblies for 2" O.D. Antenna Masts

Standard Base

New!

- Tilt Base optional
- Two DXE-CAVS-1P mounting clamps required to attach base to mounting post

DXE-VE-BASE .....Only **$99.50**

DXE-CAVS-1P V-Saddle Clamp **$8.95**

DXE-TB-3P Tilt Base Assembly **$62.50**

Heavy Duty Base

- Tilt Base included
- Two DXE-CAVS-2P mounting clamps required to attach base to mounting post

DXE-VA-BASE **$149.50**

DXE-CAVS-2P V-Saddle Clamp **$10.95**

Want the World's Biggest Ears?

Join the growing list of DXers and Contesters who know and use the best!

VP6DX DXPEDITION 2008 DUCIE ISLAND

Worked the Whole World Using DX Engineering Beverage Antennas!

FOUR-SQUARE RECEIVE CONTROLLER

Receive Four-Square Antenna Controller

- Switchable in four 90 degree spaced directions
- Reduced susceptibility to high angle signals compared to EWE, Flag, Pennant, and K9AY antennas
- Better signal-to-noise ratio
- Wideband time delay phasing
- Excellent directivity in a small space
- Usable over a very wide frequency range with optional DXE-ARAV2-4P Active Antenna
- Less physical space than a Beverage antenna
- Enhanced relay contact reliability

DXE-RFS-2P Receive Four-Square Antenna Controller & Switch Package **$359.95**

Complete Receive Four-Square Package with DXE-ARAV2-4P Active Antenna Kit

- 4 Active Vertical Antennas
- RFS-2 Four Square Switch
- CC-8 Controller
- 1,000 ft. of direct-bury F6, 75 Ω CATV Coax
- 25 Snap-N-Seal Coax Connectors
- Snap-N-Seal Connector Crimp Tool
- Coax Prep Tool

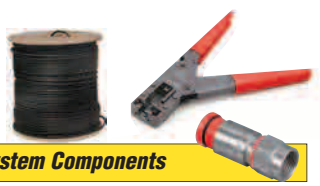
DXE-RFS-TS2P Complete Receive Four-Square Package **$1,525.00**

HAM-SWL

Active Receive Antenna

- Close spacing from transmit antennas
- Weak signal sensitivity rivaling full size antenna
- Operates from 100 kHz to 30 MHz
- Excellent strong signal handling with +30 dBm third order intercept
- Reduced Noise—quiet FET followers and exceptional feedline shield isolation
- Available in vertical or dipole configuration

DXE-ARAH2-1P Single horizontal antenna..... **$289.00**
DXE-ARAV2-1P Single vertical antenna..... **$259.00**



Receiving System Components

DXE-F6-1000 75 Ω, F6 style direct bury flooded cable, 1,000 ft. **$149.95**
DXE-F6-CTL 75 Ω F6 cable by the foot ..... **$0.19/ft.**
DXE-SNS6-25 Watertight F6 Connectors, 25 pack **$25.50**
DXE-SNS-CT1 F6 Connector Installation Tool **$52.00**

See Our Complete Selection of Components and Tools at DXEngineering.com

BEVERAGE ANTENNAS

Reversible Beverage System

- Broad operating range—0.2 to 30 MHz
- Fully isolated grounds used to prevent common-mode noise and unwanted signals
- 75 Ω design enables the use of high quality, low cost cable
- Metal housings used for superior shielding and improved life

DXE-RBS-1P Reversible Beverage Feed System.... **$149.00**

See DXEngineering.com for complete Beverage product listing!

MAXI-CORE™

Current Baluns and Feedline Current Chokes

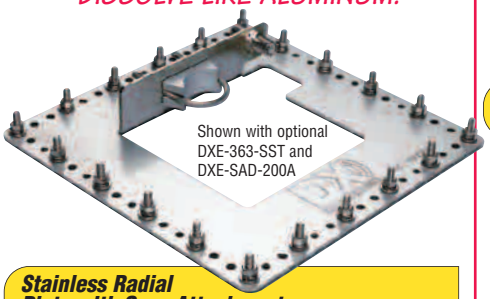
- 5, 10 and 10 kW+ Baluns and Current Chokes
- High efficiency, low loss—W8JI design
- All standard ratios available

Feedline Current Chokes

- Reduce RFI and pattern distortion

Starting at just $69.95 for FCC050-H05-A

STAINLESS STEEL—WON'T DISSOLVE LIKE ALUMINUM!



Stainless Radial Plate with Coax Attachment

Makes radial attachment a snap!

- Fits 2" pipe, 4x4 and 6x6 posts
- 0.125" thick 304 stainless steel
- Accommodates up to 120 radials
- Patented high current coax connection to radials

DXE-RADP-1P Complete with 20 stainless bolt sets **$54.50**
DXE-RADP-1HWK 20 sets of 1/4" stainless hardware ... **$7.50**
DXE-CAVS-2P Stainless Saddle Clamp for attachment to round tube 1.0" to 2.0" O.D. **$10.95**
DXE-363-SST Silver/Teflon® bulkhead connector... **$6.95**
DXE-VFCC-H05-A Vertical Feedline Current Choke..... **$94.95**

NEW—Biodegradable Anchor Pins

DXE-RADW-500KBD Radial Wire Kit, 500 feet of wire, 20 lugs, 100 anchor pins..... **$61.90**
DXE-RADW-1000KBD Radial Wire Kit, 1000 feet of wire, 40 lugs, 200 anchor pins..... **$123.95**
DXE-STPL-100BD Biodegradable Radial Wire Anchor Pins, 100-pack..... **$16.00**

DXERS 1ST CHOICE!

Remote Antenna Switches

- Best SWR and port isolation on the market!
- Weatherproof, welded stainless steel housing for best RF shielding
- 8-position switch, controller included
- Better than 1.1:1 SWR below 30 MHz

5 kW Key-Down RF Switch

- Better than 70 dB of port-to-port isolation

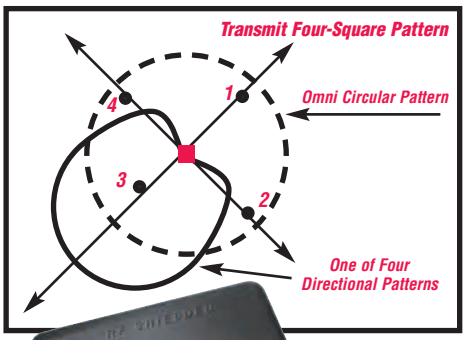
RR8-HP-P **$375.00**

10 kW Key-Down RF Switch

- Better than 60 dB of port-to-port isolation

RR8-SD-P **$495.00**

FOUR-SQUARE TRANSMIT CONTROLLER!



Transmit Four-Square Hybrid Controller—4 Directions plus Omni

- Four directions plus Omni—versatile
- Classic Hybrid design—easy to install
- 5 kW CW power rating—high reliability
- Hot switching lock-out—disables amplifier
- Drop-in replacement for Comtek—easy upgrade
- Proven DX Engineering RF relays—high performance
- RF Shielded weatherproof housing—unique protection

DXE-TFS4-160 160 Meter Four-Square Controller with Control Console **$419.90**
DXE-TFS4-80 80 Meter Four-Square Controller with Control Console **$409.90**
DXE-TFS4-40 40 Meter Four-Square Controller with Control Console **$399.90**

SWITCHING PROTECTION

Time Variable Sequencer Unit

- Protect receiver front end, preamplifiers, linear amplifiers, or other sensitive equipment from damage due to improper switching during the receive/transmit transition
- Five outputs tied to the CW keying or push-to-talk (PTT) lines each have adjustable delay from 0-30 ms in 2 ms increments
- Side-tone generator follows input of keyer, not transmitter
- Supports full CW break-in
- Ideal for protecting DXE-ARAV-2 or DXE-ARAH-2 Active Antennas from RF damage

DXE-TVSU-1 Time Variable Sequencer Unit **$159.95**

DXEngineering.com
1.800.777.0703

Order by 2:00 pm ET for Same-Day Shipping

8:30 am to 4:30 pm ET
1230 to 2030 UTC (March-October)
1330 to 2130 UTC (November-February)

Tech/International: **330.572.3200**

SOURCE CODE: 0811QS

Prices effective through December 15, 2008

The #1 Line of Autotuners

LDG ELECTRONICS

NEW! KT-100

The new KT-100 Autotuner fills a need for Kenwood transceiver owners after Kenwood discontinued the Kenwood AT-300 antenna tuner. The KT-100 is a flexible, low cost, easy to use unit just right for an AT-300 compatible Kenwood transceiver. Of course, most any LDG tuner will work just fine with a Kenwood transceiver, but wouldn't it be great if you could use that Tune button on the radio. The KT-100 allows you to do just that as LDG's first dedicated autotuner for Kenwood Amateur transceivers.

The LEDs on the front panel indicate tuning status, and will show a match in seconds, or even less of you've tuned on or near that frequency before. The KT-100 has 2,000 memories for instant recall of the tuning parameters for your favorite bands and frequencies.

If you have an AT-300 compatible Kenwood radio, you can simply plug the KT-100 into your transceiver with the provided cable; the interface powers the tuner, and the Tune button on the radio begins a tuning cycle. The supplied interface cable makes the KT-100 a dedicated tuner for most modern Kenwood transceivers. ***Suggested Price $199***

See *AT-1000Pro Review in Nov. '08 CQ*

AT-1000Pro

Building on the success of the AT-1000, LDG Electronics has refined and expanded its 1KW tuner. The AT-1000Pro has an Automode that automatically starts a tuning cycle when the SWR exceeds a limit you set. Other features include: • Operates at any power level between 5 and 1,000 watts peak. RF Relay protection software prevents tuning at greater than 125 watts. • 2 Antenna connections • Tunes from 1.8 to 54.0 MHz (inc. 6 meters) • Tuning time usually under 4 seconds, transmitting near a frequency with stored tuning parameters, under 0.2 seconds. • 2000 memories.• All cables included. ***Suggested Price $599***

AT-100Pro

This desktop tuner covers all frequencies from 1.8 – 54 MHz (including 6 meters), and will automatically match your antenna in no time. It features a two-position antenna switch, allowing you to switch instantly between two antennas. The AT-100Pro requires just 1 watt for operation, but will handle up to 125 watts. All cables included. ***Suggested Price $219***

radio not included

AT-7000

The AT-7000 is the ideal tuner for IC-7000 & other Icom Radios: Covers all frequencies from 1.8–54 MHz (including 6 meters), and will automatically match your antenna. Requires just 0.1W for operation, but will handle up to 125W (100 W on 6 m), making it suitable for everything from QRP (IC- 703 Plus) to a typical 100 W Icom transceiver. All cables included. ***Suggested Price $169***

Z-100

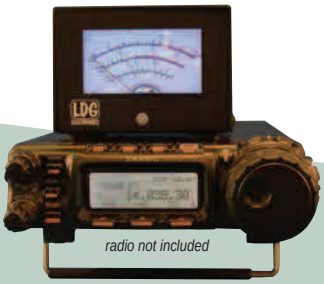
Designed from the ground up to provide 100 watt power handling in a small, lightweight package. Perfect for portable as well as sitting on your desk in your shack! The Z-100 will tune with 0.1 to 125 watts (50 watts on 6 meters), making it an excellent choice for almost any radio or operating style. Backpackers and QRP operators will appreciate the latching relays. Power can be removed from the tuner once you have tuned. Additionally, when it's not tuning, it draws nearly zero amps. ***Suggested Price $149***

FREE DIPOLE KIT WITH ANY AUTOTUNER PURCHASE!*

Purchase any LDG Electronics autotuner between September 15th 2008 and January 31st, 2009 and you will receive a free dipole kit buildable for 20, 17, 15,12, 10 or 6 meters (a $20 value) through the mail. Visit www.ldgelectronics.com for your rebate form or write to: 1445 Parran Rd. St. Leonard, MD 20685 USA. Limit one rebate per address.

*Free dipole kit applies to any new LDG autotuner $149 (suggested retail price) or higher in price. User supplies coax cable and support rope.

Now with FREE Dipole Kit with any Autotuner Purchase*!



radio not included

FT Meter

LDG's new version of its popular FT-Meter presents a lush, highly readable 2.5" meter face with calibrated scales for signal strength and discriminator reading on receive, and power output, SWR, modulation, ALC action and supply voltage on transmit. Each function is selectable from the radio's menu. On/Off switch for the light.

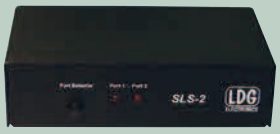
- LED back-illuminated in cool, high-visibility blue.
- Calibration adjustment is on the back of the unit; makes it easy to calibrate.
- Backlight brightness adjustment is also on the back of the unit; so you can set the backlight to your desired level brightness.

The FT-Meter comes fully assembled and ready to go; just plug it into the radio and you're in the picture like never before. ***Still Only $49***

Z-11Pro

The original portable Z-11 was one of LDG's most popular tuners, accompanying adventurous hams to their backyards, or to the ends of the earth. Now meet the Z-11Pro, everything you always wanted in a small, portable tuner. Designed from the ground up for battery operation. Only 5" x 7.7" x 1.5", and weighing only 1.5 pounds, it handles 0.1 to 125 watts, making it ideal for both QRP and standard 100 watt transceivers from 160 - 6 meters.

"With 8,000 memories in LDG's exclusive "3-D Memory" array, the Z-11Pro uses LDG's state-of-the-art processor-controlled Switched-L tuning network. It will match dipoles, verticals, inverted-Vs or virtually any coax-fed antenna. With an optional LDG balun, it will also match longwires or antennas fed with ladder-line. All cables included. ***Suggested Price $179***



NEW! SLS-2

LDG introduces the SLS-2 microphone switch with RJ-45 mic connectors for modern transceivers. The SLS-2 features two switched and one common jack. You can switch one mic between two radios, or one radio between two microphones. A push-in/push-out button on the front selects the port, and an LED lights to indicate the selection. The SLS-2 makes switching radios or microphones a breeze. ***Suggested Price $59.99***

NEW! ALK-2

The ALK-2 two-port Audio/Linear/Key switch is a versatile Amateur Radio accessory. The ALK-2 electronically switches a common 1/8" stereo jack and stereo RCA jacks between two other sets of 1/8" stereo/RCA jacks. Although the intended purpose of the ALK-2 is to switch stereo audio, code keys, or linear amplifier interface signals; virtually any pair of low voltage signals can be switched between the two ports. On the front panel there is one pushbutton and two LED indicator lights. The button is a pushbutton toggle switch which selects between the two sets of cables connected to the rear ports. The LED's indicate which port is selected. ***Suggested Price $49.99***

radio not included

AT-897 for the Yaesu FT-897

If you own a Yaesu FT-897 and want a broad range automatic antenna tuner, look no further! The AT-897 Autotuner mounts on the side of your FT-897 just like the original equipment. We even added the ability to mount the "feet" on the side of the tuner so when you're transporting your rig by the handle, you can safely set it down and not worry about scratching the case. The AT-897 takes power directly from the CAT port of the FT-897 and provides a second CAT port on the back of the tuner so hooking up another CAT device couldn't be easier. ***Suggested Price$199***

AT-200Pro

The AT-200 features LDG's new "3-D memory system" allowing up to eight antenna settings to be stored for each frequency. Handles up to 250 watts SSB or CW on 1.8 – 30 MHz, and 100 watts on 54 MHz (including 6 meters). Rugged and easy-to-read LED bar graphs show power and SWR, and a function key on the front panel allows you to access data such as mode and status. All cables included.
Suggested Price $249

Call or visit your favorite dealer today!

Visit www.ldgelectronics.com for a complete dealer list.

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IC-V82 2M FM HT

- TX: 144-148 • RX: 136-174 • Power: 7W • Memories: 200
- D-Star upgradable with optional UT-118

$129.99 after mail in ®ebate

IC-91A Dual Band HT

- TX: 144-148, 420-450 MHz • RX: 0.495-999 MHz (cell blkd)
- Power: 5/0.5W • Memories: 1304 • D-Star w/optional UT-121

$339.99

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 • Optional HM-175GPS Speaker microphone adds GPS capabilities

$579.99

IC-2200H 2M FM Mobile

- TX: 144-148 MHz • RX: 118-174 MHz
- Power: 65/25/10/5W • Memories: 207
- D-Star upgradable with optional UT-118

$149.99 after mail in ®ebate

IC-7000 Multiband Multimode Mobile

- TX: HF/6M/2M/440 MHz • RX: 0.03-199, 400-470 MHz
- Power: 100W (HF/6M), 50W (2M), 35W (440 MHz)
- Memories: 503 • 41 band≥widths with sharp or soft filter shape

$1399.99 after instant ©oupon, RMK-7000 included

ID-800 2M/440 FM Analog & D-Star Digital Dual Bander

- TX: 144-148, 440-450
- RX: 118-173, 230-549, 810-999 MHz
- Power: 55/15/5W (2M), 50/15/5W (440 MHz)
- Memories: 512 • D-Star Digital Ready

$569.99 after instant ©oupon & mail in ®ebate

IC-756PROIII HF/6M Transceiver

- TX: HF/6M • RX: 0.03-60 MHz • Power: 5-100W • Memories: 101
- 5 inch color screen • 32-bit floating DSP • Real time spectrum scope
- Improved 3rd order intercept point • Automatic antenna tuner

$2889.99 after instant ©oupon

ID-1 1.2 GHz D-Star & FM Mobile

- TX: 1240-1300 MHz • RX: 1240-1300 MHz
- Power: 10/1W • Memories: 105
- D-Star 128 kbps Data & 4.8 kbps Voice

$979.99 after mail in ®ebate

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
- Three roofing filters • External VGA connector
- Automatic antenna tuner • USB memory drive socket

$6999.99

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Radios by ICOM

VX-170 VX-7R

VX-170 2M FM HT

- TX: 144-148 • RX: 136-174
- Power: 5/2/0.5W • Memories: 200
- Extra large LCD display & speaker

$129.99 after instant ©oupon

VX-7R Tri-band FM HT

- TX: 50-54, 144-148, 222-225, 430-450 MHz
- RX: 0.5-999 MHz (cell blkd)
- Power: 5/2.5/1/0.05W (0.3/0.05W on 220 MHz)
- Memories: 900 • Submersible 3 feet for 30 minutes

VX-7RB Same as VX-7R but with a black case instead of silver

$294.99 each after instant ©oupon

FT-897D 100W HF/VHF/UHF Portable/Base

- 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

$799.99 after instant ©oupon

FT-450 100W HF/6M Portable/Base

- TX: HF/6M • RX: 0.03-56 MHz • Power: 10-100W
- Memories: 500 • IF DSP Technology • Selectable AGC, IF width & shift, contour, digital noise reduction, manual notch filter & clarifier
- Optional Auto Antenna Tuner (ATU-450)

$649.99 after instant ©oupon

FT-450AT With Auto Antenna Tuner (ATU-450) installed

$749.99 after instant ©oupon

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

$379.99 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, 35/20/10/5W (440 MHz)

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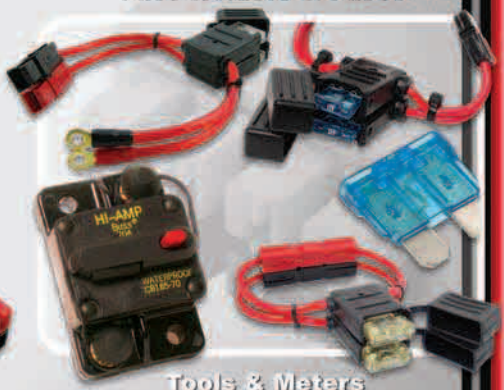

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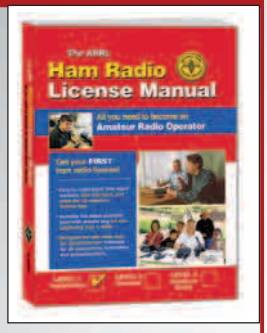

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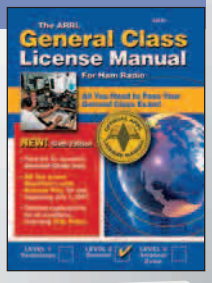

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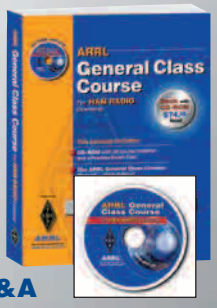

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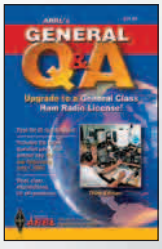

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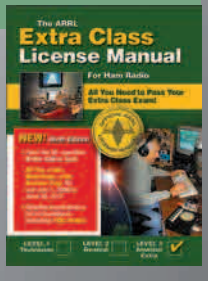

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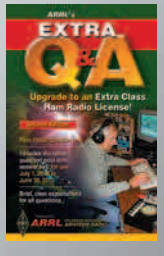

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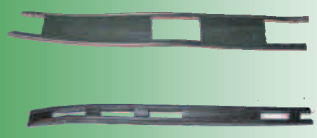

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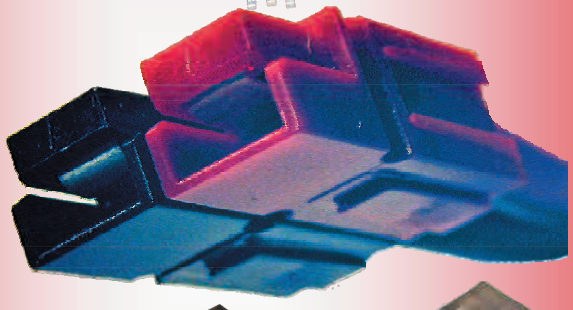

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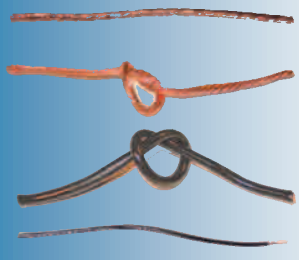

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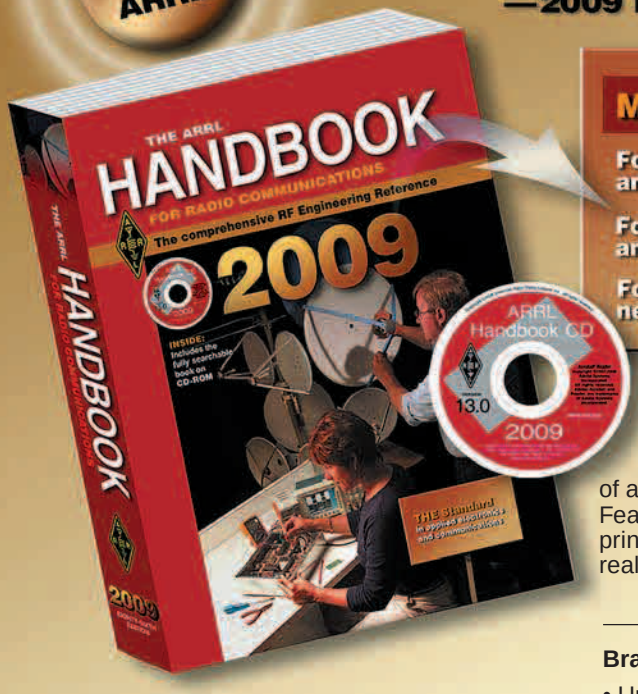

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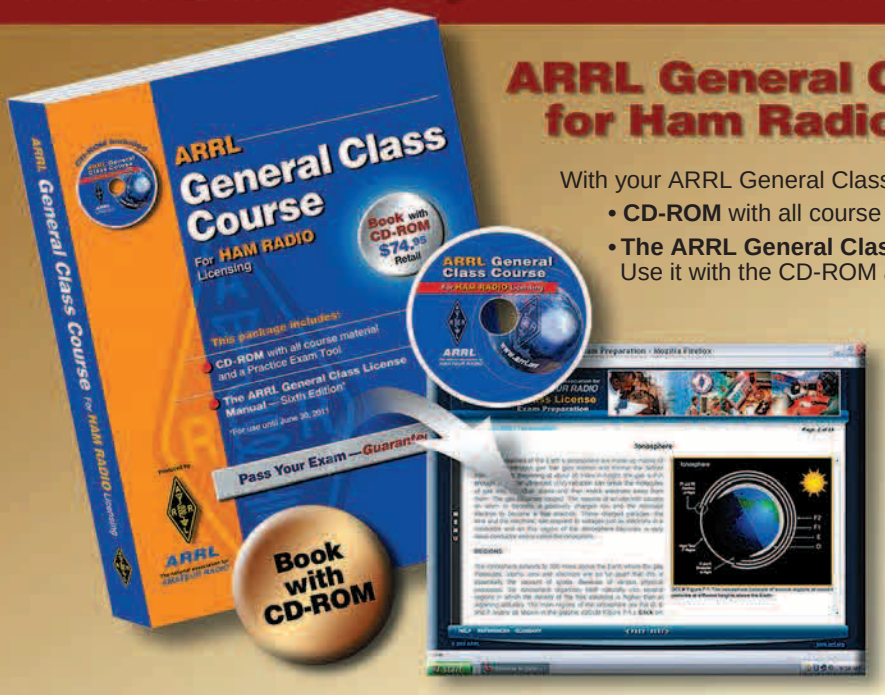

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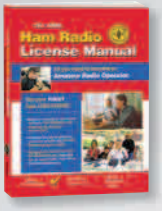

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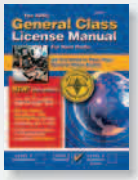

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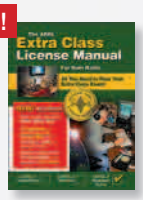

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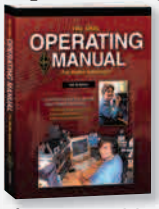

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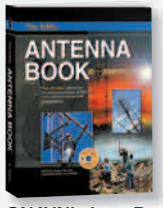

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Continued on page 134

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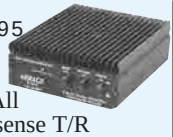
B-2518-G	5	7	40	60	80	100	125	160	160	160
B-5018-G	--	2	15	25	40	50	70	100	130	160
Watts In	.25	.5	3	5	8	10	15	25	35	50

35 Watts for 2 Meter HT



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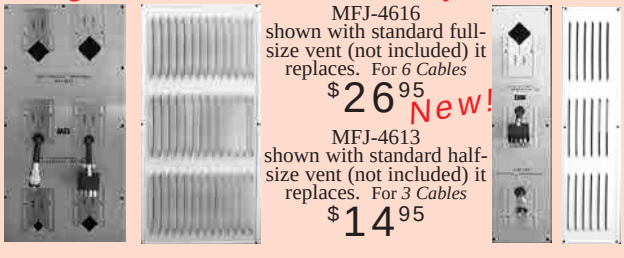

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Replace your standard air vents on the eave/sofitt of your house with these *MFJ AdaptiveCable*™ *Air Vent Plates* and…

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.

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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.

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ARRL Publications—continued from page 130

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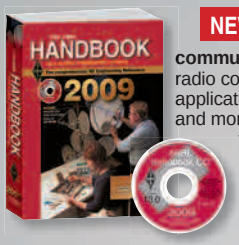

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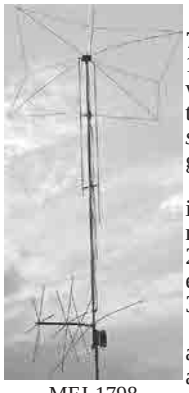


MFJ-1798
$299.95

Operate 10 bands -- 75/80, 40, 30, 20, 17, 15, 12, 10, 6 and 2 Meters with this MFJ-1798 vertical antenna and get *full size performance* with no ground or radials!

Full size performance is achieved using separate full size radiators for 2-20 Meters and highly efficient end loading for 30, 40, 75/80 Meters.

Get very low radiation angle for exciting DX, automatic bandswitching, omni-directional coverage, low SWR. Handles 1500 Watts PEP SSB.

MFJ's unique *Elevated Top Feed*™ elevates the feedpoint *all the way to the top* of the antenna. It puts the maximum radiation point high up in the clear where it does the most good -- your signal gets out even if you're ground mounted.

It's easy to tune because adjusting one band has minimum effect on the resonant frequencies of other bands.

Self-supporting and just 20 feet tall, the MFJ-1798 mounts easily from ground level to tower top -- small lots, backyards, apartments, condos, roofs, tower mounts.

Separate *full size* quarter wave radiators are used on 20, 17, 15, 12, 10 and 2 Meters. On 6 Meters, the 17 Meter radiator becomes a 3/4 wave radiator.

The active radiator works as a stub to decouple everything beyond it. *In phase* antenna current flows in all parallel radiators. This forms a very large equivalent radiator and gives you incredible bandwidths. Radiator stubs provide automatic bandswitching -- absolutely *no loss* due to loading coils or traps.

On 30, 40, 75/80 Meters, end loading -- the most efficient form of loading -- gives you highly efficient performance, excellent bandwidth, low angle radiation and automatic bandswitching.

MFJ's unique *Frequency Adaptive L-Network*™ provides automatic impedance matching for lowest SWR on these low bands. Tuning to your favorite part of these bands is simple and is done at the *bottom* of the antenna.

You don't need a ground or radials because an effective counterpoise that's 12 feet across gives you *excellent* ground isolation. You can mount it from ground level to roof top and get awesome performance.

The feedline is decoupled and isolated from the antenna with MFJ's exclusive *AirCore*™ high power current balun. It's wound with *Teflon*® coax and can't saturate, no matter how high your power.

Incredibly strong solid fiberglass rod and large diameter 6061 T-6 aircraft strength aluminum tubing is in the main structure.

Efficient high-Q coils are wound on tough *low loss* fiberglass forms using highly weather resistant *Teflon*® covered wire.

MFJ *6-Band* Halfwave Vertical Antenna

6 bands: 40, 20, 15, 10, 6, 2 Meters . . . No radials or ground needed

MFJ-1796
$229.95

MFJ-1796, is only 12 feet high and has a tiny 24 inch footprint! Mount anywhere -- ground level to tower top -- apartments, small lots, trailers. Perfect for field day, DXpedition, camping.

Efficient end-loading, no lossy traps. Entire length is always radiating. Full size halfwave on 2/6 Meters. High power *air-wound* choke balun eliminates feedline radiation. Adjusting one band has minimum effect on other bands.

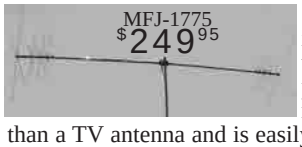
MFJ-1796W, $229.95. WARC Band version for 12, 17, 30, 60 Meters only.

MFJ-1792, $189.95. Full size 1/4 wave radiator for 40 Meters. 33 ft., handles 1500 Watts PEP. Requires guying and radials.

MFJ-1793, $209.95. Like MFJ-1792 but has full size 20 Meter 1/4 wave also.

6-Band, 40-2 Meters ***Rotatable*** Mini-Dipole

Low profile 14 feet . . .7 ft. turning radius . . . 40, 20, 15, 10, 6, 2 Meters…1500 Watts . . .



MFJ-1775
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MFJ-1775 is inconspicuous and low profile -- not much bigger than a TV antenna and is easily turned by a lightweight rotator like Hy-Gain's *AR-35*.

It's no Wimp! Its *directivity* reduces QRM/noise and lets you *focus* your signal in the direction you want -- work some *real* DX.

You can operate 6 bands -- 40, 20, 15, 10, 6 and 2 meters -- and run *full 1500 Watts* SSB/CW on all HF bands!

Features automatic band switching and uses highly efficient end-loading with its *entire length* always radiating. With 6 and 2 Meters thrown-in, you have ham radio's most versatile *rotatable* dipole!

Each HF band uses a separate, efficient end-loading coil wound on fiberglass forms with *Teflon*™ wire, and capacitance hats at each end (no lossy traps). 6 and 2 meters are *full-length* halfwave dipoles.

Built-to-last -- incredibly strong solid rod fiberglass center insulator and 6063 T-6 aircraft strength aluminum tubing radiator. Assembles in an afternoon. Adjusting one band has little effect on other bands.

MFJ-1775W, $249.95. WARC band version for 12, 17, 30, 60 Meters only.

MFJ *80/40/20* Meter ***Rotatable*** Dipole

MFJ-1785
$369.95

Now you can operate the *low bands* on 80, 40, and 20 Meters with a true rotatable dipole that'll blend in with the sky! Take advantage of excellent low band propagation during this low sunspot cycle. Handles 1500 Watts SSB/CW. 80/40 meter end-loading coils are wound on fiberglass forms with *Teflon*™ wire, and resonated with capacitance hats to ensure an extremely low-losses. Full-size on 20 Meters gives incredible DX. Balun included! 33 ft., low-profile, inconspicuous. Easily rotatable with a medium duty rotator like Hy-gain's AR-40.

MFJ's Super High-Q Loop™ Antennas

MFJ-1786
$419.95

MFJ's *tiny* 36 inch diameter loop antenna lets you operate 10 through 30 MHz *continuously* -- including the WARC bands!

Ideal for limited space -- apartments, small lots, motor homes, attics, or mobile homes. Enjoy DX and local contacts mounted vertically. Get both low angle radiation for excellent DX and high angle radiation for local, close-in contacts. Handles 150 watts.

Super easy-to-use! Only MFJ's super remote control has *Auto Band Selection*™. It auto-tunes to desired band, then beeps to let you know. No control cable is needed.

Fast/slow tune buttons and built-in two range Cross-Needle SWR/Wattmeter lets you quickly tune to your exact frequency.

All welded construction, welded butterfly capacitor with no rotating contacts, large 1.050 inch diameter round radiator -- *gives you the highest possible efficiency*.

Each plate in MFJ's tuning capacitor is welded for low loss and polished to prevent high voltage arcing, welded to the radiator, has nylon bearing, anti-backlash mechanism, limit switches, continuous no-step DC motor -- gives smooth precision tuning. Heavy duty thick ABS plastic housing has ultraviolet inhibitor protection.

Cover 40-15 Meters MFJ-1788, $469.95. Like MFJ-1786 but covers 40-15 Meters continuous. Includes remote control.

MFJ's G5RV Antenna

MFJ-1778
$44.95

Covers all bands,160-10 Meters with antenna tuner. 102 ft. long. Can use as inverted vee or sloper. Use on 160 M as Marconi.1500 Watts. Super-strong fiberglass center/feedpoint insulators. *Glazed ceramic* end insulators. All hand-soldered connections. Add coax, some rope and you're *on the air!*

MFJ-1778M, $39.95. G5RV Junior. Half-size, 52 ft. 40-10M with tuner, 1500 Watts.

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But we must be vigilant!

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…a possible allocation near 500 kHz to provide access to the medium frequency (MF) band;

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MFJ-998 1500 Watt *Legal Limit IntelliTuner*™

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Only the MFJ-998 gives you fully automatic antenna tuning for your legal limit full 1500 Watts SSB/CW linear amplifier!

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Instantly match impedances from 12-1600 ohms using MFJ's exclusive *IntelliTune*™, *Adaptive Search*™ and *InstantRecall*™ algorithms with over 20,000 *VirtualAntenna*™ Memories.

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MFJ's exclusive *Amplifier Bypass Control*™ makes tuning safe and "stupid-proof"!

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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.

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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**.

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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

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300 Watt...Best Seller

Digital Meter, Ant Switch, Balun

The *world's best selling* automatic antenna tuner is *highly acclaimed the world over* for its ultra high-speed, wide matching range, reliability, ease-of-use! Matches virtually *any* antenna.

MFJ-993B $259.95

300 Watt...*Extra* Wide Range

SWR/Wattmeter, 10000 VA Memories

Extra *wide matching range at less cost.* Exclusive dual power level: 300 Watts/6-1600 Ohms; 150W/6-3200 Ohms. Cross-Needle SWR/Wattmeter.

MFJ-991B $219.95

200 Watt ...Compact

Digital Meter, Ant Switch, Wide Range

World's fastest compact auto tuner uses MFJ *Adaptive Search*™ and *InstantRecall*™ algorithms. 132,072 tuning solutions instantly match virtually any antenna with near perfect SWR.

MFJ-929 $219.95

200 Watt ...Econo

Small, Ant Switch, 20K VA Memories

MFJ-928 $199.95

High-speed, wide matching range and compactness at low cost! Leave in-line and forget it -- your antenna is *always* automatically tuned! 2-position antenna switch.

200 Watt *MightyMite*™

Matches IC-706, FT-857D, TS-50S

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G5RV Antenna

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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!*

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200W...Weather-sealed

for Remote/Outdoor/Marine

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Fully *weather-sealed for remote Outdoor/Marine use*! Tough, durable, built-to-last the elements for years.

200 Watt...Remote

Coax/Wire Ant, No pwr cable needed

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October 23-October 31, 2008

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1.5 kW Dry Dummy Load has built-in precision, true peak-reading SWR/Wattmeter switchable to external antenna!

MFJ-267
$159.95

World's most versatile 1.5 kW dummy load has a *built-in* true peak reading SWR/Wattmeter that you can switch and use independently!

You'll find tons of uses!

Tune up your transceiver, linear amplifier or antenna tuner into a safe 50 Ohm dummy load at *full power*. Then instantly switch to your antenna and monitor SWR, forward and reflected power.

Use for testing/tuning transmitters, transceivers, amplifiers, antenna tuners, baluns, transformers, filters, matching networks, coax, stubs, transmission lines and antennas.

The 50-Ohm dry dummy load works DC to 60 MHz. SWR is below 1.3:1 at 30 MHz. Can handle 100 Watts for ten minutes or 1500 Watts for ten seconds. Comes with power derating curve.

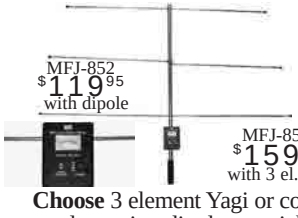
Extra-large three-inch lighted Cross-Needle meter reads SWR (1:1 to 8:1), forward and reflected power *simultaneously*.

Reads *true peak* PEP or average power on 300/3000 Watts forward and 60/600 Watts reflected power ranges 1.8-54 MHz.

High accuracy comes from a carefully designed directional coupler, an accurate active-peak reading circuit and a precision d'Arsonval meter movement.

RF tight perforated aluminum cabinet. 4½Wx3½Hx10½D inches. Uses 12 VDC or 120 VAC with **MFJ-1312D, $15.95.**

Find Power Line Noise fast!



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with dipole

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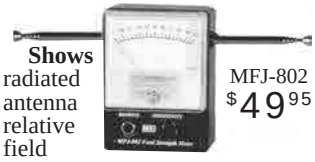
with 3 el.Yagi

Choose 3 element Yagi or compact telescoping dipole to quickly pinpoint noise. Walk or drive with these handheld, directional noise finders to search out leaky insulators, loose hardware and corroded ground lines quickly. Track noise directly to pole, transformer, insulator or others. Has field-strength meter, headphone jack to listen or record. Operates in optimum 135 MHz region. Sensitive .3uV receiver, 70 dB AGC.

Field Strength Meters



MFJ-802
$49.95

Shows radiated antenna relative field strength. Determine radiation pattern. **MFJ-802** has huge 3 inch meter. Telescoping dipole reduces influence of surrounding objects and is more reliable, repeatable than monopole. Sensitivity control. Jack for remote sensor, **MFJ-802R, $34.95.**

MFJ-801
$29.95

MFJ-801 has 1¾ inch meter, sensitivity control, 20 inch extended telescoping monopole antenna.

81 dB Step Attenuator

MFJ-762
$89.95

81 dB Attenuator in 1 dB steps. 50 Ohms. Usable to 500 MHz. 250 milliwatt maximum input. BNC connectors. Shielded stages. Connect between receiver and antenna and use S-meter as a precision calibrated field strength meter. Prevent receiver blocking, cross-modulation. Determine gain/loss, ideal for fox hunting. Evaluate linearity. Isolate circuits. Extend range of sensitive equipment. Measure input/output level differences.

MFJ Frequency Counters

MFJ-886
$129.95

MFJ-886 covers 1 MHz to 3 GHz with 300 MHz direct count, 0.1 Hz resolution. 4 gate times. 10-digit high-contrast 3/4 inch LCD display. Lock display button. Bargraph shows RF field strength. Includes rechargeable Ni-Cad batteries, charger, telescopic antenna. Black anodized aluminum. 2¾x2¼x1¼ in.

MFJ-888
$199.95

MFJ-888, like MFJ-886, but covers *10 Hz*-3 GHz. Measures frequency/period, has 50/1M Ohm input, auto hold, LED backlight, beeper. 2¾x4¼x1¼ in.

MFJ HF/VHF/UHF Dummy Loads

Oil-Cooled 1 KW CW, 2 KW SSB VersaLoad™

Run 1KW CW or 2 KW PEP for 10 minutes. Run *continuous duty* with 200 Watts CW or 400 watts PEP. Transformer oil not included.

MFJ-250X
$49.95

Low VSWR to 400 MHz. Under 1.2:1 to 30 MHz. SO-239 connect-or. Safety vent with cap, carrying handle. 7½Hx6⅝D in. **MFJ-250, $69.95.** Includes transformer oil (no PCB).

Dry 1.5 kW HF/VHF/UHF Dummy Load

MFJ-264
$74.95

Ham radio's most versatile 50 ohm *dry* dummy load. Works with all radios from 160 Meters through 650 MHz. SWR below 1.3 to 650 MHz and below 1.1 at 30 MHz. Handles 100 watts for ten minutes, 1500 Watts for 10 seconds. 3Wx3H x9D inches. Has SO-239 connector. **MFJ-264N, $84.95.** With type "N" connector.

Dry 300 Watt HF/VHF Dummy Load

MFJ-260C
$39.95

Air-cooled, non-inductive resistor in a perforated metal housing; Has SO-239 connector. Full load for 30 seconds. Silk-screened derating curve to 5 minutes. Handles 300 Watts. SWR is below 1.1:1 to 30 MHz, 1.5:1 from 30 to 650 MHz. Compact 2¼x2¼x7 inches. **MFJ-260CN, $49.95.** With type "N" connector.

3 GHz, 300 Watts Dry Dummy Load

MFJ-263
$99.95

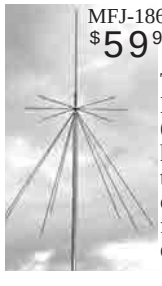
New high-tech metal film resistor gives low SWR up to 3 GHz at 300 Watts! Mounted on large heavy-duty air-cooled heatsink. SWR is less than 1.1 DC to 1 GHz, 1.2 at 1.5 GHz and 1.5 at 3 GHz. Handles 125 Watts *continuous* and 300 Watts for ten seconds. High quality *Teflon*® N connector. 10¾Wx2¼Hx5¼D in. New!

Compact Cross-Needle SWR/Wattmeters

MFJ-822
$59.95

MFJ-822, $59.95. Large 3-inch *lighted* Cross-Needle meter covers 1.8-200 MHz in 2 power ranges: 30/300 Watts. Read forward, reflected power, SWR *simultaneously*. Compact 3¼Wx3¼Hx3¼D inches takes little space. Perfect for home, mobile or portable use. SO-239 connectors. Use 12 VDC for lamp (cable included). **MFJ-842, $59.95.** Like MFJ-822, but covers 140-525 MHz, 15/150 Watt ranges.

25-1300 MHz Discone Antenna



MFJ-1868
$59.95

Ultra wide-band antenna receives 25-1300 MHz. Perfect for scanners. Transmit 50-1300 MHz. Handles 200 Watts. Ideal for 6/2/1¼Meters, 70/33/23 CM ham bands. Excellent for testing various transmitters on single coax. SO-239, 50 feet coax, stainless steel elements.

Free MFJ Catalog

Visit: http://www.mfjenterprises.com or call toll-free 800-647-1800

• 1 Year *No Matter What*™ warranty • 30 day money back guarantee (less s/h) on orders direct from MFJ

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300 Industrial Pk Rd, Starkville, MS 39759 **PH:** (662) 323-5869
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MFJ *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 $109.95

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, $124.95. Adds 2-pairs *Anderson PowerPoles*™.

22 Amp Continuous

22 Amps continuous, 25 Amps maximum. Like MFJ-4125 but adds Volt/Amp meters, cigarette lighter plug. Adjustable 9-15 VDC Output. 5¼Wx 4½Hx6D in. Weighs 3.7 lbs. Use 85-135 VAC or 170-260 VAC input. Replaceable fuse.

MFJ-4225MV $149.95

40 Amp Continuous

MightyLite™

40 Amps continuous, 45 Amps max. Adjustable 9-15 VDC output. Volt/Amp meters, cigarette lighter plug, front 5-way binding posts, two rear quick connects. 5.5 lbs. 7½Wx 4¾Hx9D inches. Use 85-135 VAC or 170-260 VAC input. Replaceable fuse.

MFJ-4245MV $199.95

75 Amp Continuous

75 Amps continuous. Adjustable 13.8-14.2 VDC output. Reverse polarity, over-current/temperature, brown-out input protection, 7.8 lbs. 6½Wx3½Hx10D in. 108-132 VAC. Great for Ameritron's ALS-500M mobile amplifier!

MFJ-4175 $359.95

High Current Multiple DC Power Outlets

Power multiple Transceivers/accessories from a* single *DC power supply . . . Keeps you neat, organized and safe . . .Prevents fire hazard . . . Keeps wires from tangling up and shorting . . . Fused and RF bypassed . . . 6 foot, 8 gauge color coded cable . . .

Versatile 5-Way Binding Posts

MFJ-1118, $84.95. Power two HF and/or VHF rigs and six accessories from your main 12 VDC supply. *Built-in 0-25 VDC voltmeter*. Two pairs 35 amp 5-way binding posts, fused and RF bypassed for transceivers. Six pairs RF bypassed binding posts provide 15 Amps for accessories. Master fuse, ON/OFF switch,"ON" LED. 12½x2¾x2½ in.

MFJ-1118 $84.95

MFJ-1116, $59.95. 8 pairs binding posts, 15A total.Voltmeter, on/off switch.

MFJ-1116 $59.95

MFJ-1112, $44.95. 6 pairs binding posts, 15 Amps total.

MFJ-1112 $44.95

MFJ-1117, $64.95. Powers *four* transceivers simultaneously (two at 35 Amps each and two at 35 Amps combined). 8x2x3 inches.

MFJ-1117 $64.95

All PowerPoles™

MFJ-1128, $104.95. 3 high-current outlets for transceivers. 9 *switched* outlets for accessories. Mix & match included fuses as needed (one-40A, one-25A, four-10A, four-5A, three-1A fuses installed). 0-25 VDC *Voltmeter*. *Extra* contacts, fuses. 12Wx1¼Hx2¾D".

MFJ-1128 $104.95

MFJ-1126, $84.95. 8 outlets, each fused, 40 Amps total. Factory installed fuses: two 1A, three 5A, two 10A, one 25A, one 40A. *0-25 VDC Voltmeter*. Includes *extra PowerPoles®, extra* fuses -- *no extra cost*. 9Wx1¼Hx2¾ inches.

MFJ-1126 $84.95

PowerPoles™ AND 5-Way Binding Posts

MFJ-1129, $114.95. 10 outlets each fused, 40 Amp total. 3 high-current outlets for rigs -- 2 *PowerPoles®* and one 5-way binding post. 7 *switched* outlets for accessories (20A max) -- 5 *PowerPoles®* and 2 binding posts. Fuses include (1- 40A, 2-25A, 3-10A, 3-5A, 2-1A installed). *0-25 VDC Voltmeter*. Includes extra *PowerPoles®* and fuses, 12½Wx1¼Hx2¾D inches.

MFJ-1129 $114.95

MFJ-1124, $64.95. 6 outlets each fused, 40 Amps total. 4 *PowerPoles®*, 2 high-current binding posts, Installed fuses: 1-40A, 2-25A, 2-10A, 1-5A, 1-1A. Includes extra *PowerPoles®* & fuses -- *no extra cost*.

MFJ-1124 $64.95

15 Amp Continuous

15 Amps continuous, 17 Amps max at 13.8 VDC. Over-voltage, over-current protection. 5-way binding posts. Load fault indicator and automatic shutdown. 90-130 VAC input. 1½ lbs. Tiny 3¾Wx2¼Hx3¾D inches fits easily in an overnight bag.

MFJ-4115 $79.95

30 Amps Continuous

Linear with 19.2 lb.Transformer

This heavy-duty linearly regulated MFJ-4035MV has *abolutely no RF Hash*. It delivers 30 Amps continuous, 35 Amps maximum from its massive 19.2 lb. transformer. Front panel adjustable 1-14 VDC output with convenient detent at 13.8 VDC. Volt/Amp Meters. 1% load regulation, 30 mV ripple. Over-voltage/current/temperature protection, 5-way binding posts, 2 pairs of quick-connects and a covered cigarette lighter socket for mobile accessories. Front panel replaceable fuse. 110 VAC input. 9½Wx6Hx9¾D in.

MFJ-4035MV $149.95

Free MFJ Catalog

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MFJ-259B *1.8-170 MHz* SWR Analyzer

World's most popular SWR analyzer is super easy-to-use

Reads SWR . . . Complex RF Impedance: Resistance(R) and Reactance(X) or Magnitude(Z) and Phase(degrees) . . . Coax cable loss(dB) . . . Coax cable length and Distance to fault . . . Return Loss . . . Reflection Coefficient . . . Inductance . . . Capacitance . . . Battery Voltage. LCD digital readout . . . frequency counter . . . side-by-side meters . . . Battery charger . . . battery saver . . . low battery warning . . . smooth reduction drive tuning . . .

World's most popular SWR analyzer! The famous MFJ-259B gives you a complete picture of your antenna's performance. You can read your antenna's SWR and Complex Impedance from 1.8 to 170 MHz.

You can read Complex Impedance as series resistance and reactance (R+jX) or as magnitude (Z) and phase (degrees).

You can determine velocity factor, coax cable loss in dB, length of coax and distance to a short or open.

You can read SWR, return loss and reflection coefficient at any frequency simultaneously.

You can read inductance in uH and capacitance in pF at RF frequencies.

Large easy-to-read two line LCD screen and side-by-side meters clearly display your information.

It has built-in frequency counter, Ni-MH/Ni-CD charger circuit, battery saver, low battery warning and smooth reduction drive tuning.

Super easy to use! Just set the bandswitch and tune the dial -- just like your transceiver. SWR and Complex Impedance are displayed instantly!

Here's what you can do

Find your antenna's true resonant frequency. Trim dipoles and verticals.

Adjust your Yagi, quad, loop and other antennas, change antenna spacing and height and watch SWR, resistance and reactance change instantly. You'll know exactly what to do by simply watching the display.

Perfectly tune critical HF mobile antennas in seconds for super DX -- without subjecting your transceiver to high SWR.

Measure your antenna's 2:1 SWR bandwidth on one band, or analyze multiband performance from HF to VHF -- 1.8-170 MHz!

Check SWR outside the ham bands without violating FCC rules.

Take the guesswork out of building and adjusting matching networks and baluns.

Accurately measure distance to a short or open in a failed coax. Measure length of a roll of coax, coax loss, velocity factor and impedance.

Measure inductance and capacitance. Troubleshoot and measure resonant frequency and Q of traps, stubs, transmission lines, RF chokes, tuned circuits and baluns.

Call your favorite dealer for your best price!

MFJ-259B $289.95

Adjust your antenna tuner for a perfect 1:1 match without creating QRM.

And this is only the beginning! The MFJ-259B is a complete ham radio test station including -- frequency counter, RF signal generator, *SWR Analyzer*™, RF Resistance and Reactance Analyzer, Coax Analyzer, Capacitance and Inductance Meter and more!

Free Manual: call, write or download

MFJ's comprehensive instruction manual is packed with useful applications -- all explained in simple language you can understand.

Take it anywhere

Fully portable, take it anywhere -- remote sites, up towers, on DX-peditions. It uses 10 AA or Ni-Cad batteries (not included) or 110 VAC with MFJ-1312D, $15.95. Its rugged all metal cabinet is a compact 4x2x6¾ in.

How good is the MFJ-259B?

MFJ *SWR Analyzers*™ work so good, many antenna manufacturers use them in their lab and on the production line -- saving thousands of dollars in instrumentation costs! Used worldwide by professionals everywhere.

More MFJ SWR Analyzers™

MFJ-249B, $269.95. Like MFJ-259B, but reads SWR, true impedance magnitude and frequency only on LCD. No meters.

MFJ-209, $159.95. Like MFJ-249B but SWR meter only. No LCD/frequency counter.

MFJ-219B, $119.95. UHF *SWR Analyzer* covers 420-450 MHz. External frequency counter jack. 7½x2½x2¼ in. *Free* "N" to SO-239 adapter.

SWR Analyzer Accessories

Dip Meter Adapter

MFJ-66, $24.95. Plug a dip meter coupling coil into your MFJ *SWR Analyzer*™ and turn it into a sensitive and accurate bandswitched dip meter. Takes guesswork out of winding coils and determining resonant frequency of tuned circuits and Q of coils. Set of two coils cover 1.8-170 MHz depending on your *SWR Analyzer*.

Genuine MFJ Carrying Case

MFJ-29C, $24.95. Tote your MFJ-259B anywhere with this MFJ custom carrying case. Has back pocket with security cover for carrying dip coils, adaptors and accessories. Made of special foam-filled fabric -- cushions blows, deflects scrapes, and protects knobs, meters and displays from harm. Wear it around your waist, over your shoulder, or clip it onto the tower while you work -- the fully-adjustable webbed-fabric carrying strap has snap hooks on both ends. Has clear protective window for frequency display and cutouts for knobs and connectors so you can use your MFJ *SWR Analyzer*™ without taking it out of your case.

MFJ-99, $60.85. Accessory Package for MFJ-259/B/249/B/209. Includes MFJ-29C carrying case, MFJ-66 dip meter adapter, MFJ-1312D 110VAC adapter. ***Save $5!***

Tunable Measurement Filter

MFJ-731, $99.95. *Exclusive* MFJ tunable RF filter allows accurate SWR and impedance measurements 1.8-30 MHz in presence of strong RF fields. Virtually no effect on measurements. Works with *all* SWR Analyzers.

MFJ *No Matter What*™ warranty

MFJ will repair or replace (at our option) your MFJ *SWR Analyzer*™ for one full year.

Dealer/Catalog/Manuals
Visit: http://www.mfjenterprises.com or call toll-free 800-647-1800

• 1 Year *No Matter What*™ warranty • 30 day money back guarantee (less s/h) on orders direct from MFJ

1.8-170 MHz *plus* 415-470 MHz SWR Analyzer

All-in-one handheld antenna test lab lets you quickly check/tune HF, VHF, ***UHF*** antennas anywhere. Measures: SWR, Return Loss, Reflection Coefficient, R, X, Z, Phase Angle, Coax cable loss, Coax cable length, Distance to short/open in coax, Inductance, Capacitance, Resonant Frequency, Bandwidth, Q, Velocity Factor, Attenuation, more!

MFJ-269 $389.95

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More hams use MFJ SWR Analyzers™ than any others in the world!

MFJ TUNERS

Ham Radio's *Most Popular* 300 Watt Antenna Tuner

More hams use MFJ-949s than any other antenna tuner in the world!

Why? Because the world's leading tuner has earned a world-wide reputation for being able to match just about anything.

***Full* 1.8-30 MHz Operation**

Tune your antenna for minimum SWR! Works 1.8-30 MHz on dipoles, verticals, inverted vees, random wires, beams, mobile whips, shortwave receiving antennas . . . Use coax, random wire, balanced lines. Has heavy duty 4:1 balun for balanced lines.

***Custom* inductor switch**

Custom designed inductor switch, 1000 volt tuning capacitors, *Teflon*(R) insulating washers and proper L/C ratio gives you *arc-free* no worries operation

MFJ-949E $179.95

up to 300 Watts PEP transceiver input power.

The MFJ-949E inductor switch was *custom* designed to withstand the extremely high RF voltages and currents that are developed in your tuner.

***8-Position* Antenna switch**

Antenna switch lets you select two coax fed antennas, random wire/balanced line or dummy load through your MFJ-949E or direct to your transceiver.

***Lighted* Cross-Needle Meter**

***Full* size** 3-inch lighted Cross-Needle Meter. Lets you easily read SWR, *peak* or average forward and reflected power simultaneously. Has 300 Watt or 30 Watt ranges.

***QRM-Free PreTune*™**

MFJ's *QRM-Free PreTune*™ lets you pre-tune your MFJ-949E *off-the-air* into its built-in dummy load! Makes tuning your actual antenna faster and easier.

Plus Much More!

***Full* size** built-in non-inductive 50 Ohm dummy load, scratch-proof Lexan multi-colored front panel, $10^{5}/_{8}$x$3^{1}/_{2}$x7 inches. Superior cabinet construction and more!

MFJ-948, $159.95. Econo version MFJ-949E. Has all features except for dummy load.

***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-989D ***Legal Limit*** Tuner

MFJ-989D $389.95

New, improved MFJ-989D *legal limit* antenna tuner gives you better efficiency, lower losses and a new *true* peak reading meter. Easily handles *full* 1500 Watts SSB/CW, 1.8-30 MHz, including MARS/WARC bands. Six position antenna switch, dummy load. *New* 500 pF air variable capacitors. *New* improved *AirCore*™ Roller Inductor. *New* high voltage current balun. *New* crank knob. $12^{7}/_{8}$Wx6Hx$11^{5}/_{8}$D".

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. $10^{1}/_{2}$Wx$3^{1}/_{2}$Hx$9^{1}/_{2}$D inches.

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.

Free MFJ Catalog

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MFJ tiny Travel Tuner

Tiny 4½x2¼x3 inch tuner handles full 150 Watts! Covers 80-10 Meters, has tuner bypass switch, tunes nearly anything!

MFJ brings you the *world's smallest* full power 150 Watt 80-10 Meter Antenna Tuner. Extra wide matching range lets you tune nearly any antenna.

It's no toy, its got guts! Built with real *air* variable capacitors (600 Volt, 322 pF) and *three* stacked powder iron toroids to handle real power -- not just QRP. Bypass switch lets you bypass tuner when you don't need it.

You can use nearly any transceiver at full power with nearly any coax fed or random wire antenna for portable, home or mobile operation.

It's perfect for compact rigs like Icom IC-706MKIIG, Yaesu FT-100D, Kenwood TS-50, QRP rigs and others with a built-in SWR meter.

Operate anywhere, anytime with a quick easy set-up! Tune out SWR on your mobile whip from inside your car. Operate in your apartment with a wall-to-wall antenna or from a motel room with a wire dropped from a window or from a mountain top with a wire over a tree limb. Great for DXpeditions or field day. Be prepared for emergencies.

MFJ-902 is so small and handy, you'll rely on it wherever you go! It's easy to pack away in your briefcase, suitcase, backpack, glove compartment or desk drawer. It's tiny enough to slide in your back hip pocket! 4½Wx2¼Hx3D inches.

MFJ-902
$99.95

Tiny Travel Tuner with 4:1 Balun

MFJ-902H, same as MFJ-902 *Tiny Travel Tuner* but has *4:1 balun* for balanced lines and 5-way binding posts for balanced lines and random wire. 5¾Wx2¼Hx 2¾D in.

MFJ-902H
$119.95

Tiny Travel Tuner with Cross-Needle SWR/Wattmeter

MFJ-904, same as MFJ-902 *Tiny Travel Tuner* but has *Cross-Needle SWR/Wattmeter.* Read SWR, forward and re-flected power all at a glance in 300/60 and 30/6 Watt ranges. 7¼Hx2¼Hx2¾D inches.

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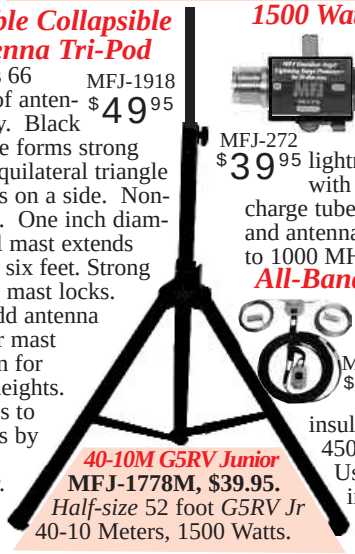

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True *1:1 Current Balun/Center Insulator* forces equal currents into dipole halves to reduce coax feedline radiation and field pattern distortion. Reduces TVI, RFI and RF hot spots in your shack. 50 ferrite beads on *Teflon*(R)coax. 1.5kW, 1.8-30 MHz. Stainless steel hardware. *Direct* antenna connection. 5x1½ in.

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As we get older, high frequency hearing loss reduces our ability to understand speech. Here's why . . .

Research shows that nearly *half* the speech intelligibility is contained in 1000 to 4000 Hz range, but contains a miniscule 4% of total speech energy.

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To dramatically improve your ability to understand speech, you must:

First, drastically increase the speech energy above 500 Hz, where 83% of the speech intelligibility is concentrated.

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The MFJ-616 splits the audio speech band into four overlapping octave ranges centered at 300, 600, 1200 and 2400 Hz. You can boost or cut each range by nearly 20 dB.

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Here's what *QST* for April, 2001 said . . . *"I expected a subtle effect at best, but I was astonished . . . The result was remarkably clean, understandable speech without hissing, ringing or other strange effects . . . made a dramatic improvement . . ."*

Immuned to RFI. Has phone jack, on/off speaker switch, 2 inputs, bypass switch. 10Wx2½Hx6D". Needs 12 VDC.

MFJ-1316, $21.95. For 110 VAC operation. Provides 12 VDC/1.5 Amps.

MFJ-72, $69.80. *All-in-one MFJ-616 Accessory Pack.* Includes MFJ-392 headphones, two MFJ-281 speakers and MFJ-1316 power supply. ***Save $7!***

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Transformer-coupled -- No RFI, hum or feedback . . . 75 seconds total, 5-messages . . . Records received audio . . .

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You can also record and play back off-the-air signals -- great help if you didn't get it right the first time! No more "*Please repeat*".

A playing message can be halted by the *Stop Button*, your microphone's PTT/VOX, remote control or computer.

Has jack for remote or computer control (using CT, NA or other program). Lets you select, play and cancel messages.

Your mic's audio characteristics do not change when your MFJ-434B is installed.

All audio lines are RF filtered to eliminate RFI, audio feedback and distortion. An audio isolation transformer totally eliminates hum and distortion caused by ground loops.

New! **It's** easy to use -- just plug in your 8 pin round or modular mic plug, set the internal jumpers for your transceiver and plug in the appropriate (included) cable for your rig.

Built-in speaker-amplifier. Speaker/phone jack. Use 9 Volt battery, 9-15 VDC or 110 VAC with optional MFJ-1312D, $15.95. 6½Wx2½Hx6½D in.

MFJ-73, $34.95. MFJ-434B Remote Control with cable.

60 dB Null ***wipes out*** noise and interference

MFJ-1026
$199.95

Wipe out noise and interference *before* it gets into your receiver with a 60 dB null!

Eliminate all types of noise -- severe power line noise from arcing transformers and insulators, fluorescent lamps, light dimmers, touch controlled lamps, computers, TV birdies, lightning crashes from distant thunderstorms, electric drills, motors, industrial processes . . .

It's *more effective* than a noise blanker! Interference much stronger than your desired signal can be completely removed without affecting your signal.

It works on *all modes* -- SSB, AM, CW, FM -- and frequences from BCB to lower VHF.

You can null out strong QRM on top of weak rare DX and then work him! You can null out a strong local ham or AM broadcast station to prevent your receiver from overloading.

Use the MFJ-1026 as an *adjustable phasing network.* You can combine two antennas to give you various directional patterns. Null out a strong interfering signal or peak a weak signal at a push of a button.

Easy-to-use! Plugs between transmitting antenna and transceiver. To null, adjust amplitude and phase controls for minimum S-meter reading or lowest noise. To peak, push reverse button. Use built-in active antenna or an external one. MFJ's exclusive *Constant Amplitude Phase Control*™ makes nulling easy.

RF sense T/R switch automatically bypasses your transceiver when you transmit. Adjustable delay time. Uses 12 VDC or 110 VAC with MFJ-1312D, $15.95. 6½x1½x6¼ in.

MFJ-1025, $179.95. Like MFJ-1026 less built-in active antenna, use external noise antenna.

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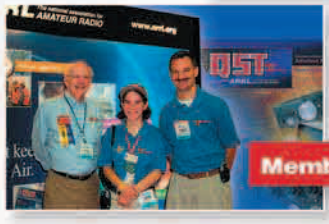

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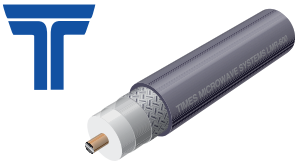

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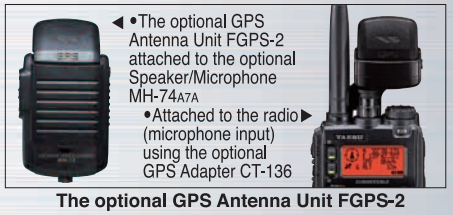

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