QST

Official Journal of ARRL The national association for AMATEUR RADIO

Devoted entirely to **Amateur Radio**

www.arrl.org

October 2007

QST reviews:

Yaesu FT-2000D
HF and 6 Meter Transceiver

Inside:

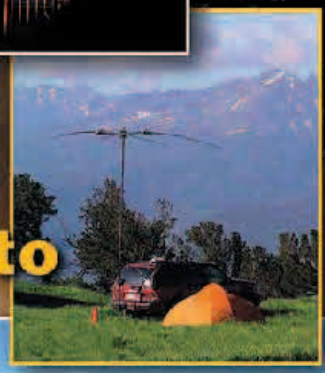
A Low Cost Frequency Synthesizer

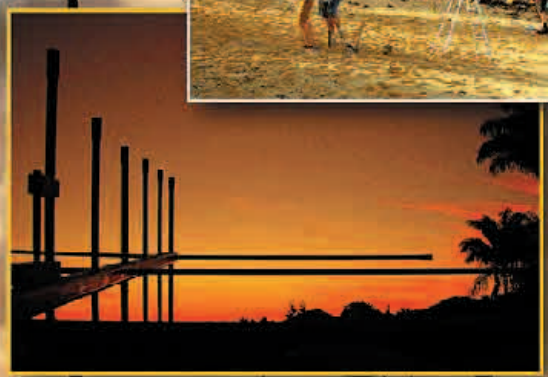
Good Ideas for Bad Propagation

How Sputnik Changed Everything 50 Years Ago

Roofing Filters: Why They Matter

Results — 2007 ARRL Photo Contest





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NEW IC-7700
The new "run rig" of choice...

IC-756PROIII
...to go along with your trusted spotting receiver.

What a nice compliment.

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Your car dash. Kitchen table. Flybridge. Rec room. Office cubicle. Hotel room. Vacation home. Ham shack. Cockpit.

IC-PCR1500

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

IC-PCR2500

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

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It all starts with a little black box. Plug it in to your PC or opt for one of the remote head versions. Whichever way you go, go with Icom wide-band!

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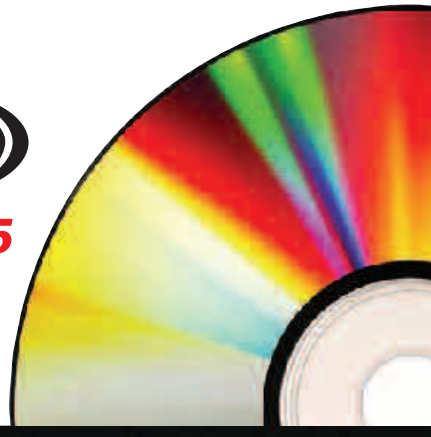
- Single Receiver
- Mobile or PC Controlled

IC-R2500

- 0.01 ~ 3299.99 MHz*** (Main)
  50 to 1300 MHz*** (Sub)
- AM, FM, WFM, CW, SSB
- Dual Wideband Receiver
- Mobile or PC Controlled
- Optional APCO 25 and D-STAR
- Dual Receiver Diversity

Bonito



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Icom's black box radios now come bundled with Bonito's RadioCom 4.5. With Radio-Control, Equalizer-Filter-Analyzer, AudioRecorder, RTTY-, CW-, WFAX-, SatFax, SSTV-, PSK- and Time Signal Decoding, Frequency- and Schedule-Manager, as well as SatTracking...(whew), you have EVERYTHING in one program.

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ADVANCED OPS
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SHIRT-POCKET COMPACT
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ICOM®

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

hy-gain® ROTATORS

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

HAM-IV

HAM-IV
$559.95

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

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

TAILTWISTER SERIES II

T-2X
$699.95

T-2XD
$1079.95
with DCU-1

For large medium antenna arrays up to 20 sq. ft. wind load. Available with *DCU-1 Pathfinder* digital control (T2XD) or standard analog control box (T2X) with *new* 5-second brake delay and *new* Test/Calibrate function. Low temperature grease, alloy ring gear, indicator potentiometer, ferrite beads on potentiometer wires, *new* weatherproof AMP connectors plus 8-pin plug at control box, triple bearing race with 138 ball bearings for large load bearing strength, electric locking steel wedge brake, North or South center of rotation scale on meter, low voltage control, $2^{1}/_{16}$ inch max. mast.

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

CD-45II

CD-45II
$389.95

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
$999.95
with DCU-1

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

ROTATOR OPTIONS

MSHD, $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.

AR-40

AR-40
$289.95

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
$1379.95

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.**

Digital Automatic Controller

DCU-1
$699.95

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
$79.95

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

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Voice: 662-323-9538 **Fax:** 662-323-6551

NEW! Automatic Rotator Brake Delay

RBD-5
$34.95

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

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

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

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

For Small Antennas & Limited Space

MODEL / ANT CONN / COAX CONN

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

For Medium Size Antennas

MODEL / ANT CONN / COAX CONN

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

For Tall or Multi-band HF Antennas

MODEL / ANT CONN / COAX CONN

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

COMET and Maldol Mobile

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Contents

This Month in QST

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Technical

News and Features

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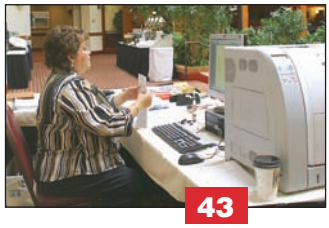
QST Workbench

Operating



OUR COVER
The results of the 2007 *QST* Photo Contest are in! From the top: Our first place winner features a 2 meter beam and a 70 cm beam on Puget Sound. Congratulations Norm McBeath, WB7VXX. Bruce Thompson, KGØSH, operated Field Day at Williams Peak, Colorado (elevation 10,000 feet); Paul O'Kane, EI5DI, of Dublin, Ireland took this photo of hams raising a 160 meter vertical antenna on Rodrigues Island; Francisco Rogerio F. Aragão, PT2TD, of Brasilia, Brazil, shot his Arrow VHF/UHF handheld antenna while he was waiting for a signal from satellite SO-50. The background photo, taken by Jan Mitchell, WH7Y, at Kualoa Park, Oahu, Hawaii, depicts dawn at the Koolau ARC's Field Day site. There's a selection of other photos from this year's contest on page 21.

Departments

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See page 14 for detailed contact information.

Telephone: **860-594-0200**

Fax: **860-594-0259**

NEW COMPACT HF TRANSCEIVER WITH IF DSP

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

HF/50 MHz 100 W All Mode Transceiver

FT-450 Automatic Antenna Tuner ATU-450 optional

■ **FT-450AT With Built-in ATU-450 Automatic Antenna Tuner**

Compact size : 9" X 3.3" x 8.5" and Light weight : 7.9 lb

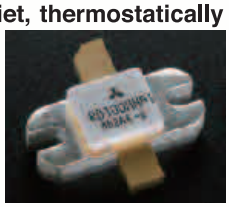
■ Large informative Front Panel Display, convenient Control knobs and Switches

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

Handy Front Panel Control of Important Features including:

- **CONTOUR Control Operation**
  The Contour filtering system provides a gentle shaping of the filter passband.
- **Manual NOTCH**
  Highly-effective system that can remove an interfering beat tone/signal.
- **Digital Noise Reduction (DNR)**
  Dramatically reduces random noise found on the HF and 50 MHz bands.
- **IF WIDTH**
  The DSP IF WIDTH tuning system provides selectable IF passband width to fight QRM.
  SSB - 1.8/2.4/3.0 kHz , CW - 0.5/1.8/2.4 kHz
- **Digital Microphone Equalizer**
  Custom set your rig to match your voice characteristics for maximum power and punch on the band.
- **Fast IF SHIFT Control**
  Vary the IF SHIFT higher or lower for effective interference reduction / elimination.

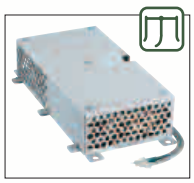
■ The rugged FT-450 aluminum die-cast chassis, with its quiet, thermostatically controlled cooling fan provides a solid foundation for the power amplifier during long hours of field or home contesting use.



MOS FET RD100HHF1

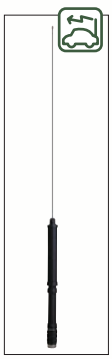
The rugged aluminum die-cast chassis with cooling fan

■ Operate anywhere using optional internal or external antenna tuning systems



Internal Automatic Antenna Tuner ATU-450
Covering 160 m to 6 m Amateur Bands Dipole or Yagi antennas
(The ATU-450 Antenna Tuner is included in the FT-450AT)

External Automatic Antenna Tuner FC-40
Covering 160 m to 6 m Amateur Bands (with 65+ ft end fed wire)



Active Tuning Antenna System ATAS-120A
Covering 40 m to 6 m Amateur Bands
(For mobile)

More features to support your HF operation

●10 kHz Roofing filter ●20 dB ATT / IPO ●Built-in TCXO for incredible ±1 ppm/hour (@+77 °F, after warmup) stability ●CAT System (D-sub 9 pin): Computer programming and Cloning capability ●Large, Easy-to-See digital S meter with peak hold function ●Speech Processor ●QUICK SPLIT to automatically Offset transmit frequency (+5 kHz default) ●TXW to monitor the transmit frequency when split frequency operation is engaged ●Clarifier ●Built-In Electronic Keyer ●CW Beacon (Up to 118 characters using the CW message keyer's 3 memory banks) ●CW Pitch Adjustment (between 400 to 800 Hz, in 100 Hz steps) ●CW Spotting (Zero-Beating) ●CW Training Feature ●CW Keying using the Up/Down keys on the optional microphone ●Two Voice Memories (SSB/AM/FM), store up to 10 seconds each ●20 seconds Digital Voice Recorder ●Dedicated Data Jack for FSK-RTTY operation ●Versatile Memory System, up to 500 memory channels that may be separated into as many as 13 Memory Groups ●CTCSS Operation (FM) ●My Band / My Mode functions, to recall your favorite operating set-ups ●Lock Function ●Adjustable Main Tuning Dial Torque ●C.S. Switch to recall a favorite Menu Selection directly ●Hand Microphone included ●IMPORTANT FEATURE FOR THE VISUAL IMPAIRED OPERATORS - Digital Voice Announcement of the Frequency, Mode or S-meter reading

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

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

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It's Now All Yours ! ... YAESU FTM-10SR

2 m/70 cm Band
FM Dual Band Transceiver
(2 m 10 W / 70 cm 7 W)
FTM-10SR

IP57 Submersible 3 feet for 30 min Body/Front panel

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

2 m/70 cm Band
FM Dual Band Transceiver
(2 m 50 W / 70 cm 40 W)
FTM-10R

IP57 Submersible 3 feet for 30 min Front panel

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

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

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

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

50 W 2 m/70 cm*
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YAESU NOW PRESENTS THE THIRD GENERATION ULTRA-COMPACT HAND-HELD FM TRANSCEIVER

The Third Generation Ultra-compact Handheld, VX-3R, is loaded with more new convenient and enjoyable features — "AA" Battery Operation*, FM Stereo Broadcast Reception, Internal Bar Antenna for the AM Broadcast Band. Yaesu again leads the world of Compact Hand Held Transceivers!! The supplied High-Capacity Lithium-ion Battery (FNB-82LI) is compatible with the VX-2R. Handy to upgrade!

* Optional 3 x "AA" Cell Battery Case FBA-37 (Batteries not supplied)

ULTRA COMPACT 2 m/70 cm
DUAL BAND FM HANDHELD

VX-3R

- Ultra-Compact (1.9" x 3.2" x 0.9") and Light Weight! (4.6 oz)
- Rugged Aluminum Die-cast Chassis
- 1.5 W Output w/Internal Battery (70 cm : 1 W)
  3W Output w/External DC (70 cm : 2 W)
- High-Capacity Super-thin Tiny Lithium-ion Battery with Charger (supplied)
- The Optional FBA-37 Permits Convenient Operation with AA Batteries ("AA" x 3)
- Special Memory Banks :
  WX Broadcast, VHF Marine, Short-wave Broadcast Stations
- Huge 1286-channel Memory Capacity
  24 Memory Banks x 100 ch
- Wide-band Receiver Coverage (Cellular-band Blocked)
- Internal Bar Antenna for AM Broadcast Band
- Separate Broadcast Band Earphone Jack for a Stereo Headset or Earphone
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Interoperability

"'Interoperability' is a big word with many different definitions depending on the context. In radio it means, broadly, the ability of operators or devices to communicate (that is, to exchange information) with one another. Interoperability normally refers to the characteristics of equipment rather than to operators although language and jargon also can be barriers to communication."

Public safety communicators have been grappling with the problem of interoperability for decades. When everyone used analog FM voice it was possible, in principle, to solve the problem simply by designating a common frequency. In practice it wasn't always that easy. Different agencies used different frequency bands, and even when they could get on the same frequency they couldn't talk very far and often used different jargon. The emergence of a variety of trunked and digital systems exacerbated the situation. Today there are technical solutions to the public safety interoperability problem — but they depend on the availability of specific hardware, training, and a willingness on the part of agencies to relinquish control.

By comparison, Amateur Radio scores well in terms of interoperability. All CW stations built in the past 80 years are able to communicate with one other, assuming they have a frequency in common. The same is true of all SSB stations built in the past 60 years. (Historical note: The first amateur SSB transmission was made on September 21, 1947 from the Stanford University Radio Club, and the first two-way SSB contact was established on 20 meters between club station W6YX and WØTQK in Missouri on November 3 of that year.) On VHF FM, a newly minted operator with a brand new handheld transceiver can communicate with an old-timer who has used the same tube-type rig for the past 40 years.

Things get more complicated with digital modes. Codes and protocols become as important as hardware. As we move from the realm of hardware to software, maintaining interoperability becomes a greater challenge and does not occur automatically. A modern computer-based RTTY station can communicate with the old mechanical marvels, but only because they both use the venerable Baudot code. AMTOR stations can only communicate with other AMTOR stations. PSK31 is a remarkable development and a great improvement over Baudot-based RTTY for keyboard-to-keyboard communication, but its devotees can only communicate among themselves. With a few exceptions (the three versions of PACTOR are backward compatible and G-TOR is structured to be compatible with HF Automatic Link Establishment, or ALE) the HF data modes are independent islands in the digital stream. The story is much the same with regard to digital voice, which is developing more slowly except with regard to Internet-based internetworking such as IRLP and EchoLink.

For routine amateur operations, this is of no great consequence. We would like to be able to identify other stations that we encounter in the amateur bands and sometimes are frustrated by our inability to decode their transmissions, but this is a relatively minor issue most of the time. However, in emergencies we must be able to communicate with one another. If we do not maintain our interoperability within the Amateur Radio Service as we branch out in different digital directions, a call for help could go unheeded even if other stations are in range — with potentially tragic consequences. In addition, the agencies we serve in responding to emergencies *expect* us to be able to communicate with one another, because we have done it so well for so long. Interoperability is one of Amateur Radio's distinguishing features; losing it would be a giant step backward.

This aspect of digital development has been a concern for some time, so it was reassuring to hear a series of presentations at the Third Global Amateur Radio Emergency Communications Conference (GAREC-07), held in Huntsville on August 16-17 just before the ARRL National Convention. In explaining how they are applying specific advanced technologies to emergency communications, speaker after speaker identified interoperability with other technologies and networks as a key objective.

It was a pleasure to hear how the VoIP Hurricane Net, **www.voipwx.net**, is utilizing both EchoLink and IRLP to provide "ground truth" reports to the National Hurricane Center.

It was encouraging to hear the proponents of D-STAR, Winlink 2000, and ALE all address the need to ensure that communication can take place between their platforms.

It was enlightening to hear how Army MARS is pursuing its mission of providing an auxiliary communications conduit for military, civil, and disaster officials during periods of emergency, and the steps already being taken to increase collaboration among the Army, Air Force and Navy-Marine Corps MARS organizations.

It was instructive to learn how disaster response organizations such as the American Red Cross, the Salvation Army, and Southern Baptist Disaster Relief meet their communications requirements using a variety of tools — including Amateur Radio when appropriate — and what they need from us now, which is quite different from just a few years ago. "Please send this spreadsheet to our headquarters" is an example.

Tying much of this together is the Internet. By its very nature, the Internet is able to survive a lot of disruption — but connections to it from a disaster area may be non-existent at first and woefully inadequate, even via satellite, for hours, days, and possibly even weeks afterwards.

So it was a joy to share the GAREC experience with nearly 100 dedicated, committed Amateur Radio volunteers who were as intent on cooperating as on explaining and advocating their favorite technologies. This spirit of cooperation and the recognition of the need to preserve our interoperability bode well for the future of Amateur Radio emergency communications, and for our ability to continue to serve our local, national and global communities.

David Sumner, K1ZZ
ARRL Chief Executive Officer

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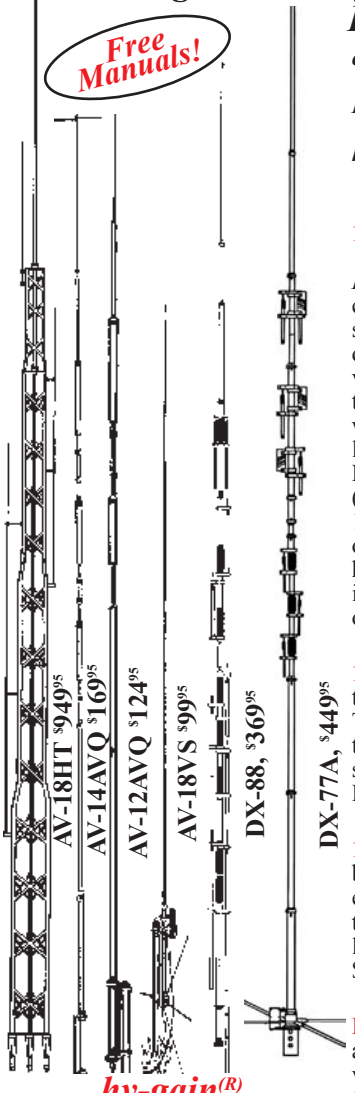

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AV-12AVQ	$134.95	10/15/20 M	1500 W PEP	13 feet	9 pounds	80 MPH	1.5-1.625"
AV-18VS	**$99.95**	**10 - 80 M**	**1500 W PEP**	**18 feet**	**4 pounds**	**80 MPH**	**1.5-1.625"**
DX-88	$369.95	10 - 40 M	1500 W PEP	25 feet	18 pounds	75 mph no guy	1.5-1.625"
DX-77A	**$449.95**	**10 - 80 M**	**1500 W PEP**	**29 feet**	**25 pounds**	**60 mph no guy**	**1.5-1.625"**

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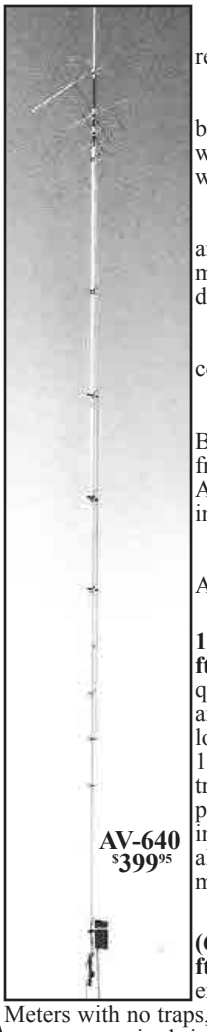

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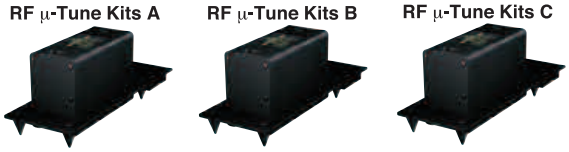

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This Just In

Joel P. Kleinman, N1BKE
jkleinman@arrl.org

In Brief

- The ARRL National Convention, featuring the ARRL EXPO area, took place in conjunction with the Huntsville (Alabama) Hamfest August 18-19. Just before the convention, an international group of emergency communicators took part in GAREC 2007, the Global Amateur Radio Emergency Conference. A report will follow in the November issue.
- Several emergency nets were activated in the wake of Hurricane Dean, a powerful storm that churned through the Caribbean and the Yucatan Peninsula in August.
- Jim DeLoach, WUØI, won the *QST* Cover Plaque Award for July 2007.
- Satellite-television provider DirecTV is teaming up with Current Group to provide BPL (broadband over power line) service. Based on Current's existing BPL approach, ARRL is cautiously optimistic that the new partnership will not cause interference problems for Amateur Radio operators.
- In other BPL news, the ARRL filed an Informal Objection to Ambient Corporation's request for a renewal of their nationwide experimental authorization that allows them to operate BPL operations anywhere in the country they choose. In addition, the ARRL filed its reply brief at the US Court of Appeals for the District of Columbia Circuit. This brief follows the FCC's brief that attempted to rebut the ARRL's challenge to the FCC's BPL rules enacted in late 2004 and affirmed by the agency in 2006.
- The Morris Radio Club has donated more than $31,000 to the ARRL Foundation in support of an annual scholarship.
- Dennis Dura, K2DCD, joined the Headquarters staff in Newington as Emergency Preparedness and Response Manager. Contest Manager Tom Hogerty, KC1J, left the HQ staff to pursue other opportunities after nearly 20 years of service.
- The International Telecommunication Union has granted a request from the Ministry of Communications and Transport of Bosnia and Herzegovina (BiH) to replace T9A-T9Z with E7A-E7Z. The new prefix is expected to be implemented later this year.
- Allen Eiermann, K3LSR, has been named the new acting chief of Air Force MARS.
- The following online courses began in August: Technician License Course (EC-010), Amateur Radio Emergency Communications Level 1 (EC-001), Radio Frequency Interference (EC-006), Antenna Design and Construction (EC-009), Analog Electronics (EC-012) and Digital Electronics (EC-013).
- Mission Specialist Barbara Morgan, KD5VNP, a teacher-astronaut, was among the crew of STS-118, the shuttle *Endeavour* mission that delivered a piece of the space station to the ISS in August.
- The ARRL UHF Contest was held August 4-5, and the 10 GHz and Up Contest was August 18-19. Next up: the September VHF QSO Party, September 8-10.
- More than 380 lighthouses in more than 48 countries were on the air for the annual International Lighthouse/Lightship Weekend.

Media Hits

Allen Pitts, W1AGP

- Quickly….answer the *Jeopardy!* question, "The Amateur Radio Service is part of this agency, known as the FCC." If you said, "What is the Federal Communications Commission?" you could have won a $400 Double Jeopardy question on August 4.

At its root, Amateur Radio is about people, and there were a number of family related stories in July that caught media attention.

- *The Reporter-Times* in Martinsville, Indiana, gave its congratulations to Ben Blackburn, KC9LXA, and Mary Lou Hawkins, KC9LXC. Ben, 13, along with his grandma Mary Lou (age? none of your business!) recently took the test to get their Amateur Radio Technician licenses together. They had been challenged by Grandpa Russ Hawkins, KC9LOT.
- Amethyst Lauder, KI4WSZ (age 8) and her sister Kaighla, KI4WTG (age 11) have been getting a lot of positive press around Tennessee, including the July 24 Knoxville *News Sentinel*. They are the children of Amy, KI4KXS, and David, KI4KBS, and Amethyst may be the youngest ham in the state.
- Meanwhile, another 11 year old in Florida got news hits, including the July 21 Daytona Beach *News-Journal*. Victoria Sanita, AI4ZS, is the youngest Extra class operator in that area. Victoria first earned her Technician license over a year ago, and loves DXing with her father, Frank, AA4FS.
- Congratulations of a different kind went to Purdue University Professor Leslie Geddes who was honored on July 27 when President Bush presented him with the National Medal of Technology — the nation's highest honor for technical innovation. According to the Associated Press reports, Geddes, at age 86, credits his accomplishments to his past as an Amateur Radio operator. "I've been a gadgeteer all my life," he quipped.
- It's usually not hard to get a notice into a weekly paper, but to take over an entire edition is unusual. The Tri-Town Amateur Radio Club dominated the June 21 edition of Russell Publications' *Neighbors* (Petone, Illinois) with multi-page spreads on their 75th anniversary. Congratulations on the hit!
- Not all of the news was happy in July. The collapse of the Minneapolis bridge brought media comments about Amateur Radio. This time the stories were in reaction to the inability of cell phones in the area to handle all the critical messages. Preparing for a recent article in *CONTACT!* found that most cell systems can actually carry fewer than 5% of their customers in voice messages at any one time. Some systems were found to be a lot less robust. MSNBC noted this on August 2 in their story by Alan Boyle who interviewed ARRL Section Manager Skip Jackson, KSØJ. While emergency communications worked well, civilian communications were called "inadequate." John Biachtal of Wired News (USA) also wrote about the cell phones being overwhelmed. His advice to the readers was blunt and to the point — "Get (ham radio) licensed and join an emergency communications group."
- Finally, if you have not seen it yet, there's a fanciful new Web site called "The Spoof," which has totally fictional — and funny! — news articles. Many involve ham radio and while it takes a bit of science background to understand the jokes, the tone and ability to laugh at ourselves is delightful. I believe this one will become quite popular. **www.thespoof.com**.

S. KHRYSTYNE KEANE, K1SFA

GAREC 2007, the Global Amateur Radio Emergency Communications Conference, took place in Huntsville, Alabama, in August just before the ARRL National Convention. There will be more on both GAREC and the National Convention in next month's issue.

Secretary of Defense Robert M. Gates presents the Defense Distinguished Service Medal to Vice Chairman of the Joint Chiefs of Staff Adm Edmond Giambastiani Jr, US Navy. The occasion? The admiral's retirement ceremony at the US Naval Academy in Annapolis, Maryland in late July. Cynthia Giambastiani joined her husband, better known on the ham bands as N4OC, for the presentation. After graduating from the Naval Academy with leadership distinction in 1970, Giambastiani rose to become the seventh vice chairman of the Joint Chiefs. The American Forces Press Service reported that Deputy Secretary of Defense Gordon England closed his remarks with a message in Morse code. Both Giambastiani and England, a former ham, are ARRL members.

DOD PHOTO BY STAFF SGT D. MYLES CULLEN, US AIR FORCE

COURTESY CHUCK SKOLAUT, KØBOG

At the successful ARRL Arizona State Convention in Williams, ARRL HQ staffer Chuck Skolaut, KØBOG, meets with Official Observer Coordinator Carla Ackley, KD7JGJ.

Inside HQ

Awards and Recognition Survey

During the last two years, we have conducted a number of online e-mail research surveys. These surveys let us know what you are thinking about a particular topic. For example, we based much of the organization and structure of the new edition of the *Ham Radio License Manual* on this research.

Recently we asked our members what types of awards and recognition items they would like us to offer. We surveyed about 5000 e-mail addresses from the general membership. We also e-mailed a second survey to about 900 ARRL Affiliated Clubs.

So what did we learn? You would like us to offer additional recognition awards for years of membership in the ARRL, as well as for involvement in specific volunteer activities such ARES, Field Leadership positions and Volunteer Examiner. Based on this information, we will be offering some of these recognition items in the near future, and, in fact we already have. Last year, we added the EmComm Honor Roll to *QST* to recognize those amateurs who have completed all three Emergency Communications courses. In the last issue of *QST*, we initiated the ARRL VEC Volunteer Examiner Honor Roll to recognize the Top 25 Volunteer Examiners according to the total number of exam sessions they have participated in since their accreditation. We have also increased the number of downloadable recognition certificates and awards in a number of areas. With regard to awards that members pay for, we heard loud and clear to keep these items optional, make them easy to order and keep them inexpensive.

There was also interest in us offering Amateur Radio utility items including ARRL/ARES branded vests, tools, blankets and flashlights.

On the awards side, members are generally satisfied with our current award offerings. DXCC and Field Day were the programs in which there was the most interest in additional awards. Members also told us that you would also like some more award options for Sweepstakes, The ARRL International DX Contest and Worked All States. Again, we heard the message to make these additional awards strictly optional and relatively inexpensive.

The ARRL Affiliated Club survey told us that clubs would like to be able to order sharp-looking, personalized recognition awards for their members. Based on this request, we plan to give clubs the option of ordering personalized awards for their members via a Web-based system. This should be operational within a few months.

Again, to all of you who participated, thanks for your time and your thoughts.

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.

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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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As an ARRL member, you elect the director and vice director who represent your division on ARRL policy matters. If you have a question or comment about ARRL policies, contact your representatives at the addresses shown.

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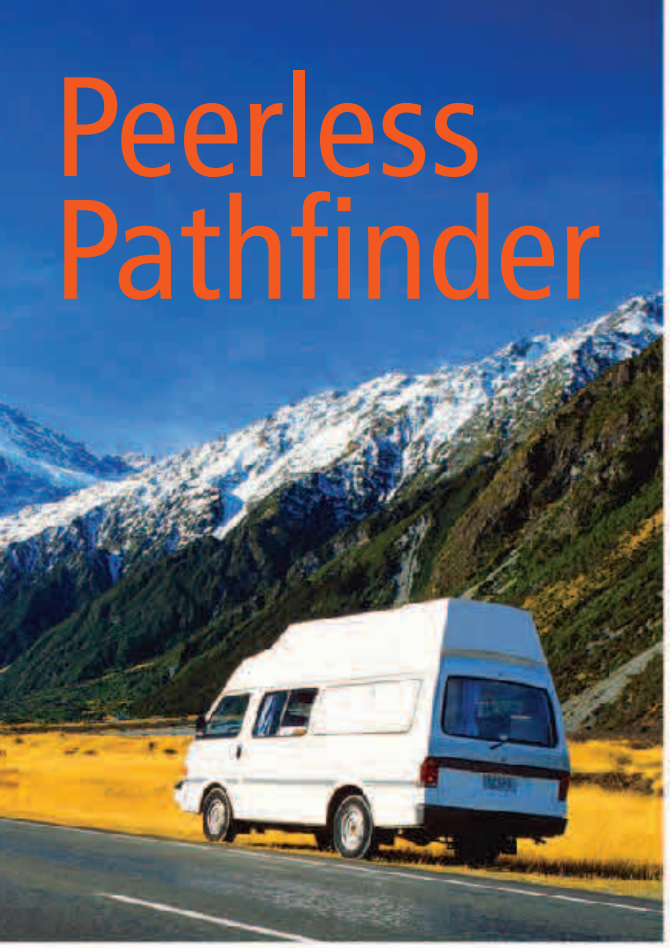

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Up Front in QST

Cold War Relic Now Available for Use by all Ham Radio Operators

Gene Schouweiler, WØKAD

Titan II Intercontinental Ballistic Missile (ICBM) site 571-7 at the Titan Missile Museum, Green Valley, Arizona, is the only one remaining of those that were on "Cold War" alert from 1963 to1987. All 54 sites were dismantled as a result of President Reagan's 1981 "Strategic Forces Modernization Plan." Fortunately, the site south of Tucson was designated for preservation by the Air Force.

CHUCK PENSON, WA7ZZE

The Discage antenna at the Titan II Missile Museum, Green Valley, Arizona, is available for use by licensed ham radio operators, thanks to the Green Valley ARC.

A dedicated team of volunteers stepped up to the enormous task of converting a once active missile site into a museum, and the Titan Missile Museum opened to the public in May 1986. Since then, more than a million people from around the world have toured the site. Visit the museum Web site for more information at **www.titanmissilemuseum.org**.

The Titan Missile Museum and The Green Valley Amateur Radio Club (GVARC), working together, have made the original missile site's 90 foot "Discage" antenna available to any Amateur Radio operator who wishes to attach their own HF equipment. Today, anyone with portable HF equipment can experience the use of this "Cold War relic" antenna, known to hams as a discone, built by Collins Radio Company more than 45 years ago. Just drive up, sign up, hook up and get on your favorite ham band from 6 MHz to 30 MHz.

The GVARC would like to hear from anyone who has knowledge regarding the design, construction or maintenance of this USAF Missile Site Antenna Project. Comments and questions can be posted to the club Web site, **gvarc.us**, or contact WØKAD at **gvarc@hotmail.com**.

"You Go, Girls!"

DAVID LAUDER, K14KBS

The Lauder sisters (Kaighla, KI4WTG, age 11, and Amethyst, KI4WSZ, age 8) seem justly proud of their ham radio licenses, which they received in June. Since then, they've been active on VHF keeping in touch with other hams, including mom Amy, KI4KXS, and dad David, KI4KBS. Two newspapers and a TV station have taken an interest in the sisters' pastime.

"Then, Now and the Future"

The Reelfoot ARC of Union City, Tennessee, designed this impressive display, which was set up at the Obion County Public Library during July and August. The 20 foot long, 6 cabinet display had the theme "Amateur Radio: Then, Now, and the Future." For more information, see the RARC Web site, **www.reelfootarc.com/events.html**. — *Jamie Hall, WB4YDL*

JAMIE HALL, WB4YDL

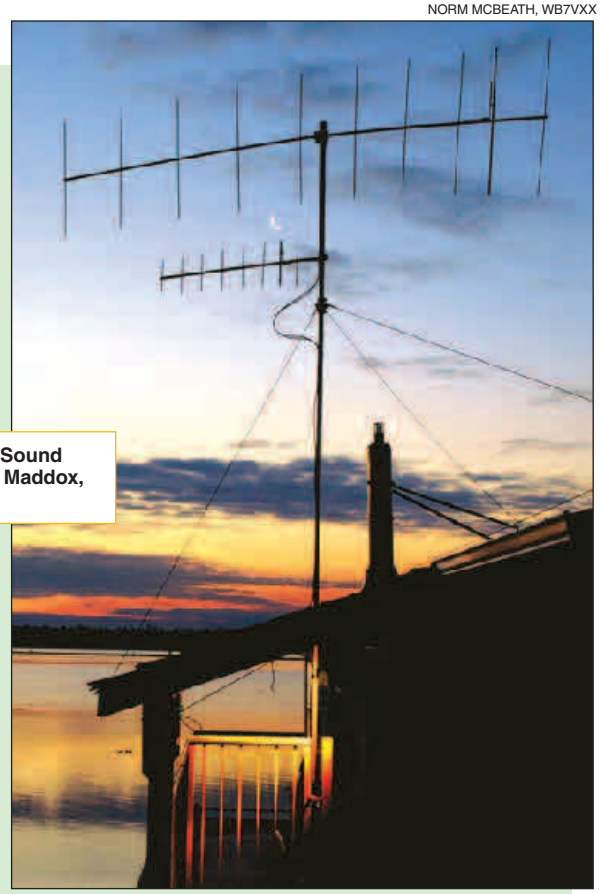
Rose Miles, W9DHD, directed this effective way of promoting ham radio at the Obion County Public Library in Union City, Tennessee.

Presenting:

The Winner (and Near Winners) of the 2007 ARRL Photo Contest

Our thanks again this year to all who entered the ARRL Photo Contest! The judges — members of the *QST* graphics, production and editorial staff — had the challenging task of choosing the best of an impressive array of more than 40 images. The winner of our $100 prize appears at the top right on the cover of this issue — congratulations Norm McBeath, WB7VXX, of Ferndale, Washington!

NORM MCBEATH, WB7VXX



The winner! **As Norm describes it: "Time, sunset. Location, on a bay of Puget Sound west of Ferndale, Washington. The antennas were homemade for me by Floyd Maddox, WB7PMT — 10 element 2 meter beam and 8 element 70 cm beam."**

RANDY JOHNSON, W6SJ

Sunset on Grand Bahama: **Randy Johnson, W6SJ, of Corona del Mar, California, sent us this impressive look at his Moxon antenna during his third trip to the Bahamas in November 2005 for the CQWW DX Contest. He writes: "…anyone can do this. You don't need to rent a big contest station to have fun and there are a number of locations, particularly in the Caribbean, that can host such an operation."**

ROBERT TOLENTINO, N2MPJ

Fastidious repackaging: **When Robert Tolentino, N2MPJ, of Massapequa, New York, needed to replace a faulty shift register in his receiver, he found one at reasonable cost — but in a different package. Seven hours with a microscope resulted in a working replacement!**

DUKE BROWN, W1ZA

Looking up: **Duke Brown, W1ZA, describes this one: "This is a multiple exposure shot of the North Star looking through the tower and antennas of W1ZA in Powhatan, Virginia."**

PHIL TEMPLES, K9HI

Education: **Phil Temples, K9HI, of Watertown, Massachusetts, snapped ham radio educator Gordon West, WB6NOA, as he showed an impressive-looking UHF Yagi to Courage Center Handiham camper Nabila Mashiyyat, KD7ZWP. The photo was taken at Radio Camp in Malibu, California, in 2004.**

DAVE OLEAN, K1WHS

January in Maine: **Writes Dave Olean: "Here's an early morning photo of some snow covered towers and VHF antennas at K1WHS taken January 2006 at Lebanon, Maine." No surprise that Dave is a top VHF/UHF contester and moonbouncer. Space limitations won't allow us to describe the antennas and towers in detail, but to provide perspective, the top antenna on the right-hand tower is at 137 feet, and the camera was located about 2000 feet away.**

REDUCE OR ELIMINATE NOISE AND INTERFERENCE

DSP NOISE REDUCTION

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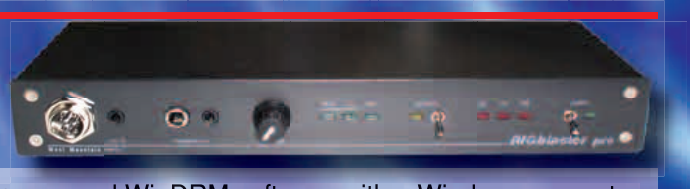
The COMspkrs look good in a ham station or at a computer desk and have better sound quality than most two-piece computer speakers. The audio quality is especially good for music or voice with 3 watts per channel. They may be used mono or stereo with a radio instead of a computer, or even an MP3 player.

DIGITAL VOICE ON HF

RIGblaster pro



Operate digital voice on HF with SSB bandwidth! A RIGblaster pro and WinDRM software with a Windows computer that has a basic, full duplex, sound card is all you need to operate digital voice. HF signals that take no more spectrum than SSB but are noise free like FM. WinDRM is the HF digital program that works with a RIGblaster pro. The WinDRM program is free, and because you can use a RIGblaster pro there will be no problem in getting QSOs.

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CORRESPONDENCE

TIMELESS WISDOM

♦ Almost 50 ago when we built our home that we still live in, I visited our Town Engineer to see if I needed a permit to build a 50 foot tower (now grown to 90 feet over the years). He said I didn't need any permit (today, I'd be thrown out by the ears), but not being a ham, he asked if lots of friends would be helping to put the tower up. I said yes, and that I'd probably recruit some neighbors, too. He suggested that I give my wife a camera loaded with a full roll of film (we used film back in the Stone Age) and have her walk around the tower during the day and take pictures of all our interested and helpful neighbors as they were holding tools, pulling ropes, carrying tower sections, looking up and pointing and such. Then, in later years when the neighbors complain about the eyesore in my yard, I could pull out the pictures and show them that they helped put it up. What a wise man he was!

BOB BEAUDET, W1YRC
ARRL Rhode Island Section Manager
Cumberland, Rhode Island

D-STAR DILEMMA

♦ In reference to the D-STAR article in the September 2007 issue ["Operating D-STAR," pp 30-33], weak signals get lost when digital processing is used. One would think that in the emergency communications venue, communications would be at the forefront instead of audio quality. Digital cell phones are a good example of problems with this technology — instead of the signal being degraded, signals simply drop out. The communications manufacturers have sold the governmental entities and cell telephone companies a bill of goods with this technology. If a signal drops out instead of being degraded on the EMS frequency, someone could lose their life over digital technology. Does ham radio want to go down this same road? The big advantage of reliability lies with non-digital voice systems. The latest technology is not always the best.

C. RICHARD PUMPHREY, WN9DDV
Clinton, Tennessee

THERE'S MORE TO EMERGENCY COMMUNICATIONS

♦ I am writing in response to the letter by John Scheuchenzuber, W4QVA ["Correspondence," August 2007], where he tells us about spreading his message, "One Person, One Handheld Radio." He admits that he is not interested in what most of us consider the traditional "hobby" aspects of Amateur Radio, but is rather narrowly focused on emergency communications. His speeches telling people that "you and a handheld radio can be the lifeline for the entire community" is a gross oversimplification of the capabilities of Amateur Radio and can lead to disappointing or even fatal results.

I believe the real key to our national security is prevention, not Amateur Radio. Amateur Radio will not prevent our enemies from attacking us again. As far as rumors and propaganda, even though most radios are equipped with all sorts of filters, I have yet to see one with a truth filter on it. There is nothing about Amateur Radio that makes the information coming out of the speaker any more credible or reliable than any other form of communication. Saying otherwise is spreading false hopes and dangerously unrealistic expectations.

Do not rely on one person with a handheld radio to save you. Training, planning and preparation will.

SCOTT SCHULTZ, NØIU
Wentzville, Missouri

BACKGROUND CHECKS ARE A GOOD THING

♦ I respectfully object to the ARRL position against background checks for emergency personnel. I am for as stringent checks as possible. Here is my rationale: I was a Red Cross volunteer working after Hurricane Katrina. About 110 of us slept in a church in La Place, Louisiana. I was quite happy to know we all had been screened to reduce the chance of having one or ore questionable persons around me or my gear. The Red Cross supplied me with a voucher system for air tickets and a cash card to draw travel expenses. On my third day here I became crew leader, was given the keys to a $40,000 van laded with relief supplies and led two other vans and two support vehicles. It is simply bad stewardship to turn over such an operation to someone with no background check. I could see how a background check seems too much to require of a ham who drives up and sleeps in his own RV and walks back and forth to a communications room. But in emergency conditions we cannot predict our working responsibilities, bunking facilities and the emotional stability of those we are thrown in with.

One of the subtle benefits of having background checks is not so much to weed out the bad folks as to discourage them from even applying. So, as Harry Truman said, "If you can't stand the heat stay out of the kitchen." Let the emergency support agencies vet their field staff as they see fit. Let those who are not willing to submit to the same examination as their co-workers stay home and provide their support on an individual basis as message relay points or financial donors.

BILL RAGSDALE, K6KN
Woodland, California

LOW VOLTAGE ARC CAUSES BIG PROBLEMS

♦ I read the article by James Hanson, W1TRC ["A Home-made Ultrasonic Power Line Arc Detector," April 2006, pp 41-45], and was impressed by the fact that the utility investigator came to his home equipped with a commercial ultrasonic detector. In my area of Washington State, repairmen who check noise reports have no detection equipment at all, not even transistor radios.

I recently had a noise problem that I tracked down using my AM radio to an area with two power poles. The repairman, who arrived while I was out, examined the high voltage (HV) connectors and found nothing amiss, so the noise persisted. After suffering six months of annoying interference, I was walking by one of the poles one day and I heard a faint sizzling sound. With the noise source now better pinpointed, I called the utility once more. The serviceman climbed the pole, rechecked all the HV components and the step-down transformer but found nothing wrong. On the ground below, the noise was blaring on my radio and I persuaded the man to take my radio up the pole. Within a minute he located the problem — the noise was not coming from the HV components at all, but from the system neutral line lower down the pole. This line was rubbing against a guy wire that was grounded. The problem — a low voltage arc — could not have been found without my old transistor radio. Don't expect your utility to be properly equipped to find a noise problem — you have to help.

BRUCE FLEMING, KI7VR
Vancouver, Washington

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Mike, KM0T – I had always dreamed about a radio and interface like this; but never thought it would ever happen. I sometimes catch myself staring at the screen showing the microwave band frequencies thinking "Man this is awesome!" Seems every time I turn around, there is something new coming down the pipe to make the whole setup better.

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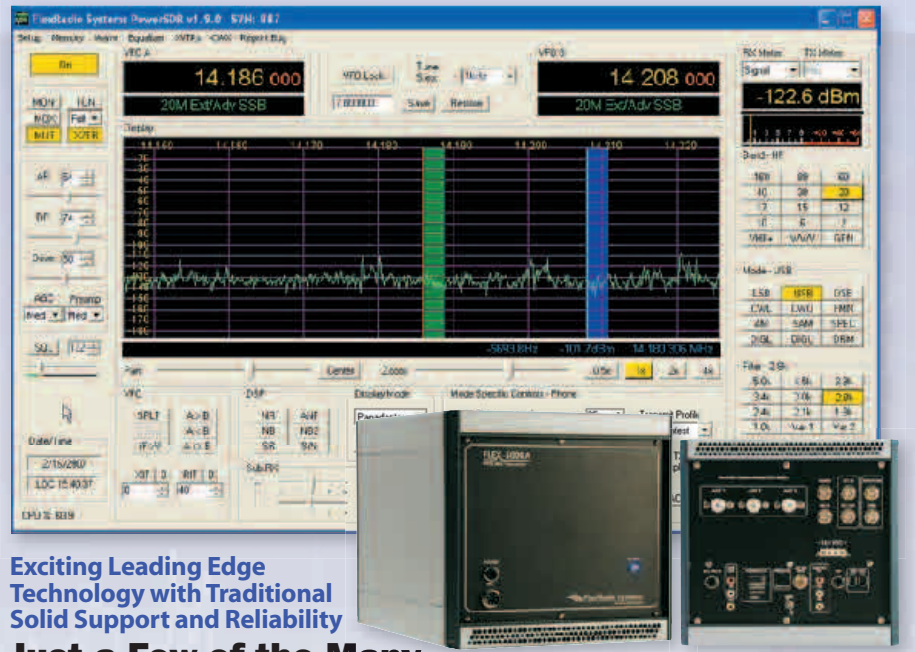

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The design of the Prometheus is the result of over 10,000 hours of research and development, encompassing hundreds of hours of mathematical analysis, computer simulation and modeling, and numerous prototypes and experiments spanning over a five year period.

The result is a rugged, commercial quality amplifier designed to run cool under 1500W continuous SSB, CW or RTTY, with transformers and combiners designed for full power operation even on 160 meters. With no tuning and no warm up time delay, it provides reliable power instantly so that rare DX station doesn't get away. The product features tell just part of the story. Learn more about this cutting edge amplifier and Dishtronix, the visionary USA company that made PROMETHEUS a reality at: **www.dishtronix.com**

Product Features

- Fully Automatic Band Switching: The DX2400L1 can be controlled (optional converter may be required) with the transceivers band data through CAT/CIV/RS232 style optically isolated interface.
- For older transceivers without band data, the DX2400L1 Internal Frequency Counter can sample the incoming RF drive and determine the proper band of operation under microprocessor supervision.
- Four Position Antenna Switch with automatic memory for last antenna used for each band.
- Cool running 4800W Extra Heavy Duty DC Power Supply is the most powerful in the industry.
- Optically Isolated RS485 Remote Interface allows operation up to 1500 feet away through a twisted cable pair with optional PC adapter and software package or optional remote control head.
- ALC: Negative going from 0 to -10 Volts, digitally adjustable. SWR-ALC foldback protection.
- Optically isolated Remote On capability from transceiver +12V Auxiliary jack.
- Protection Circuits: SWR protection circuit. Over temperature warning and shutdown protection. Over/ under voltage lockout protection. Overdrive protection. Hardware failure protection (combiner balance, PIN T/R failure)
- Digital Bargraph Display for Forward Power, Reflected Power and True (computed) SWR.
- Full Loop QSK Keying to interlock transceiver and amplifier.
- Vacuum Antenna Relay as standard equipment. PIN diode T/R switch available as an option.
- FLASH Microprocessor allows field upgrades of amplifier firmware.
- Separate low voltage control transformer for bias and microprocessor circuits reduces power consumption in continuous standby mode and allows metering of transceiver when in bypass mode.
- Full Optic Isolation of all control functions (Key In, Key Out, PTT, Band Data, Remote On) from transceiver as well as full optic isolation of computer/ remote interface port.
- 2400 W PEP Total Rating of RF power transistors.
- Heavy Duty Low Pass Filters constructed with 12 gauge coils and custom high power capacitors.
- Oversize (30 lb) Heat Exchanger and 4 thermostatically controlled, ball bearing, variable speed cooling fans mounted in push-pull configuration for redundancy.
- Sturdy 1/8" thick extruded aluminum cabinet with precision laser machined 1/8" thick chassis, front and rear panels finished with textured black paint over yellow irridite finish.
- Hardware included for support of optional automatic antenna tuner.
- Dual Control Inputs allow operation from two different radios.
- Optional rack mount package.

Patents Pending

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Kenwood APRS® Radio

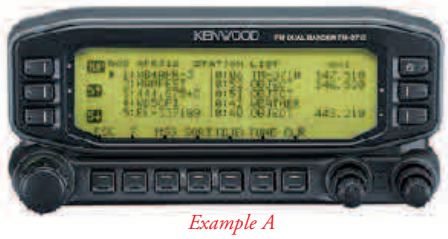
Bob Bruninga, WB4APR

APRS® was designed to be a data channel for the rapid exchange of local information of immediate interest between users in the local area. Not only does this include the locations of other mobiles, but also Weather data, Direction finding information and numerous objects of local interest such as IRLP, EchoLink® or WinLINK nodes and even local voice repeaters so that mobile travelers are aware of the local ham radio assets surrounding them.

The new TM-D710A will not only display the full details of APRS® information that has been displayed for years on the TH-D7A and TM-D700A radios, but now also the voice operating frequency of any other TM-D710A APRS® radio or of any APRS® station that has entered his frequency information in his position packets. On receipt of this data, even the present TM-D700A and TM-D7A models will flash the information to the front panel screen:

But the new TM-D710A can display these frequencies on its station list and then TUNE to each such station by simply pressing the TUNE button as shown below. On transmit, the TM-D710A can automatically insert its Band-B operating voice frequency in each position packet, so that others can contact the operator no matter where he is tuned. In example A, the mobile station WB4APR-3 shows that the Band-B frequency of his TM-D710A is presently tuned to 147.510 MHz.

This can work for IRLP and EchoLink® objects on APRS® as well, so that a mobile operator in a new area, can see, and instantly tune to the local node in an area. *[See Example A]*



Example A

When the station is selected, then the full information is displayed including the direction and distance to the station or object as shown below. *[See Example B]*

Example B

The national APRS® network also encourages the automatic transmission of recommended voice repeater frequency objects for travelers. These objects show up not as a repeater callsign, but as the actual frequency itself. This way, it is easy to see in the station list, the recommended frequency for an area. Again, a simple push of the TUNE button will make the traveler instantly monitor that locally recommended frequency. *[See Example C]*

Example C

Not only do all other APRS® stations show up on an attached GPS, but the location of these Frequency objects also show up on the map to help the operator understand how close he might be to one of these assets. *[See Example D]*

Example D - AvMap G5

In addition to the Band-A APRS® data channel and Band-B voice channel in the TM-D710A, there is a third communications back-channel for operator to operator voice contact when in simplex range. This capability called "Voice Alert" is built into every Kenwood APRS® radio so that independent of what is happening on the APRS® channel and even without knowledge as to what frequency a mobile is currently monitoring on his Band-B, he can still be contacted by a voice call via this Voice Alert channel from anyone in simplex range.

Kenwood is dedicated to helping ham radio operators communicate with other ham radio operators. Using the features of APRS® embedded in the new TM-D710A APRS® radio, mobile travelers and emergency responders can quickly find each other and rapidly establish communications! Meanwhile this information is also available globally via the APRS®-Internet and various display systems.

Are You Using the Right-Sized Fuse?

Fuses are inexpensive and out of sight — make sure you've got the right one. What you don't see can hurt you!

Alan Applegate, KØBG

While this article is aimed at the mobile operator, it contains information applicable to any installation.

Fuses protect just about every piece of Amateur Radio gear made. Most of the time, the fuses are there to protect the wiring, not the internal electronics. If you doubt this premise, think about this. An internal voltage regulator might be rated for a maximum current of 500 mA. Short its output, and it *isn't* the 30 A power line fuse that will blow.

What *Is* a Fuse?

A fuse is a deceptively simple device. It is a wire that, when subjected to too high a current, melts. When it does, the circuit opens — hopefully. I say hopefully, because if you've chosen the incorrect size for your application, it may not open, or it may open after a long delay. In any case, you want the fuse to do its job well before your wiring becomes its own fuse.

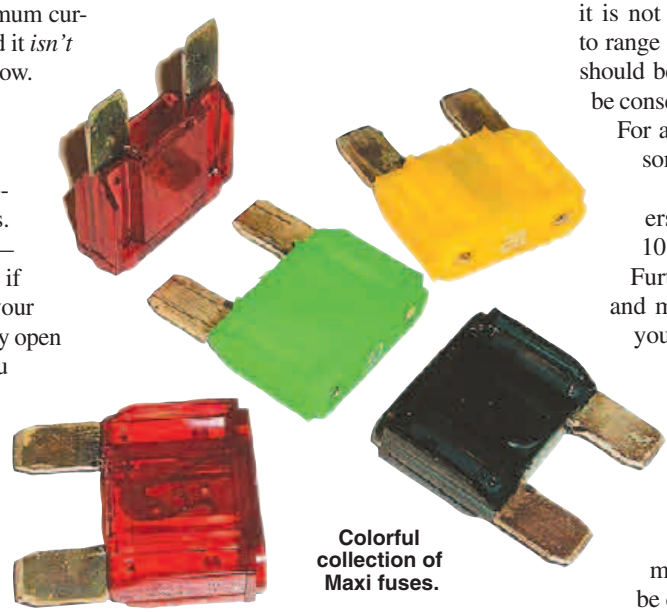
What About Current Ratings?

There is a lot of misunderstanding about fuse ratings, both in terms of the current and voltage they are designed to handle. You shouldn't use household type fuses to protect your 12 V dc powered circuitry, or vice versa. Part of this stipulation has to do with quenching any arc that might occur within the fuse. Further, low voltage fuses can fail catastrophically (explode), if subjected to high voltages.

Most people think a 30 A fuse will suddenly open if the current exceeds 30 A. It might, and it might not! The chart in Figure 1 shows the failure curves for several sizes of Maxi fuses. Maxi fuses are popular in amateur applications as they are a modern replacement for the older, cylindrical style 5 AG fuses.

Note that a 30 A Maxi fuse will take about 3 seconds to open when subjected to a 100 A load! The same fuse will carry 40 A for about 2 minutes! As the static temperature goes up, the vertical scale compresses slightly, and in very cold temperature settings it elongates slightly. So, there is a time lag between applying an overload, and the fuse opening to protect the wire.

In the meantime, the wire being protected is getting rather warm. If it gets too warm, hot really, it could cause a fire. This fact figures heavily on our choice of fuse amperage ratings, the wire size we choose, and ultimately how safe our installation is should a dead short occur.



Colorful collection of Maxi fuses.

Make the Wire Size Match the Load

American wire gauges (AWG), as with their European and Asian counterparts, have specific amperage ratings. These ratings are based on the type of insulation, the ambient temperature they are subjected to, their proximity to other wiring and even their intended use. We often see the acronym ICAS, which stands for Intermittent Commercial and Amateur Service. There are similar standards (both real and assumed) in just about every industry. In our case, it pays to be conservative, and this fact will become more evident later on.

The ARRL Handbook lists the various AWG ratings for bare and enamel coated wire.[1] These ratings are based on a standard of 700 circular mils per ampere (CM/A), but it is not uncommon for suggested ratings to range from 250 CM/A to 1000 CM/A. It should be noted that 700 CM/A appears to be conservative, but it is not as we shall see.

For a better understanding, let's look at some specific cases.

Most amateur 100 W transceivers' dc power cords are built using 10 gauge or thinner wire (see sidebar). Further, most are about 10 feet long, and most are fused with 30 A fuses. If you subject them to 21 A of current (nominal input for key down, full power), they'll exhibit about a 0.5 V drop. This includes the drop caused by the internal resistance of the fuse, and that of its holder (0.00089 Ω, 0.0008 Ω respectively).[2] This means the power cable assembly will be dissipating about 12 W.

If we subject the cable to a load of 100 A (not a dead short) for which the fuse would nominally require 3 seconds to open, our voltage drop is 2.16 V, and our cable assembly has to sustain over 200 W of dissipation for 3 full seconds. Now you know why it is so important to choose the correct wire size. To reiterate, the wire must be capable of handling the nominal ICAS load with a minimal amount of voltage drop, and it must also be capable of handling an impressive overload, albeit briefly.[3]

If you're thinking out loud to yourself about now with the admonition: "I use circuit breakers, so I don't have this problem," you're kidding yourself! The fact is, circuit breakers exhibit a much longer time lag than

[1]Notes appear on page 32.

any fuse except some specially designed slow-blow types. What's more, most cheap circuit breakers will fail closed on dead shorts if the current exceeds 2000 A or so. A standard SLI (Starting, Lighting, Ignition) car battery in good condition can easily supply this amount of current when subjected to a dead short.

There are more standards and rules of thumb applied to wire and fuse selection than just about any other subject you can name. The problem is, very few of them take fuse delay into account. What you read here is purposely conservative, so if you decide to push the envelope, you're on your own.

Design to be Safe

First of all, you need to know your radio's operating current draw. For FM applications, this is a steady state, while the transmitter is on, and you can use the manufacturer's current specification. For SSB applications, we need to know the average as well as the peak power. The reason will become clear further on.

For example, a 50 W output FM transceiver will draw about 7 A, but this isn't the whole story. The FM transceiver in question only puts out 50 W when the input voltage is about 13.8 or so. At 12.8 V, its output will drop to perhaps 30 W. This same reduction in power also happens to SSB transceivers, but it is less noticeable.

Picking the Wire Size

Based on length and the peak current draw, a wire size should be selected that offers less than 0.5 V drop, and preferably less than 0.25 V drop. There are several other good reasons for minimizing voltage drop besides the reduction in output power. One is temperature rise. Since an automobile environment is often hotter than that of a base station, over-sizing the wire (less resistance) in a mobile environment will keep temperature rise to a minimum. Too high a temperature rise, and the insulation will melt! This is another good reason to use wire with a 105° C rating in any application.

A more extreme case is that of an HF, 500 W mobile amplifier. Most draw between 25 and 40 A average, and peak to about 100 A. The wire selection should be based on the peak power draw, not the average. Minimal voltage drop is extra important in this case if we're going to minimize IMD (intermodulation distortion — read that as splatter). Voltage drop is why I use a second battery mounted next to my mobile amplifier, and feed it with 4 gauge wire. If I didn't have a second battery, I would have to use 2/0 wire to achieve the same minimal voltage drop under peak load due to the additional length.

I should point out that in many cases the transceiver and the amplifier will be supplied by the same feed cable. If so, you need to take both into account when sizing your wire.

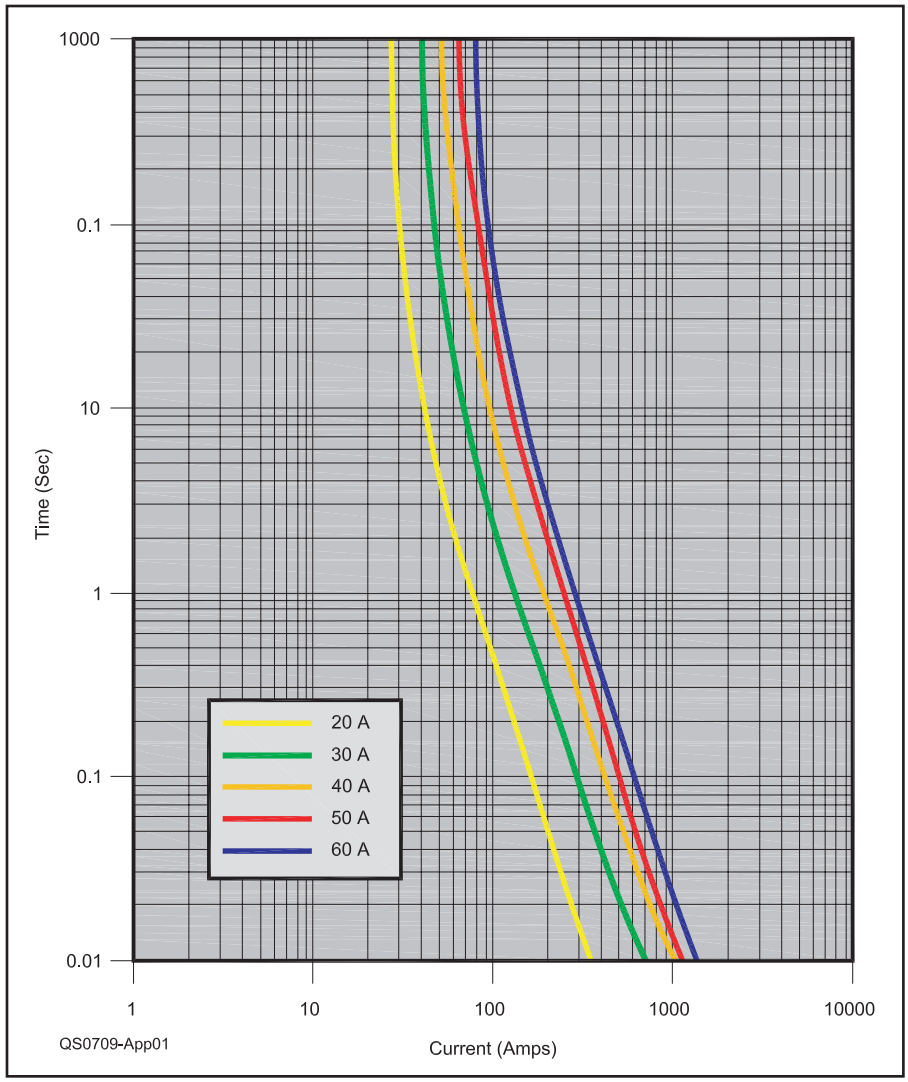


Figure 1 — Chart of opening delay vs current flow for five common sizes of Maxi fuse.

Picking the Fuse

Proper fuse selection is also important. Obviously, it needs to be large enough to not only handle the average load, but also perform its duties should a short or other overcurrent condition occur. In an FM scenario, this should be no more than the maximum current draw. Unfortunately, it's difficult to find an odd amperage rated fuse. So, the next standard, larger size should be used. If you have sized your wire correctly, you will never have a problem.

In the case of the HF, 500 W mobile amplifier, fuse selection is a little harder. If you selected your wire size as outlined above, then a fuse capable of handling the average current will suffice. Yes, the peak amperage is greater than the fuse rating, but the delay will allow the fuse to handle the ICAS load easily. In my own mobile setup, my average current draw is just over 50 A (transceiver and amplifier combined), and the peak is just over 100 A. The wire is protected by a 60 A Maxi style fuse. It has never opened due to an overload, since the peak duration is less than the delay at peak current (see Figure 1).

Hooking it All Up

There are a few other items to consider. One is fuse holders. Maxi fuse holders are not easy to find, so some folks opt to go to their local auto parts store and buy ones with attached pigtails. I don't like that holder type because they require splicing, and the thinner wire size doesn't meet our design criteria. Instead, use the large size Anderson Powerpole connectors, such as those sold byPowerwerx (**www.powerwerx.com**), MFJ (**www.mfjenterprises.com**) and West Mountain Radio (**www.westmountainradio.com**). These fit a Maxi fuse perfectly. The medium-sized ones fit the ATO size

Calculating Voltage Drop

You can easily calculate the voltage drop using Ohm's law if you know the actual wire size. Remember, it may look like 10 AWG, but it may not be, depending on where the wire was made. If in doubt, measure it with a caliper.

Chapter 7 of *The ARRL Handbook* lists the resistive values for solid, enameled, copper wire. Although we'll always be using stranded, insulated wire, the values are close enough for our calculations.

Keep in mind that the fuses and their connectors add additional resistance that must be added in. Higher amperage fuses have lower resistance than do smaller ones, and typically have lower resistance connections as well. Since fuse and holder resistance data isn't readily available,we'll use a conservative constant of 0.0018 Ω for each fuse assembly, and there are usually two (one in each conductor).

Here's an example. From *The ARRL Handbook*, the resistance of 1000 feet of 10 gauge wire is 0.9987 Ω. If our cable is 10 feet long, then the resistance of each conductor is 0.0009987, or about 0.02 Ω for both conductors rounded up. If we add in our fuse resistances, the total resistance for the cable assembly is 0.0234. From Ohm's law (E=I×R), at 21 A (nominal peak for a 100 W transceiver), the voltage drop is 0.49 V.

To make things easier, here is a formula into which you can plug in the values.

$(2R_W \times \ell \times 0.001) + 2k \times I = V_D$

where:

R_W = the 1000 foot resistive value from *The ARRL Handbook*

k = nominal resistive value for one fuse and its holder

ℓ = length of the cable assembly on feet

I = peak current draw in amperes

V_D = cable assembly voltage drop.

In the preparation of this article, I rechecked my math several times as the calculated voltage drops didn't agree with actual measurements I have made in the past. Additional research revealed a variation in published resistance and circular area measurements of nearly 15% between sources. I further discovered the power cable supplied with my mobile transceiver was not 10 gauge, but a slightly smaller 11 gauge (based on the *Handbook*'s published diameters). So, I decided to measure the resistance of the power cord feeding my mobile transceiver.

Since I don't own a Wheatstone bridge to measure the sub-ohm dc resistance of such a short piece of copper wire, I decided to measure the actual voltage drop using a digital voltmeter of known accuracy. Much to my surprise, the key down voltage drop was 0.7 V dc (at about 21 A). This calculates to a total dc resistance of 0.033 Ω for the cable, fuses and fuse holders.

Since many transceivers will turn themselves off if the voltage drops below 11.5 V dc or so, if you add in the cable drop, you come up with 12.2 V dc, or slightly less than the resting voltage of an SLI battery. This exemplifies why minimizing voltage drop is an important goal.

fuses, if you have a need for them.

West Mountain Radio, and others, sell fuse blocks (with multiple, individually fused ports) that provide a convenient distribution point for all of your power needs. Some types of blocks have a short pigtail. These too require splicing, and should be avoided. By the way, there is a good article about Anderson Powerpole devices in the March 2006 issue of *QST*.[4]

There is also a minisized fuse, but I don't recommend them if for no other reason than their minimally sized contacts. I believe in buying fuses that come in packaging indicating that they are made in the USA. I have found some offshore fuses that are so poorly made that they will carry a 200% load for many hours before they open. I've seen cases in which the plastic melted off the fuse, and it still hadn't opened. Calling them a fuse is a misnomer!

Laying it Out

Once you've made your wire size and fuse size selections and the time comes to install it all, keep in mind that neatness counts. In the 36 years I've operated mobile, I have seen some installations that look more like a fishing reel snarl than a wiring job. Neatness counts. It makes for a safer installation!

Whatever you do, make sure you carry spares. I have a small plastic box affixed to the top of my amplifier that contains two or more spares for every fuse type and size I use. Overkill you say? I've helped quite a few fellow amateurs out of a jam because I had those spares.

If you need more information about wiring your mobile station, visit my Web site, **www.k0bg.com,** dedicated to the proper care and feeding of mobile installations, with safety as a byword.

Notes

[1] *The ARRL Handbook for Radio Communications,* 2007 Edition. Available from your ARRL dealer or the ARRL Bookstore, order no. 9760 (9779 in hardcover). Telephone 860-594-0355, or toll-free in the US 888-277-5289; **www.arrl.org/shop/**; **pubsales@arrl.org**.

[2] This is the internal resistance of a 60 A Maxi fuse, and its holder. Smaller amperage fuses will have slightly higher resistances, as will other types of holders. For fuses in the 20 to 60 A range, the resistive value given is within manufacturing tolerances.

[3] It should be noted that these figures are for two conductors, not just one. Relying on the chassis of a vehicle to provide an adequate ground return is not generally a good idea for several reasons including voltage drop and RFI ingress.

[4] D. Schier, K1UHF, "More Power to You," *QST,* Mar 2006, pp 31-33.

Alan Applegate was first licensed in February 1970, and installed his first mobile setup in December of that year, three months after earning his Advanced class license (WBØBHE). He's operated high power (500 W) HF mobile since March 1973, with three homebrew and three commercial amplifiers. During that time, he has owned 15 vehicles and driven three company cars, all with mobile HF radios (14 different HF rigs over the years).

He obtained his Amateur Extra class license in 1977, and has held the call KØBG ever since. He retired from US WEST (now Qwest), after spending most of his career in technical sales and support.

You can reach the author at 3202 Notting Hill Ave, Roswell, NM 88201, or at **k0bg@plateautel.net**. QST

Strays

QST congratulates...

♢ *QST* author Wayne C. Long, K9YNF, of Cascade, Wisconsin, whose "subscription fiction" site, *longshortstories* (**www.longshortstories.com**), has been launched.

An All-Band Attic Antenna

Nothing beats an "aluminum cloud" on a tall tower, but when choices are limited, an indoor antenna can be amazingly effective.

Kai Siwiak, KE4PT

If zoning rules or aesthetic considerations make outside antennas prohibitive, an indoor antenna might just provide enough performance for casual operation on all bands ranging from 80 to 6 meters. With only 100 W, I've managed contacts with hams in over 130 DXCC countries and all 50 states, including 25 states and 13 countries confirmed on 6 meters. I've even made contacts on the 160 meter band, but the efficiency there is poor, and I don't recommend operating on 160 meters with this antenna.

This isn't a design article for a specific indoor antenna, but rather a description of the performance of one indoor antenna, and some guidelines that might help you understand the limitations, performance and RF safety aspects of antennas of this type.

The KE4PT Attic Antenna

I've been operating with an indoor inverted-L antenna in my attic for several years. I drive the antenna with an ICOM IC-706MKIIG running 100 W through a current balun and an ICOM AH-4 automatic antenna tuner located at the antenna feed point.[1] The tuner is what makes this antenna capable of operation on all of these bands. The basic idea was to place as much of the wire as possible into the clearest space of a cluttered attic in my one floor home in south Florida, as seen in Figure 1.

Design Approach

My basic design approach was to provide a fat radiating conductor using two parallel conductors of fairly thick wire spaced nearly 3 feet apart. This tends to smooth out impedance variations versus frequency and lets the automatic tuner do its work smoothly. I chose aluminum wire for its availability and cost. These wires were placed as far as physically possible from other conducting objects in the attic.

I wanted an antenna that could be operated over the widest frequency range possible; so the L length was chosen as long as possible to obtain reasonable efficiency at the lowest frequencies, but with tolerable antenna pattern ripples at the highest frequencies. The actual length was constrained by the available attic space. Next, I used an antenna ground post to act as a counterpoise element. The whole system was match tuned at the feed point with an automatic tuner.

[1]Notes appear on page 37.

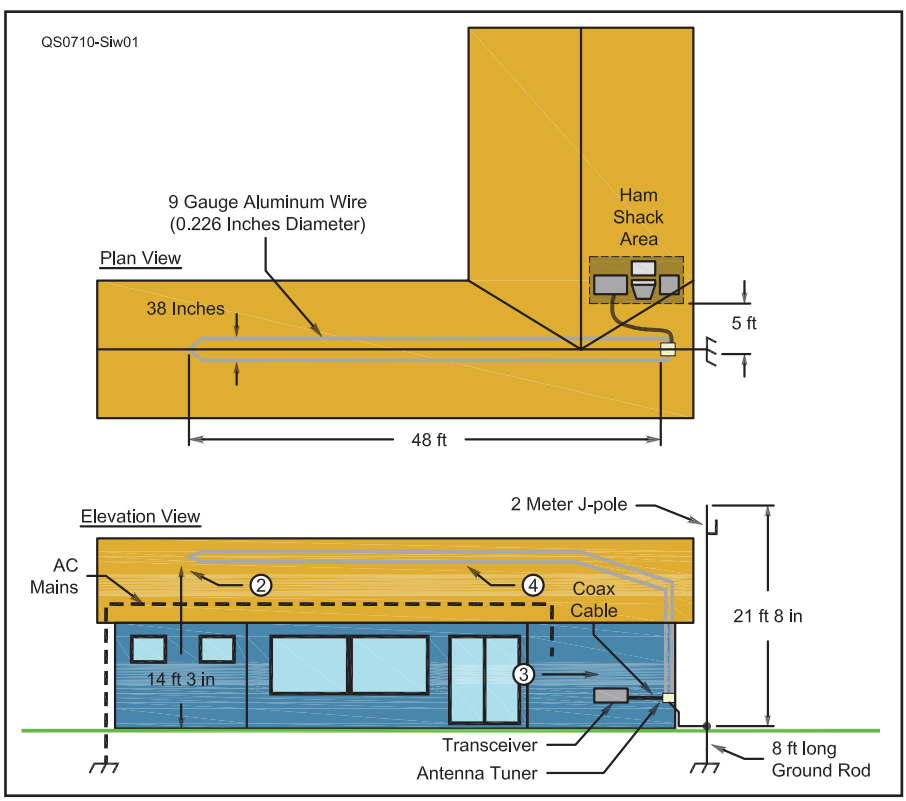


Figure 1 — Plan and elevation views of the attic inverted L antenna. The numbers are keys to the photographic views.

It All Came Together

The horizontal part of the L element comprises two parallel lengths of 9 gauge aluminum wire shorted at the far end, and spaced about 38 inches, as shown in Figure 2. The horizontal portion is about 48 feet long, and a bit more than 14 feet above the ground, under the roof of the house. The horizontal length is approximately a wavelength at 21 MHz so the antenna pattern is very nearly omnidirectional from the 20 down to 80 meters.

The parallel wires are brought together and emerge from the ceiling on a far wall of the house in a storage closet, as shown in Figure 3. Both of the parallel wires are joined together and connected to the antenna post of the AH-4 tuner. A copper ground wire runs from the tuner ground connection to an outside 8 foot deep ground rod. The antenna shares this ground rod with a conductive mast supporting a 2 meter J-pole that tops out at 21.7 feet. This mast also functions as part of the HF radiating system. A length of 50 Ω coaxial cable connects the tuner through an eight turn 5 inch diameter choke balun to the transceiver at the operating position in the ham shack on the other side of the wall of the storage closet.

We're Not Alone

The antenna isn't alone in the attic. There are air conditioning ducts as well as the ac mains power distribution for the house, which are marked by the heavy dashed line in Figure 1. This conduit can also be seen in Figure 4. I modeled the inverted L, the ground post with the attached J-pole mast, and the ac mains including its own ground post by using *4nec2* antenna modeling software.[2] The pro-

Figure 2 — The inverted L element is supported by egg insulators suspended from the rafters in the attic.

Figure 4 — The ac conduit parallels the antenna elements.

Figure 3 — The ham shack and transceiver are 6 feet to the left of the AH-4 tuner shown in the lower part of the photo.

The Advantage of CW

With a maximum of 100 W from my transmitter, my CW average power is 40 W, but with SSB it is an average of only 20 W (3 dB advantage for CW). At the receiver end of the propagation link the CW receiver noise bandwidth is typically 300 Hz compared with 2700 Hz for SSB (9.5 dB more for CW). Finally, the CW operators appear to listen a bit more intently to my CW, especially many of the DXpedition operators, perhaps tolerating 6 dB SNR whereas comfortable SSB listening needs 10 dB SNR (another 4 dB advantage for CW). The net advantage of CW over SSB might be as much as 16.5 dB or the equivalent of about 3 S-units!

gram uses the *NEC2* (Numerical Electromagnetic Code) calculation engine, and is available for free. I started the *NEC* based analysis to make sure that I could adequately assess the RF exposure that results from this unusual antenna. As a by-product of that effort I was able to learn about the antenna patterns and radiation efficiency of this antenna.

The *NEC* modeling revealed that substantial RF currents exist on the J-pole mast, and they contribute significantly to the overall radiation from the antenna. The J-pole mast contributes a vertical polarization component to the overall radiation pattern that helps keep the far field patterns relatively omnidirectional, especially at the higher frequencies. This was an unplanned benefit, with the interesting lesson that all conductors radiate, even when connected across an earth ground connection!

Indoor Antenna Performance

What can be better that an extended on-the-air test? I kept track of many of my contacts (QSOs) by plotting them using *DxAtlas* by Alex Shovkoplyas, VE3NEA.[3] The results can be seen by the color-coded points on the maps in Figures 5, 6 and 7. The QSOs are between my south Florida location and the mapped points. Figure 5 shows QSOs in the 160 meter band (a few dark red marks), and in the 80, 60, 40 and 30 meter bands. The very close distances are covered well, although there were contacts as far away as Australia, South Africa and India and into Europe on 40 and 30 meters. The green points shown in Figure 6 show 20 meter coverage. A distinct skip zone occurs around my location. Coverage beyond that is worldwide. Figure 7 shows dark blue points for 17 and 15 meter band QSOs, light blue points for 12 and 10 meter QSOs and distinctive gold points marking the 6 meter "magic band" QSOs with 14 states, Puerto Rico and Spain. The 17 through 10 meter coverage has a prominent skip zone of about 1000 km around my location.

Propagation predictions using *HAM-CAP* freeware basically confirm the actual performance of the antenna over the long term, including the skip zones and the tendency for the 17 through 10 meter bands to dominate coverage into South America.[5] I get my fair share of the rare and distant ones (VU7, 9Q1, VK9N, 1AØ, VQ9 and KH8/S on all five bands), not because of awesome RF power — I use just 100 W — or a high "aluminum cloud" antenna, but by listening and operating carefully, although those rare DX catches are as much a testament to the operating skills of the DXpedition operators! I also take advantage of the extra 2 to 3 S-units of signal-to-noise enhancement that operating on CW provides.

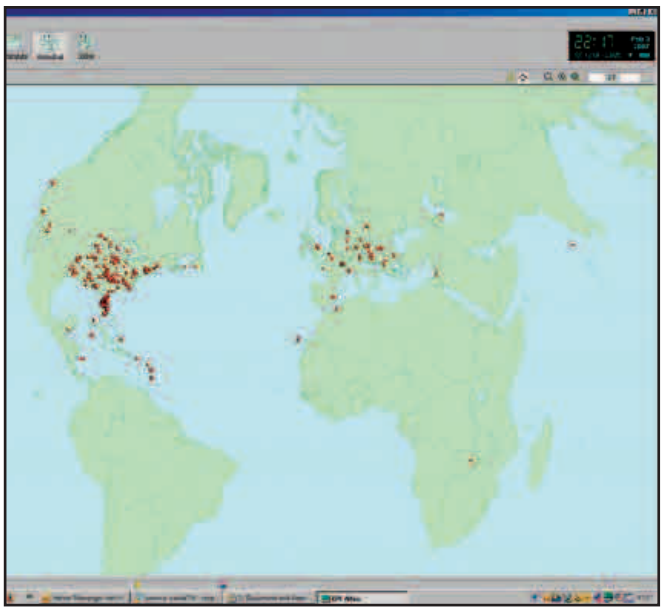


Figure 5 — Some contacts from KE4PT in South Florida. Dark red 1.8 and 3.6 MHz, red 5.4, 7 and 10.1 MHz.

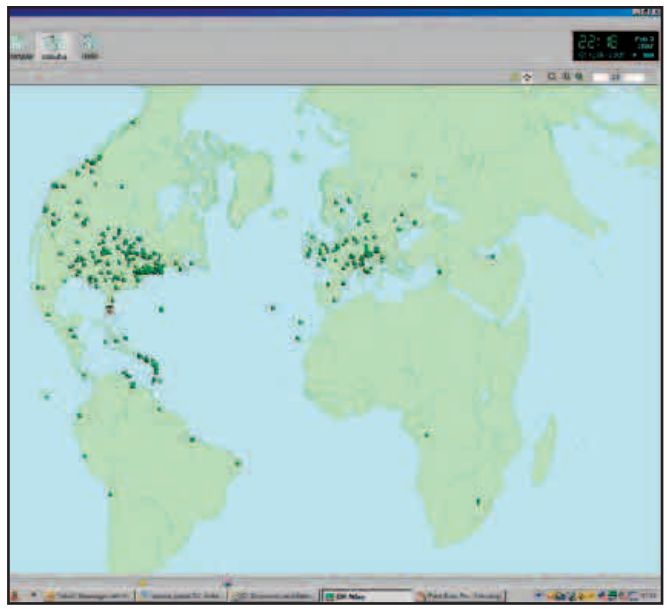


Figure 6 — Contacts from KE4PT in the 14 MHz band.

What *NEC* says

The proof is in the antenna currents. I modeled the antenna and ground system, along with the ac mains and the J-pole mast using *4nec2,* which employs the *NEC2* calculation engine. The basic radiation pattern in the lower bands is a flattened cardioid pattern pointing upward as seen in the 10.1 MHz pattern shown in Figure 8. The antenna pattern in the figure is centered on the feed point of the antenna. To a receiver anywhere on the horizon, the pattern at 10° elevation varies less than an S-unit for 20 meters and longer wavelengths.

As frequency is increased the antenna pattern on the horizon develops more ripples, and the 2 meter J-pole mast contributes more vertically polarized energy to fill in horizontally polarized pattern dips. At 51 MHz, shown in Figure 9, multiple antenna pattern lobes are evident, but coverage again is still roughly omnidirectional in azimuth — effectively within 2 S-units. The total antenna system polarization is randomly elliptical, having both vertical and horizontal components. This can be seen in Figure 10 in which the polarization axial ratio is shown in color on the 51 MHz pattern. Blue indicates a linear polarization, and a trip through the color spectrum shows elliptical polarization culminating in circular polarization in the directions corresponding to the purple colored pattern areas. Informal S-meter tests by a local ham within 20 miles of my location verified that there was substantial energy in both the horizontal and vertical polarization components during an impromptu 6 meter band test.

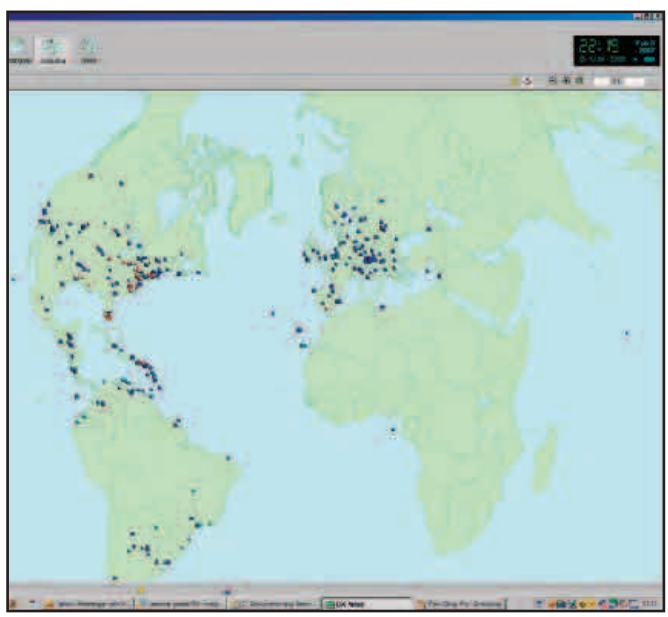


Figure 7 — Higher frequency contacts. Dark blue 18 and 21 MHz, light blue 24 and 28 MHz, gold 50.1 MHz.

The antenna radiation efficiency can be defined as the total power radiated into space (that is, above the ground) divided by the transmitter power. Efficiency, predicted by *NEC2*, is between about –7 dB and –1 dB across 3.5 to 54 MHz. Efficiency dips to a dismal –20 dB in the 160 meter band, so the antenna is not too useful there, although I've made a few contacts in several states on that band. I tried modifications of the design by modeling various ground radials attached to the ground post. Efficiency was not significantly improved, however. At my location, the ground radials could be physically placed only perpendicular to the horizontal element, but that configuration produced undesirable deep nulls in the azimuth pattern.

No attempt was made to predict the antenna input impedances because (1) I always intended to use an automatic tuner, and (2) there were simply too many non-modeled coupling effects in the attic, including a substantial barrel-tile roof which sits inches above the antenna wires. As expected, the *NEC* analysis revealed that the currents on the antenna wires, the ac mains wires, and the J-pole structure are indeed standing waves starting with a null at the open end of each wire. This motivated a relatively simple RF exposure analysis described next.

Some Words about RF Safety and RFI

Indoor antennas should be very carefully considered from the RF safety point of view, especially for those within the dwelling. In addition, there is always potential for RF interference within the home. This applies as much to wire antennas as it does to small loops. Two possible hazards exist: the potentially high RF voltage that can exist on the antenna conductors and exposure to electric (E) and magnetic (H) fields. Both potential hazards are avoided by keeping one's distance!

But How Close is Safe?

I initially evaluated this antenna by real-

FIGURES 8, 9 AND 10 GENERATED BY ***4NEC2*** (HOME.ICT.NL/~ARIVOORS/)

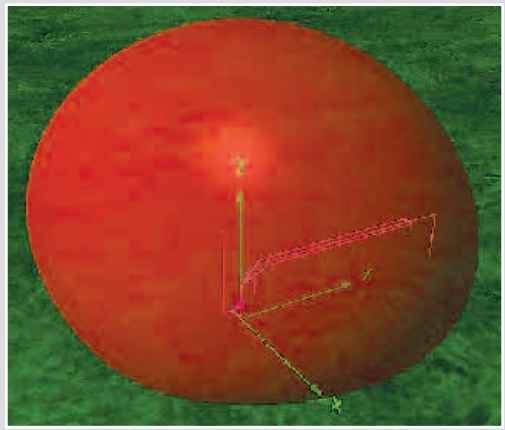


Figure 8 — The antenna and its 10.1 MHz pattern.

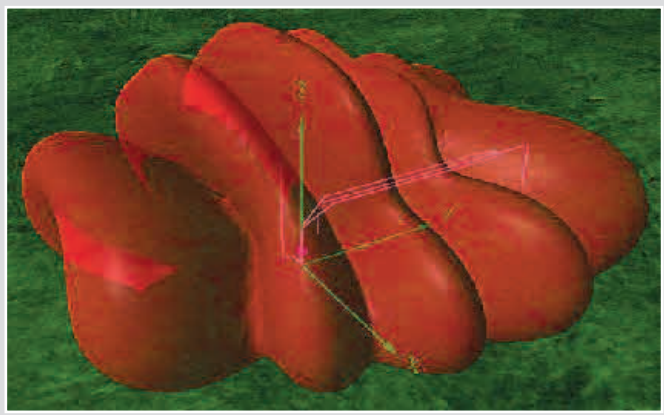


Figure 9 — The antenna and its pattern at 51 MHz.

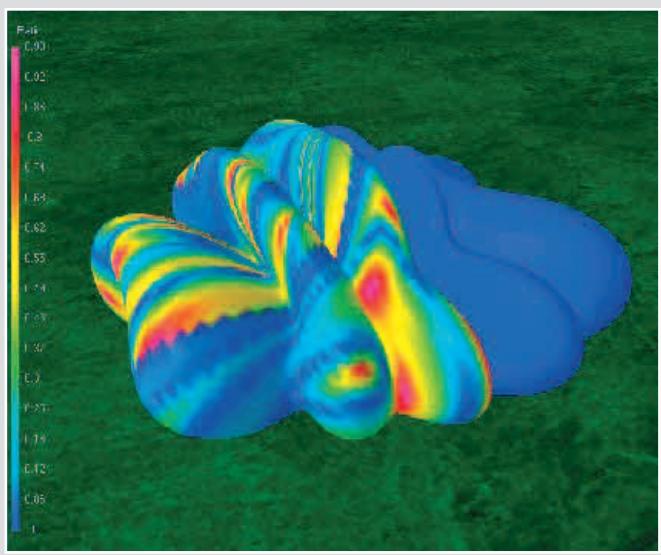


Figure 10 — Polarization axial ratio at 51 MHz.

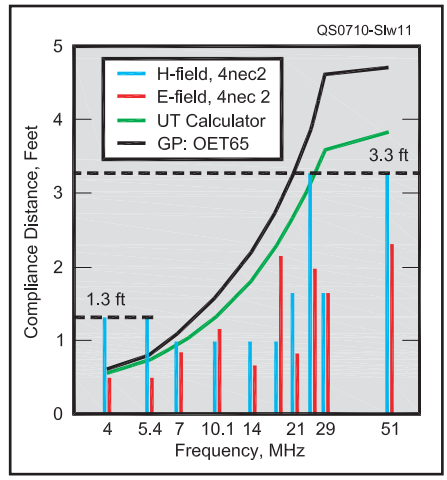


Figure 11 — RF safety compliance distance (at 100 W) from any part of the antenna ranges from 3.3 feet on 6 meters down to under 1.4 feet on 80 meters.

izing that at any particular frequency the currents and voltages along the conductors would be standing waves — just as on a dipole. As verified by *NEC* modeling, the electric charge accumulations are "out of phase" with the currents on the wire. Thus, where the standing wave current in the wire (and hence the H fields around the wire) goes through a null the voltages (and hence the E fields) peak, and vice versa.

To estimate the RF exposure, I then assumed that at any point on the antenna wire the currents would resemble those of a resonant dipole with the full power applied at that point. Then I tried the very simple-to-use University of Texas online calculator to determine a compliance distance.[6] I used the "occupational/controlled environment" since I have full control of access to the RF exposed areas.

Crunching the Numbers

The calculator needs very few inputs — 100 W RF power, an assumed 2.2 dBi gain of a dipole and a choice of whether there is a ground contribution (I selected no ground contribution). The largest compliance distance of 3.8 feet from any part of the antenna occurs in the 6 meter band, and that was initially the number I used for the compliance distance *at all frequencies*.

As an added check, I also used the "General Purpose Tables" in *RF Exposure and You*, with 100 W, 0 dBi and a controlled environment.[7] Finally, I calculated the near E and H fields using *4nec2* with a "real ground" and 100 W. The composite results are shown in Figure 11 in the form of compliance distance versus frequency. The University of Texas calculator and the general purpose tables give similar results. They appear to be adequate above 7 MHz, but they underestimate the exposure compliance distance at lower frequencies for this particular antenna.

A Second Opinion

The *4nec2* calculations predict compliance distances that are up to a factor of two larger than those obtained with the other approximations for frequencies below 7 MHz. The magnetic fields near the ground on the vertical portion of the antenna are the source of this discrepancy.

The *NEC2* engine in *4nec2* does allow connections of wires to ground, but does not model wires underground such as the ground post that's part of this antenna. It also does not correctly handle the charge distributions at the wire-ground interface, except for the case of a perfect ground. Bill Guy, W7PO, kindly helped me by using *NEC3,* which cor-

rectly accounts for buried wires, to check my antenna including the actual buried ground posts.[4] *NEC3* is still under export restrictions and is not generally available.

And the Answer Is —

A spot check of near fields of my antenna both near the vertical and near the horizontal parts of the wires shows that away from the ground connection *4nec2* (using the *NEC2* engine) and *NEC3* predict the same relative field strengths, typically within 10%, for a given radiated power level. Near the ground post connection, however, ground-level field values are similar only if a perfect ground is selected in *4nec2*. For practical RF exposure evaluations, especially for unusual antennas such as this one, modeling should be tried with both a real ground and with a perfect ground, then the most conservative compliance distance should be used.

For this antenna, the 6 meter band *4nec2* result of 3.3 feet gives sufficient compliance distance safety margin on all lower frequency bands. *Lesson: Evaluate unusual antennas very carefully, especially if a ground or ground post is part of the system!*

RFI Rears its Head

Because this indoor antenna is extremely close to wiring in the house, RF interference within the home is a strong possibility. I've noticed coupling RF energy to the ADSL, computer connection, side of my phone line, but only during 160 meter operation. That RFI potential and the generally poor antenna efficiency keep me off the 160 meter band. There is also noticeable coupling to my TV and audio systems, which is remedied by restricting operating during prime family TV viewing times.

Conclusions

An indoor antenna such as this one is not the contester's dream antenna, nor is it a DX hunter's "special," but it can be a useful and effective "stealth antenna" that will get you on the air on all ham frequencies between 3.5 and 54 MHz. Careful operating practices and the use of narrow-band modes, such as CW and digital modes, can yield delightful results. The use of an antenna automatic matching tuner at the feed point allows great flexibility in positioning attic wires, and in my case, allowed for an effective all-band design. Modeling with *NEC* provides great insight into the performance. Finally, great care must be taken in the RF safety analysis.

I'd like to acknowledge and thank Bill Guy, W7PO, for his help with the *NEC3* modeling, and Bob McGraw, K4TAX; Bob Walker, N4CU; Tom Kneisel, K4GFG, and Diana Siwiak, KE4QXL, for their helpful reviews and suggestions.

Notes

[1]R. D. Straw, Editor, *The ARRL Antenna Book,* 21st Edition, pp 26-21. Available from your ARRL dealer or the ARRL Bookstore, ARRL order no. 9876. Telephone 860-594-0355, or toll-free in the US 888-277-5289; **www.arrl.org/shop/**; **pubsales@arrl.org**.

[2]A. Voors, "NEC Based Antenna Modeler and Optimizer," **home.ict.nl/~arivoors/**.

[3]*DX Atlas*, **www.dxatlas.com/**.

[4]K. Siwiak and W. Guy are both members of the ARRL RF Safety Committee, **www.arrl.org/rfsafety/**.

[5]*HAM-CAP*, **www.dxatlas.com/HamCap/**.

[6]Online RF exposure evaluation, **n5xu.ece.utexas.edu/rfsafety/**.

[7]E. Hare, *RF Exposure and You*, ARRL, Newington, CT, 1998.

Kai Siwiak, PhD, KE4PT, was first licensed in 1964. He is a consulting engineer specializing in antennas, propagation, communications systems and ultra-wideband (UWB) wireless technology. Kai has authored several text books on those subjects and also wrote the electromagnetic theory chapter in ARRL's RF Exposure and You. *He holds more than 30 US patents, has been a frequent contributor to IEEE 802 standards, and was an advisor to the US delegation to the ITU-R on UWB technology. He is a member of ARRL, SAREX (Space Amateur Radio Experiment), a life member of AMSAT and a member of the ARRL RF Safety Committee. Kai prefers CW, usually on 40 through 6 meters, depending on those elusive sunspots. He can be reached at* **ke4pt@amsat.org** *for any questions or comments.*

QEX
A Forum for Communications Experimenters

In The September/October 2007 Issue:

- Maynard Wright, W6PAP, explains the impedance graphing capabilities of some powerful computer software in "*Octave* for Circle Diagrams."
- Dr George Steber, WB9LVI, describes some simple circuits that combine with a digital oscilloscope, signal generator and PC to create "An Unusual Vector Network Analyzer."
- Mateo Campanella, IZ2EEQ, used a direct digital synthesizer IC and PIC microcontroller to build "A DDS Based QRSS (and CW) Beacon."
- Paolo Antonizzi, IW2ACD, and Marco Arecco, IK2WAQ, team up to describe the design and lab testing of "Very High Q Microwave Cavities and Filters."
- J. R. Laughlin, KE5KSC, designed a circuit to reduce background noise pick-up and feedback squeal for a "Differential Leveling Microphone."
- Steve Gradijan, WB5KIA, shares the news about a free software development tool by Code Gear from Borland in "*Turbo Delphi Explorer*: Develop Amateur Radio Projects for *Windows* with a Free Compiler."
- Fred Glenn, K9SO, describes his system of using *Excel* spreadsheets to compare antenna performance and propagation predictions by "Using Gain-Probability Data to Compare Antenna Performances."
- Contributing Editor L.B. Cebik, W4RNL, compares some circularly polarized satellite antennas in "Antenna Options."

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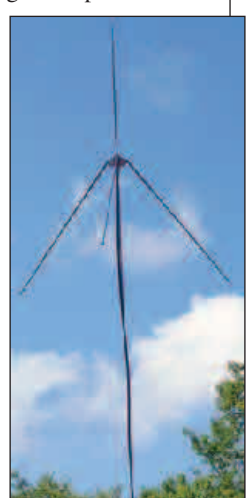


A Low Cost Frequency Synthesizer

A PC, a sound card and software combine to make a powerful signal generator.

George R. Steber, WB9LVI

One of the handiest devices on the electronics workbench is the humble signal generator. It can be used for checking radios, providing signals for breadboard circuits, verifying that test equipment, like oscilloscopes and counters are working, and even for checking other signal generators. Especially useful is a stable, accurate RF signal generator for frequency calibration of those older radios and other equipment with analog dials that you have accumulated over the years.

Have you ever wondered how accurate those dial markings are? This article may help answer that question as well as provide material for a nice weekend project. If building is not your forte, read along anyway and learn about phase locked loops, frequency synthesis, receiver calibration, and how to build a unique SSB/CW radio receiver using only

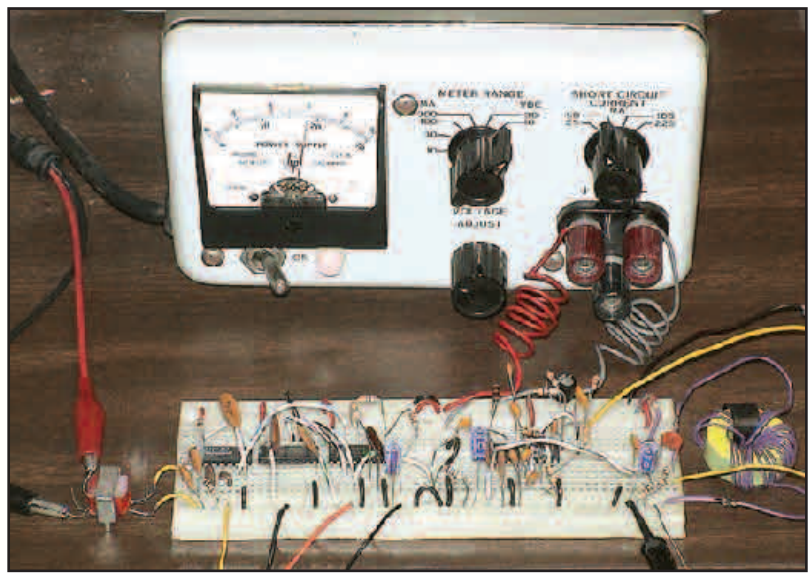


Figure 1 — Photo of synthesizer breadboard.

Frequency Synthesis 101

Frequency synthesis is not a new technique and is available in nearly all types of modern radio equipment. The most commonly used method, sometimes called the indirect method, uses a phase locked loop (PLL) to generate the output frequency.

A block diagram of the simple PLL synthesizer used in this project is shown in Figure A. The main component is the 74HC4046A PLL integrated circuit (IC). It contains a voltage controlled oscillator (VCO) and three different phase comparators, not all shown. We'll use just one of them, phase comparator 2 (PC2) as seen in Figure A. Resistor R1 and capacitor C1 set the frequency range while the voltage at pin 9 controls the frequency F_{osc} of the VCO. A divide by N counter, in this case a 74HC4040 12 stage counter, is used to divide down the frequency for one input of PC2 at pin 3. The other input of PC2 is driven by the audio from the sound card at pin 14. The output of PC2 is then filtered by components R2, R3 and capacitor C2 and presented to the VCO input at pin 9.

In operation the PLL works like this: If the counter output frequency is lower than the frequency of the input signal then PC2 produces a higher voltage to drive the VCO to a higher frequency. If the counter frequency is higher than the signal input frequency then the VCO is driven lower in frequency. Eventually the counter frequency is forced to be the same as the input frequency and differs only in phase. If the loop is stable, the PLL will lock up on phase at that point. Whether or not this happens is determined by the filter components that are selected for this purpose. Note that, when locked, because of the divide by N function, the VCO frequency is N times the signal frequency, so frequency multiplication is achieved.

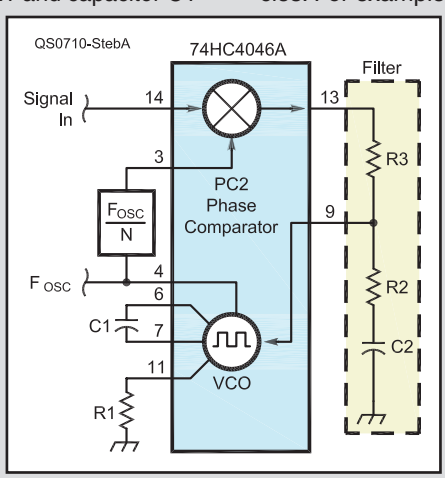


Figure A — Block diagram of 74HC4046A phase locked loop.

Many frequency synthesizers stay locked onto a single frequency and use the taps on the counter, or another decoding scheme, to provide different output frequencies. For example if one chose the DIVIDE BY 4 pin of the counter as output, we would see F_{osc} divided by 4 at that point. My synthesizer uses another approach and varies the frequency of the input signal from the sound card, which is software programmable in frequency. Note that this would work well only if the PLL stayed in lock over a large enough range to be useful. In my design the PLL can be made to lock over a range of nearly 4 to 1. For example, at its highest range (Range 1), the synthesizer can stay locked from 2.4 MHz to 9.2 MHz, more than enough to cover standard time stations CHU (3.33 MHz) and WWV (5.0 MHz), both the 80 and 40 meter amateur bands and utility stations such as NMN and WLO around 8.42 MHz.

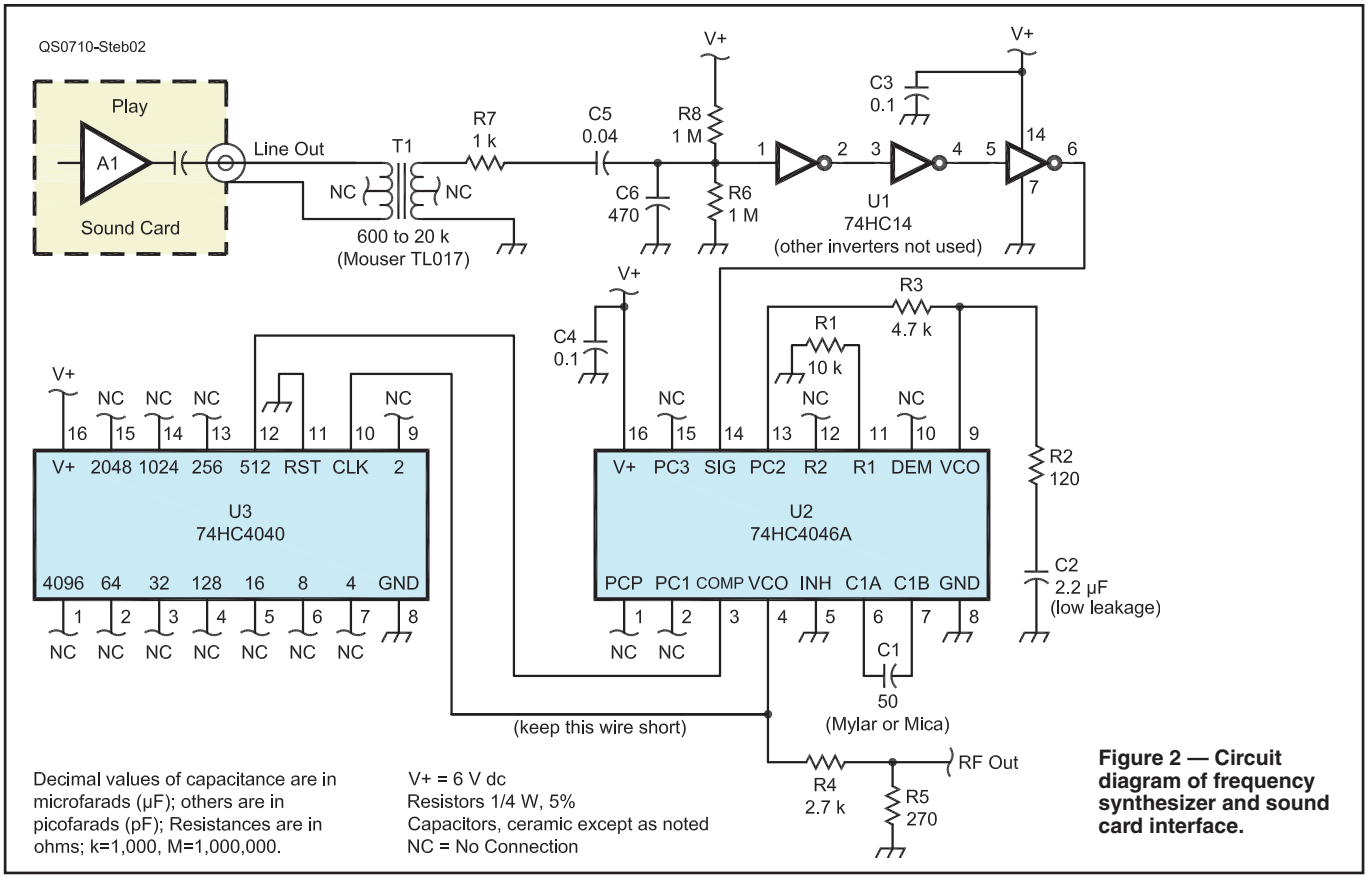


Figure 2 — Circuit diagram of frequency synthesizer and sound card interface.

your PC, a sound card, a bit of software and a handful of low cost parts.

Motivation for this project was furnished by my venerable Clemens Model SG-83B, a transistorized RF signal generator produced for the US Navy in the early 1960s. While checking my old Drake R4B receiver with the SG-83B, using the zero beat method, I noticed there was a considerable frequency discrepancy between the two units on their dials. What I needed was an accurate RF signal generator that I could use as a reliable reference. I'll keep you in suspense for now on how this project resolved the problem but you can probably guess it has something to do with a synthesizer.

Described in this article is the construction of an unusual RF synthesizer using your PC and a sound card, something that hasn't been done before, at least to this author's knowledge. And, while this approach is not without issues, on the plus side it is simple to build, low in cost. It also offers the capability of producing variable frequency signals in several frequency ranges with good accuracy, stability and resolution approaching 1 Hz. Problems involving jitter, drift, and other factors associated with the synthesizer are discussed as well as its use for calibration of receivers and signal generators. An additional project involving the synthesizer, a simple software driven SSB/CW receiver is also described on the ARRLWeb.[1] This material should appeal to almost anyone involved with radios and electronics.

You will need a PC running *Windows* and a low-noise sound card for the project. You can use one of the newer 3 GHz PCs or utilize your old 200 MHz PC. Of course, there are no guarantees that this project will work with your system. But it has been tested with a 200 MHz Pentium Pro, a 500 MHz Pentium III, and a 1.1 GHz AMD Athlon processor running *Windows 98SE* and *Windows XP* with Sound Blaster (SB) Live! — Value Edition.

So, if you have a Pentium or AMD PC with a *Windows* compatible, low noise 16-bit sound card, you may have the basis for a *Windows* driven frequency synthesizer. All you need to do is build the simple circuit described, connect it to your computer sound card and run the program. The circuitry is low cost, around $5, and uses readily available parts. You can build the circuit on a solderless breadboard as I did or design a printed circuit board and enclosure for it. You may wish to review the fundamentals of frequency synthesis in the sidebar.

Frequency Synthesizer Circuit

Figure 1 shows my breadboard setup for the frequency synthesizer circuit. Only a few components are required. In this instance, I am using a solderless breadboard as it is an easy way to get started. The synthesizer consists of the parts on the left side of the breadboard shown in Figure 1. The other parts, on the right side, are used for the SSB/CW receiver described in the sidebar. Designing a PCB and placing the circuit inside of a metal enclosure may offer a better option for those interested in a long term, more RF friendly system.

Since the breadboard was located on a table next to the computer, I just used a shielded cable with alligator clips from the line out of the sound card jack on the back of the computer. Sound cards typically have a 3.5 mm stereo jack for output so you will need to make your cable accordingly. Alternatively, such cables are commonly found at your local electronics or AV store.

The synthesizer circuit schematic is shown in Figure 2. The circuit is very simple requiring just an audio transformer, three ICs, and some resistors and capacitors. Only one sound card line output (either left or right channel) is needed. Although the schematic shows a single output for clarity, it is in fact taken from one channel of the sound card LINE OUT stereo jack.

Sound card audio is fed to a 600 Ω to 20 kΩ audio transformer, T1, available from Mouser Electronics (part number 42TL017). The transformer provides two major functions. First, it provides a high degree of common

[1]Notes appear on page 42.

mode signal rejection, typically well over 100 dB. A common mode signal is one that affects both inputs of a circuit simultaneously, such as often accompanies 60 Hz hum. It would be difficult, and expensive, to obtain that kind of common mode rejection with an instrumentation amplifier over the audio range. Secondly, the transformer provides necessary voltage gain since the line output has a signal of only around 1.5 V. T1 boosts that by a factor of 5.8 while introducing virtually no distortion to the zero crossings.

The next part of the circuit, the 74HC14, is a Schmitt trigger IC used to square up the input sine wave. You may ask at this point, why are we squaring up the sine wave after we spent so much trouble accurately producing it in the first place? The answer is that once we have the very accurate sine wave, we need to find the positive zero crossing for the PLL and a very accurate square wave is a good way to do this. I experimented with other zero crossing detectors such as the LM339, but, of the circuits I tried, this one produced the best results with the fastest rise time.

The heart of the PLL system is IC2, the 74HC4046A made by Texas Instruments. (It should not to be confused with the CD4046, a first generation IC with lower maximum frequency.) I need to warn you that other manufacturers (eg ON Semiconductor) make the 74HC4046A but I have had the best results with the TI chip. If you use another type, you may have to modify the filter values and also the lock range may suffer. IC2 has a maximum VCO frequency of around 20 MHz but in this project we will restrict it to about 9.2 MHz because of the limited frequency range of the sound card audio. The VCO frequency range is controlled by R1 and C1. To facilitate other ranges we may wish to change the value of C1. The values of R2, R3, and C2 were chosen to provide a wide range of phase lock and to minimize jitter. These values may require taking more time to lock when changing frequencies. C2 may be changed to 0.47 μF if shorter acquisition time is desired at the expense of more jitter. Also C2 must be a low leakage type capacitor.

A 74HC4040 12 stage ripple counter is used as the divider in the loop between the VCO and the PC2 input. We may wish to change the divider value to facilitate different frequency ranges. This involves connecting to a different output point of the counter. It is shown here as a divide by 512 counter. I call this value Ndiv in the program.

The RF signal is taken from the VCO through a resistive voltage divider to minimize loading the VCO and to reduce the RF level. Note that the VCO output is a square wave and consequently has numerous odd harmonics. In some applications we may wish to filter this signal. In some cases this is not necessary, however, and a short antenna may be connected at this point for checking, for example, the calibration of a radio receiver. Harmonics may also be used to extend the range of the synthesizer. More will be said on this subject later on.

Table 1
Frequency Synthesizer Lock Ranges for Various Parameters.

Range	*Ndiv*	*C1 (pF)*	*PLL Freq Lock (MHz)*
1	512	50	2.4 to 9.2
2	512	270	1.0 to 2.6
3	256	430	0.5 to 1.6
4	256	100	1.5 to 5.0
5	256	270	1.0 to 3.0
6	128	470	0.5 to 1.7

A 6 V dc power source is needed to power the circuit. This can be obtained from a small power supply or from 4 AA or AAA flashlight batteries connected in series. The circuit can work at voltages from 4.5 to 6 V dc.

As noted above, different frequency ranges may be attained by selecting different values for C1 and Ndiv. Table 1 shows several ranges attained with selected values of C1 and Ndiv. These ranges were chosen from many possible combinations as they provided less than 20 ns peak-to-peak jitter on the counter output. Other ranges are possible with varying degrees of jitter. In general I've found that using Ndiv greater than 512 produces higher jitter. Another possibility is to keep C1 and Ndiv fixed and use various taps on the 74HC4040 to get other frequencies.

Understanding Jitter, Accuracy and Drift

Jitter is a problem that can seriously degrade the performance of our synthesizer in some applications. Without presenting complicated mathematics, here is a description of where jitter originates and its effects. There are two sources of jitter in our system. One is caused by the sampling clock and its associated circuits in the sound card. The other is due to the PLL design itself.

Jitter is similar to oscillator phase noise and is an alternate way of looking at the same thing. It is basically the undesired variation in the phase of a signal. You may wish to consult a copy of an *ARRL Handbook* for more information on the subject of phase noise. A significant consequence of jitter is raising the noise floor and making weak signals harder to copy when used as a local oscillator in a receiver. Jitter in a sound card is caused by a random timing error in the sampling clock and other circuits causing the sine wave to waver back and forth a slight amount in time. I have measured the average cycle to cycle jitter of the sound card signals at the output of the 74HC14 with my Tektronix TDS360 digital real time oscilloscope using one or more cycles of precise time delay and found it to be 20 ns at 2000 Hz and decreasing to less than 5 ns at 16,000 Hz. Outside this audio range the jitter was higher, up to 50 ns. This is not a significant amount for audio frequencies but is considerable for RF frequencies. Unfortunately this jitter will occur at RF since it will be recognized as a frequency variation by the PLL and it will attempt to track it. To get an idea of how jitter impacts a signal, consider a 5 MHz signal which has a period of 200 ns. A jitter of 10 ns at this frequency amounts to 5% of a cycle.

A small amount of jitter is also introduced by the PLL even when locked. The PLL IC (74HC4046A) has a digital phase detector (PC2) utilizing four memory cells and some logic gates. Advantages of this circuit are that lock is achieved with zero phase shift and autonomy from power supply noise. PC2 is "idle" most of the time since the output is kept in its high impedance mode until needed to provide a narrow correction pulse. The memory is set by the input audio and continuously reset by the VCO. When in lock, a pulse appears at the PC2 output with a duration which is the difference in time between the input and the oscillator rising edge. Such correction is often referred to as *pumping* up or down. Pulses are applied to the smoothing filter to control the VCO. Clearly, while in lock the correction pulses are narrow and the pump is mostly disconnected from the power supply line. This provides noise immunity since the supply noise impacts the control voltage only during the short correction pulses.

The problem with the 74HC4046A is that the phase detector has a *dead zone* of about 2 ns where the detector does not respond to the input conditions. When the input frequency moves away from the oscillator frequency, at least 2 ns are required before the detector starts generating an output pulse. The outcome is an undesirable jitter.

Sound card jitter and the PLL jitter combine in a random way. Measurements at the VCO output of the PLL confirm the average jitter to be about the same values noted above for the sound card. Note, however, that the sound card jitter affects the PLL periodically at a rate depending on the value of Ndiv. So the cycle to cycle jitter of the VCO in this period may be much less.

How much jitter can be tolerated? This depends to some extent on the application. If we desire an accurate RF signal generator without regard to phase stability, we only need to maintain phase lock without too much concern for jitter. Zero beating of the synthesizer and a receiver will be accurate (to the extent we can identify the "zero frequency" point). On the other hand, if we want to use the synthesizer as a local oscillator in a receiver, we should expect a substantial increase in the noise floor as the jitter increases. I have used this frequency synthesizer as the VFO in a simple SSB receiver (described on the Web page) with good

results.[2] The noise floor was indeed raised, but not as much as I thought it would be, and I could still easily copy CW and SSB signals all over the 40 and 80 meter bands, including weak ones. This may be due in part because these bands are already very noisy and adding more doesn't change it too much.

I was surprised at the accuracy of the synthesizer. Using a sampling rate of 48,000 samples per second and a desired output frequency of 5000 kHz, I measured 4999.976 kHz with an HP 5314A frequency counter at the VCO after a computer warm-up of 20 minutes. This shows that my sound card sampling clock is low by 24 cycles out of 5 million. To fix this error I use a correction factor of 1.0000048 applied to the audio frequency of the sine wave generator in my software and the HP now reads 5000.000 kHz. With this factor included I now cover the entire frequency range of the synthesizer within about plus or minus 1 Hz.

During a cold start of my computer the sound card sampling clock is off causing an error of 12 cycles high out of 5 million. After 5 minutes the error is only 6 cycles high and settles to about 1 to 2 cycles after 10 minutes. Drift is normal for crystal clocks and this small amount may not be enough to worry about in this application. Eventually the drift stabilizes so calibration should be done only after sufficient warm-up of the computer.

Sound Card Settings

A low distortion, low noise, full duplex sound card is desirable.[3] The economical Sound Blaster Live — Value Edition fills the bill and probably many others will too. But since I cannot test them all, I'll restrict my attention to this one. Referring to Figure 2, we see that A1 is the line output of the sound card. The MIXER control in your *Windows* software controls the gain of this amplifier. The level of the LINE OUTPUT signal is controlled in the

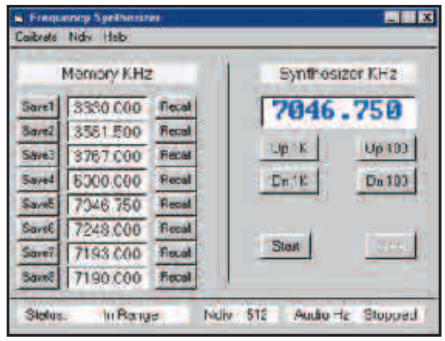


Figure 3 — The main window of the frequency synthesizer program.

PLAY section of the MIXER via the WAVE and SPKR sliders. So, to control the amplitude of the sine wave output, just adjust the sliders. In my case I set the SPKR slider to maximum and the WAVE slider to about 90%. It's important to mute all the other controls including the LINE OUT control and set the TREBLE control to the midpoint. It's also a good idea to check the settings of your card in CONTROL PANEL to make sure that surround sound, reverb or other effects are not selected.

Earlier Sound Blaster sound cards such as the SB16 and AWE 32 are not recommended for this project as they are noisy. The same may be said of SB16 compatible cards, so be wary. My advice is not to use any of these cards. A discussion of sound card properties is provided on the ARRLWeb.[4]

Frequency Synthesizer Setup and Application

The frequency synthesizer software is available on the ARRL Web site and is zipped (only 26 kB) for fast downloading.[5] Unzip it to a new folder and you are ready to go. Just run the executable (.exe) program. It was tested with *Windows 98* and *XP*. When you run the software you may get a message such as "Required DLL file MSVBVM60. DLL was not found." This is a *Visual Basic* run time file and is on many systems. If it is not found, you will need to obtain it and install it on your system. It is freely available from Microsoft and other sites on the Web. It is usually available as *Visual Basic 6.0 SP5: Run-Time Redistribution Pack* (*VBRun60sp5.exe*) and is a self-extracting file. Download takes about 6 minutes at 28.8 kbps.

If you get the message "Component 'COMDLG32.OCX' or one of its dependencies is not correctly registered: a file is missing or invalid." when you try to run the program, you will need to register it on your system. It is freely available from Microsoft and other sites on the Web. More details are included with the software.

If you just want to experiment with the frequency synthesizer program, go ahead as it does not modify the registry or install any other material on your computer. You can remove it by just deleting the entire folder it is located in.

A screen shot of the frequency synthesizer program is shown in Figure 3. The synthesizer controls are on the right including the up and down frequency buttons. Dragging the mouse across the frequency display with left mouse button down selects one or more digits which can be changed by entering new values from the keyboard. Eight memories on the left side can be used to save and recall favorite frequencies. There is a status bar on the bottom to let you know the current value of Ndiv and audio frequency. An error message will appear if you exceed the range of the sound card.

To run the synthesizer, make sure the circuit is powered and connected to the sound card line output as shown in Figure 2. The audio MIXER that came with your sound card or the one that came with *Windows* needs to be checked as you may have changed its settings for use by other programs. Refer to the section on sound card settings discussed earlier.

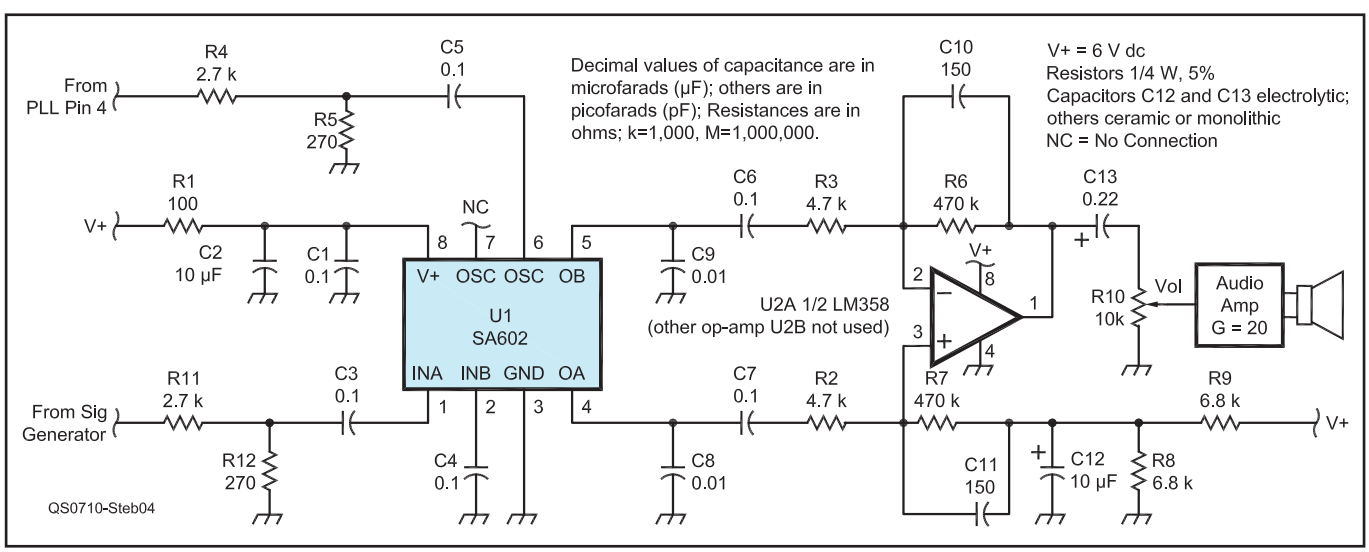


Figure 4 — Circuit for testing signal generators.

Now run the sine wave synthesizer program and adjust Ndiv so that it is the same as in your circuit. Also check Table 1, to make sure your desired frequency range can be attained with the C1 value you used. Then, click the START button and your frequency synthesizer should be working. Adjust the output frequency to the desired value. You can just scrub the frequency window with your mouse and type in a new frequency, or use the UP or DOWN buttons to make adjustments.

To get maximum accuracy with the frequency synthesizer you may wish to calibrate it using a frequency counter. Connect the frequency counter probe, using a series resistor of 4.7 kΩ, directly to the VCO pin 4 and read the frequency. The resistor is needed for isolation and damping, as many counters would load down the VCO or cause spurious results. First set the calibration factor in the software to 1.0000 to get a fresh start. Using your counter value, calculate the new correction factor, as I did earlier in the article, and enter it in the program. Now the program and your frequency counter should read the same value. Calibration needs to be performed only once since parameters are saved in a file FSinit upon exit.

Using the frequency synthesizer for receiver calibration is easy. Your receiver should be in the SSB or CW position so it can detect the synthesizer carrier. Connect a short piece of wire to the RF output point shown on Figure 2 and bring it close to the antenna input of your receiver, which should have a similar short piece of wire connected to it. Set the desired frequency in the synthesizer and make sure Ndiv is set to the correct tap corresponding to your circuit and the software. Adjust your receiver for zero beat and read the dial. That's it.

You can also utilize signals beyond the synthesizers apparent range using the odd harmonics of its square wave. For example,, a 5120 kHz synthesizer signal will have a strong third harmonic at 15,360 kHz and a weaker fifth at 25,600 kHz. Harmonics can be used for checking a receiver well into the HF range.

At the start of the article I mentioned checking the calibration of my trusty old Drake R4B with the Clemens generator. When I used the frequency synthesizer with the Drake, the frequency markings on the analog dial came out right on the mark. Not bad for an old tube set! Next up was calibration of the Clemens with my synthesizer as reference. The following section describes how to do that.

Calibrating Signal Generators

Frequency counters are often used to check signal generators. But in cases where the output level is too low for the counter, or triggering is a problem, another method may be used as described here. Employing a RF mixer and the synthesizer, a signal generator can be tested for accuracy by using the zero beat method. In this instance I have chosen the SA602 double balanced mixer. It is readily available, has high conversion gain, substantially attenuates the LO and RF signals, is low cost, around $3 at DigiKey and other sources. The mixer produces, essentially, the sum and difference of the two frequencies presented to it. So if we want to compare the frequency of our synthesizer to another generator, we simply feed our synthesizer to one input of the mixer and the generator to the other input. A simple circuit for doing that is shown in Figure 4.

Make sure the generator signal is adequately attenuated, to provide around 200 mV, so the mixer is not damaged. If the voltage is too high, a simple resistive voltage divider can be used to reduce it. To obtain the audio, the balanced outputs of the SA602 are used with a differential type amplifier (LM358 or LM2904). Filtering out the sum frequency, with C8 and C9, leaves the difference frequency which we can monitor by listening for a "beat" tone. I used an external audio amplifier and speaker to listen to the tone. When I tried an audio amplifier IC, such as an LM386, on my breadboard it howled loudly due to audio feedback as there is a lot of gain needed here. In my case an offboard amplifier with a gain of 20 avoided the problem. When the tone goes to zero frequency (zero beat) the generator is at the same frequency as the synthesizer. I have found that it is easier to first set the frequency of interest with the frequency synthesizer and then adjust the signal generator, as many signal generators are prone to drift, while the synthesizer is right on the mark and doesn't drift.

Final Comments

I have checked out the calibration of several old analog HF receivers and two digital ones using the synthesizer with good results. I also checked several of my signal generators and the accurate digital frequency readout of the synthesizer was definitely welcome. My old Clemens generator produces a nice sine wave but drifts around as do some of my other analog generators. The frequency synthesizer, even with its jitter, has low drift and good accuracy.

I have not built a synthesizer with a laptop computer or one with sound circuitry embedded on the motherboard. If you try such an experiment, please let me know the results. In case you're wondering, I don't anticipate using the synthesizer for transmitting as it would require extensive filtering.

It was fun building the SSB/CW receiver and copying Morse code again.[6] I'm trying to get my speed up after a lapse of several years! When you get *your* receiver working, please let me know about it. I'm sure it won't compete with your fancy commercial rig, but it was probably more enjoyable to build! By the way, I found combining ham radio with the PC in this project fascinating. Hope you did too. In any case, I trust you'll have a lot of fun synthesizing!

Notes

[1]**www.arrl.org/files/qst-binaries/**.

[2]J. Taylor, K1RFD, "Product Review — Computer Sound Cards for Amateur Radio," *QST*, May 2007, pp 63-70.

[3-6]See Note 1.

George R. Steber, PhD, WB9LVI, is Emeritus Professor of Electrical Engineering and Computer Science at the University of Wisconsin in Milwaukee. He was a researcher there for 35 years before retiring a few years ago. George earned an Advanced class license and is a life member of ARRL and the IEEE. He has written several articles for QST. *George has extensive industrial experience, with 18 patents issued, and still occasionally serves as a consultant and product designer. In his spare time he enjoys reading, racquetball, astronomy, music and video projects and playing his trumpet in a local band. You may reach him at Dr George R. Steber, 9957 N River Rd, Mequon, WI 53092 or* **steber@execpc.com** *with* SYNTHESIZER *in the subject line and e-mail mode set to text.* QST

New Products

TRC-1 TACTICAL RADIO CARRIER FROM TAC-COMM

♢The TRC-1 Tactical Radio Carrier from Tac-Comm provides a method to protect, package and deploy mobile transceivers for portable operating or emergency communications. The aluminum carrier is designed to adapt most mobile radios for use as standalone base stations. Multiple TRC-1s can be stacked or used side-by-side for situations where more than one radio is needed. In addition to protecting the radio and providing a convenient carrying handle, the carrier keeps all components such as microphones and power cords together. Key information such as local emergency communications frequencies can be attached to the TRC-1 for easy reference. Price: $59.99. For more information or to order, visit **www.tac-comm.com**.

ARRL Board of Directors Act on Background Checks, Digital Issues at July Board Meeting

The ARRL Board of Directors lays the groundwork for new policies at their second meeting of 2007.

S. Khrystyne Keane, K1SFA

ARRL President Joel Harrison, W5ZN, prepares for the next portion of the July Board meeting.

The ARRL Board of Directors took action on two pressing matters — background checks and emerging digital technologies — at its second meeting of 2007, held July 20-21 in Windsor, Connecticut. ARRL President Joel Harrison, W5ZN, chaired the meeting. Invited guests included IARU Vice President Tim Ellam, VE6SH, and Radio Amateurs of Canada President Earle Smith, VE6NM.

Background Checks

A major concern at this Board meeting was the topic of served agencies and background investigations. The Ad Hoc Background Investigation Committee agreed that pursuing federally recognized credentialing for Amateur Radio volunteers was critical for the Amateur Radio Emergency Service (ARES) to function. The Board also extended the scope and duration of the Background Investigation Committee to further investigate credentialing.

In a separate action, the Board decided to adopt a policy with regard to *Memoranda of Understanding* with the various served agencies that "communications volunteers participating in ARRL-sponsored programs should not be required by served agencies to undergo background investigations of any kind," but notes that criminal background checks — performed by law enforcement agencies — are "generally acceptable." The policy continues, "It is not reasonable for a served agency to require these volunteers to consent to credit checks, mode of living investigations or investigative consumer reports. In negotiating or renegotiating *Memoranda of Understanding* that commit the League to provide volunteer emergency communications support, the League must be assured that these volunteers will not be required by the partner organization to consent to credit checks, mode of living investigations or investigative consumer reports."

Digital Technologies

Digital communication was another topic up for discussion at the Board meeting. One question was the extent to which D-STAR systems fall within the FCC definition of "repeater." Some repeater coordinators do not consider D-STAR to be a repeater. Regardless, the Board thanked existing VHF/UHF frequency coordination groups for their efforts "to promote orderly use of amateur frequencies," and requested that such groups "extend

Lisa Kustosik, KA1UFZ, ARRL Meeting Planner and Assistant to the Chief Executive Officer, prepares materials for the Board Meeting outside the meeting room in Windsor, Connecticut.

(Left to right) ARRL Hudson Division Vice Director Joyce Birmingham, KA2ANF; Midwest Division Vice Director Cliff Ahrens, KØCA; New England Division Vice Director Mike Raisbeck, K1TWF, and Northwestern Division Vice Director Bill Sawders, K7ZM, watch one of the many presentations at July's Board meeting.

their efforts to coordinate digital systems such as D-STAR" and consider the bandwidths actually required for successful operation.

The Board also thanked those involved in digital networks that serve ARES, specifically the *Winlink 2000* development team, for creating a system that facilitates Amateur Radio's ability to provide emergency communications. The League affirmed its desire to work with developers of digital systems to improve efficiency, address control issues and enhance compatibility with other users of the Amateur Radio bands.

Legislative Matters

John Chwat and Janet Worthington, KB3PDS, of Chwat & Company, ARRL's Washington, DC legislative consultant, presented the Legislative Relations report. In this session of Congress, the firm hired Worthington, who with more than three years' experience on Capitol Hill, actively advocates on behalf of the League. Chwat & Company has continuously monitored and reported on congressional legislation and activities to the ARRL, and networks ARRL legislative priorities with House and Senate members and staff. They have also conducted targeted lobbying on the key issues of Broadband over Power Lines and antenna placement, assisted in the grassroots networking of ARRL Officers, Directors and members to contact their elected officials, as well as constant monitoring the legislative activities in all 50 states. Chwat and Worthington also work closely with General Counsel Chris Imlay, W3KD, on relevant legislative matters.

The report also discussed the status of two bills pending in the US Congress, HR 462 and S1629.

The Board also voted to support HR 2743, "The Military Affiliate Radio System Emergency Communications Act of 2007." This bill would permit the continued use of the MARS and SHARES programs of frequency-stabilized Amateur Radio equipment that meets FCC Part 97 technical standards. Otherwise, volunteers in these programs might be prevented from using their regular station equipment.

ARRL First Vice President Kay Craigie, N3KN, and ARRL Atlantic Division Vice Director Tom Abernethy, W3TOM, confer during a short break.

ARRL Dakota Division Director Jay Bellows, KØQB, and ARRL CEO David Sumner, K1ZZ.

ARRL Headquarters Activities

ARRL Chief Operating Officer Harold Kramer, WJ1B, brought the Board up-to-date on the first six months of 2007 as it relates to ARRL Headquarters and staff. With the elimination of the Morse code testing requirement, a "transformation occurred in Amateur Radio," he said. The ARRL, he said, was prepared for the changes the elimination brought forth: new licensees, license upgrades and a renewed interest in Amateur Radio overall.

The first six months of 2007 also saw some significant organizational changes at HQ, Kramer said. "The former Membership Services Department and the Field and Educational Services Department merged into one department, Membership and Volunteer Programs, under the leadership of Dave Patton, NN1N." A new Emergency Preparedness and Response Manager joined the staff, Dennis Dura, K2DCD, and Debra Johnson, K1DMJ, heads up the newly created Educational Services Department.

"We have also made significant progress in both improving and integrating our Web services with our Customer Relations Management System," Kramer said. "A cross-departmental team has created all new, much improved membership application pages on the ARRL Web site. This team has also upgraded our credit card entry system so that it processes transactions in real time and added additional security to our credit card transactions. As a part of this process, we have enhanced our warehousing and shipping systems."

While Kramer went on to list accomplishments by each ARRL department, he stressed that the positive results seen at HQ were realized "by working as a team…[these successes] would not have happened if we had not all worked together. Thanks to everyone on staff for making these extra efforts."

Kramer pointed out that the ARRL Lab continues to work with amateurs concerning the various BPL systems, as well as participates on industry committees working on BPL. They have helped many members with RF interference problems, and have improved and expanded *QST* Product Review testing.

The newly formed Membership and Volunteer Services Department oversaw the initiation of monthly teleconferences with Section Managers in their respective Divisions. The ARRL Club Affiliation process was simplified and the *ARRL Club News* electronic newsletter was launched and now has about 8000 subscribers.

The Publications Department released nine new or revised publications, including a new *General Class License Manual*, *General*

President Harrison and Sumner compare notes during the Board meeting, while ARRL Membership and Volunteer Programs Manager Dave Patton, NN1N (right), records the meeting minutes.

(Left to right) Great Lakes Division Director Jim Weaver, K8JE; Delta Division Director Henry Leggette, WD4Q; Dakota Division Director Jay Bellows, KØQB (partially hidden); Central Division Director Dick Isely, W9GIG, and Atlantic Division Director Bill Edgar, N3LLR, listen intently during a presentation at the Board meeting.

Summary of Major Board Actions

The *Minutes* of the 2007 Second Meeting of the Board, Moved and Seconded, are only published on the ARRLWeb at **www.arrl.org/announce/board-0707**. If you do not have Internet access, you may request a written copy of the *Minutes* by writing: ARRL Secretary, 225 Main St, Newington, CT 06111.

Minute	Purpose	Action
Organizational		
11	Ad Hoc Committee to Prepare Confidential Information Management Guidelines — *President to appoint committee that will update* Director's Workbook.	To President
17	Banking Instructions and Permissions *Updates authorizations for financial management.*	Approved
25	IARU Region II, Area B Director *Board nominates ARRL International Affairs Vice President Stafford, W6ROD, for the position.*	Approved
26	VHF/UHF Frequency Coordination *Thanks Coordinators for their work and asks for coordination of D-STAR systems.*	Approved
27	Military Affiliate Radio System Emergency Communications Act of 2007 — *Adds the support of the Board.*	Adopted
29	Ad Hoc Committee to Evaluate ARRL and ARRL Foundation Fundraising — *President to appoint committee to evaluate ability to solicit funds from past, present and future qualified donors.*	To President
30	Policy Relating to Memoranda of Understanding *Promulgates policy with respect to served agencies that require background investigation of volunteers.*	Approved
31	Ad Hoc Background Investigation Committee *Committee's charge expanded to include investigation of credentialing.*	Extended
32	Study of the Governance of the Section Field Organization *Study with final report due in July 2008.*	To P&SC Committee
33	Goal of 30,000 New Amateur Radio Licensees in 2008 *Board establishes a goal for newly licensed amateurs in 2008 and subsequent years.*	Approved
34	Board Thanks *Winlink* Team and Pledges Support for Digital Networks That Serve ARES *League affirms its desire to work with developers of digital systems including the* Winlink 2000 *system to improve efficiency, address control issues and enhance compatibility with other users of the amateur bands.*	Affirmed
35	Rules and Regulations Concerning ARRL Elections *Rules updated to specifically include Section Manager elections, as well as further define campaign materials.*	Approved
Awards and Recognition		
21	*2007 Philip J. McGan Memorial Silver Antenna Award* to Daniel McMonigle, N3IXQ — *McMonigle received permission from major cable TV network to place ARRL Public Service Announcements on the company's networks.*	Conveyed
22	*2006 Herb S. Brier Instructor of the Year Award* to Dr William Birmingham, KC8WBD — *Mr Birmingham, for many years, has demonstrated his commitment to teaching Amateur Radio in and out of the classroom.*	Conveyed
23	*2006 Hiram Percy Maxim Award* to Greg S. Davis, N3ZL *Mr Davis is an outstanding young man, volunteer and Amateur Radio operator with wide ranging interests and aspirations.*	Conveyed
24	*Joe Knight Distinguished Service Award* to Victor Madera, KP4PQ — *The Board recognizes Mr Madera's long and distinguished service to amateurs of Puerto Rico, the Southeastern Division and the ARRL.*	Conveyed

Summary prepared by Dave Patton, NN1N.

Class Q&A, *ARRL Antenna B*ook and the *2007/2008 Repeater Directory*. *QST* saw an emphasis on emergency communications, as well as additional editorial content featuring advanced technology.

The Sales and Marketing Department reported an increase in membership in the first six months of the year. Insurance and banking opportunities were presented as optional benefits to the membership.

The ARRL Volunteer Examiner Coordinator Department implemented plans for the expected workload increase due to the elimination of the Morse code testing requirement. With a gain in the number of license exam sessions, ARRL Volunteer Examiner teams are responsible for administering 71 percent of the Amateur Radio exams.

The Web/Software Development Department reported that the ARRL Web site had more than 2.1 million visitors and 50 million page views during the first six months of 2007. They moved the Logbook of The World system to a new, upgraded server. They also created a new Web site for the ARRL Foundation.

Committee Reports

Recognizing the significance of recent FCC actions that included the removal of the Morse code testing requirement, the Board set a goal of increasing the number of new licensed amateurs for each of the next five years, with an initial goal of 30,000 in 2008. With the total number of licensees dropping by about 6000 per year in recent years, the Board recognized the importance of striving to create real growth in the Service. The new licensing regime, along with the approaching increase in sunspots, can provide the motivation and inspiration for all hams to increase the numbers of licensees, as well as the interest level of all.

The Board decided to ask the Programs and Services Committee to evaluate how the Section Field Organization is governed. In doing so, the Board requested progress reports from the Committee regarding this study, with final results reported to the Board no later than the July 2008 Board meeting.

The Rules and Regulations concerning the League's elections were clarified and amended with regard to "mass communication" of campaign material during Director, Vice Director and Section Manager elections. The Board prohibited "communications by mail, electronic distribution, posting to a Web site, e-mail, hand delivery or any other means of distribution to League members in the particular Division or Section" involved in an election at League expense during the campaign period if the material might reasonably be expected to affect the outcome of the election.

Director Butler Honored

At the close of the meeting, President Harrison noted that Southeastern Division Director Frank Butler, W4RH, after 50 years of elected service to the ARRL (starting out as Western Florida Section Communications Manager in 1957), was not standing for re-election this October. Everyone present gave him a standing ovation in appreciation of his long service.

The next meeting of the ARRL Board of Directors is scheduled for January 18-19, 2008.

Photos by the author.

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

ARRL Board of Directors Names Award Recipients

S. Khrystyne Keane, K1SFA

The ARRL Board of Directors named four ARRL award recipients at their July 20-21 meeting in Windsor, Connecticut: The 2006 Hiram Percy Maxim Award; the 2006 Herb S. Brier Instructor of the Year Award; the Joe Knight Distinguished Service Award, and the 2007 Philip J. McGan Memorial Silver Antenna Award. The 2006 Doug DeMaw, W1FB, Technical Excellence Award recipient was named after the meeting.

2006 Hiram Percy Maxim Award

The recipient of the 2006 Maxim Award is Greg S. Davis, N3ZL, age 17, of Florence, South Carolina. This award, given annually to a licensed radio amateur under the age of 21, takes into account the nominee's most exemplary nature of accomplishments and contributions to both the Amateur Radio community and the local community.

COURTESY N3ZL

N3ZL

Davis, first licensed at 14, upgraded to Amateur Extra class before he turned 16. While his first love is ragchewing, he likes to DX, contest and operate CW. He is interested in and active in emergency communications. As part of his Eagle Scout project, he was responsible for planning, assembling and installing emergency communications antennas at Red Cross emergency evacuation centers.

2006 Herb S. Brier Instructor of the Year Award

The recipient of the 2006 Instructor of the Year Award is Dr William P. Birmingham, KC8WBD, of Grove City, Pennsylvania. Over a period of many years, Dr Birmingham has demonstrated his commitment to teaching Amateur Radio in the classroom as well as promoting Amateur Radio outside the classroom.

COURTESY KC8WBD

KC8WBD

Herb S. Brier, W9AD, long-time *CQ* Novice Editor, represented the spirit of effective, caring Amateur Radio instruction. The ARRL, in conjunction with the Lake County (Indiana) Amateur Radio Club, sponsors this award in his memory to recognize the very best in volunteer Amateur Radio instruction and recruitment.

2006 Doug DeMaw, W1FB, Technical Excellence Award

In a separate action after the Board meeting, Rick Campbell, KK7B, was declared the winner of the 2006 Doug DeMaw, W1FB, Technical Excellence Award for his article "The MicroT2 — A Compact Single-Band SSB Transmitter" that appeared in the December 2006 issue of *QST*. This award honors the best technical article published in either *QST* or *QEX* magazines during the award year. The winner is nominated through ballots cast by ARRL Technical Advisors.

COURTESY KK7B

KK7B

Rick has a BS degree in physics from Seattle Pacific University and a Master's and PhD in electrical engineering from the University of Washington. He is employed with the advanced development group at Cascade Microtech and is an adjunct professor at Portland State University, where he teaches RF design.

In 2006 Campbell was elected chair of IEEE MTT Committee 17, which studies and promotes HF, VHF and UHF technology.

Campbell has a long history of writing for ARRL publications. In addition to numerous *QST* and *QEX* articles, he is one of the authors of the ARRL book *Experimental Methods in RF Design*.

Joe Knight Distinguished Service Award

The recipient of the Distinguished Service Award is ARRL Puerto Rico Section Manager Victor Madera, KP4PQ. In his nomination of Madera, ARRL Southeastern Division Director Frank Butler, W4RH, said: "The Puerto Rico Amateur Radio Club existed in Puerto Rico for many years, perhaps back to the 1950s. By 1990, it was falling into decline. At that time, Victor organized a new club, called the Puerto Rico Amateur Radio League, patterned after the ARRL, but intended to serve all of the amateurs of Puerto Rico. Victor served as the President of the PRARL for a number of years, and then took over the jobs of both Secretary and Newsletter Editor. He still holds these positions to this day. The newsletter, *Eureka!*, is still published in hard copy, as well as electronic form. Largely due to Victor's efforts, the PRARL is the only Special Service Club in Puerto Rico.

"After a number of cases of VHF-FM repeater interference between Puerto Rico and the US Virgin Islands (only 50 miles apart), Victor organized the PR/VI Volunteer Frequency Coordinators. Since that time, there has been very little interference between the islands. Further, the data on all repeaters is submitted annually to the ARRL for inclusion in our *Repeater Directory*."

COURTESY KP4PQ

KP4PQ

This award, first established in 2003, honors the exceptionally notable contributions by a Section Manager to the League's health and vitality. It is named for New Mexico Section Manager Joe Knight, W5PDY (SK), who served as New Mexico's Section Manager for 27 years.

2007 Philip J. McGan Memorial Silver Antenna Award

The recipient of the 2007 McGan Award is Daniel M. McMonigle, N3IXQ, of Newtown Square, Pennsylvania. McMonigle has been involved with public service and emergency communications, making speeches to civic and community groups. In 2007, through his tireless efforts, permission was received from the Comcast East cable network to place ARRL public service announcements on the company's networks. The cable air time value of this advertising was valued at more than $1.5 million.

The McGan award is named for Philip J. McGan, WA2MBQ (SK), the first chairman of the ARRL's Public Relations Committee. After his death, friends in the New Hampshire Amateur Radio Association joined with the ARRL Board of Directors to pay a lasting tribute to the important contributions he made on behalf of Amateur Radio. The McGan Award goes to that ham who has demonstrated success in Amateur Radio public relations and best exemplifies the volunteer spirit of Phil McGan.

COURTESY N3IXQ

N3IXQ

Public Relations activities for which the McGan Award is presented include efforts specifically directed at bringing Amateur Radio to the public's attention (and most often the media's) in a positive light. This may include traditional methods, such as news releases, or non-traditional methods, such as hosting a radio show or being an active public speaker. QST

Waiting for the Sun

When will HF conditions improve, and what do we do until then?

Steve Ford, WB8IMY

If you were licensed within the last couple of years, you've never experienced "the good old days." Excuse me while I adjust my rocking chair and take another swig of lemonade.

Let me tell you, sonny, back in the year 2000 the Sun was spewing particles like you can't imagine. It ionized the part of our atmosphere known as the *ionosphere* to heck and gone. This supercharged ionosphere behaved like a giant curved mirror, bending radio waves back to Earth and sending signals around the globe with the greatest of ease. On the 10-meter band you could talk to Europe with just 10 W and a short wire hanging off your balcony. Stations from Asia were booming in on 15 meters in the early evening. The 20-meter band was open to the world all night!

Alas, those days are gone. We still have the ionosphere, of course, but the Sun has descended into the doldrums, as it has a tendency to do 5 or 6 years after the peak of a Solar Cycle. As a result, today's ionosphere is a weak mirror at best. The 10-meter band is as dead as a proverbial doornail. There are openings here and there, but they are uncommon and limited. Fifteen is somewhat better, but not by much. Twenty meters has a few decent days, but mostly tends to be mediocre in the daytime and unusable within a couple of hours after sunset.

The good news is that these lousy conditions are temporary. The Sun will become active again and the good old days will return. The bad news is that the peak of the next Solar Cycle is still 3 to 4 years away. If you enjoy hamming on the HF bands, what do you do until then?

My Solution

Here's a solution for global communication 24/7 that doesn't use the ionosphere at all. It is so simple, I can condense the concept into 4 steps…

1. Assemble a linear particle accelerator and smash a stream of protons into a hard target so that you end up with lots of unstable *pions*. Now focus the pions into a long tunnel where they will decay into virtually massless particles known as *neutrinos*. Channel the neutrino output into a beam and modulate it at an audio frequency.

2. Assemble a neutrino receiver. About 50,000 tons of ultra-pure water surrounded by 11,000 photomultiplier tubes should suffice. It's best to locate your receiver underground, perhaps in a salt mine. By completing this step you've finished the transceiver and have also qualified for a Nobel Prize in physics.

3. Direct the neutrino beam into the ground, aiming it at the receiving station. It doesn't matter where the station is located. The neutrinos will shoot directly through the Earth at almost the speed of light with little, if any, loss. A station at the opposite point on the globe might as well be next door.

4. At the receiving end, your fellow Nobel Prize candidate will have his neutrino transceiver ready. Just plug in your microphones and enjoy! Who needs the ionosphere?

If you must insist on using the ionosphere and conventional radios for worldwide communication, I have a few alternative suggestions.

Head for the Low Bands

Even though conditions range from mediocre to poor on 30 meters and up, the lower bands are still hopping. In fact, conditions on the lower bands actually *improve* at the bottom of the Solar Cycle.

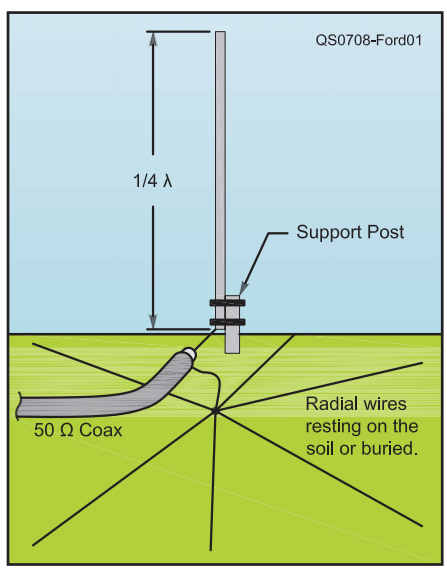


Figure 1 — A ¼ wavelength vertical antenna can be a good performer on the low bands, but the best verticals require a network of radial wires on the ground. You can build your own, or buy one of the many commercial models. See the advertising pages of *QST*.

The 40-meter band is my personal favorite. During the day it provides reliable communication out to 500 miles or more. At night, the band can open to the world — even at this point in the Solar Cycle. The only problem with 40 meters is the high-power shortwave broadcast stations that dominate the voice portion of the band at night. If you live east of the Mississippi, the proliferation of broadcast signals can make it nearly impossible to enjoy AM or SSB chats after sundown. CW and the digital modes, however, are in the clear and offer some interesting alternatives. We'll discuss this idea in a moment.

The next band down the frequency ladder is 60 meters. This band is only available to General, Advanced and Amateur Extra licensees. We are restricted to five operating frequencies (5330.5, 5346.5, 5366.5, 5371.5 and 5403.5 kHz) and we're limited to upper sideband voice at only 50 W output. Even so, 60 meters can be a blast in the evening. The propagation is similar to 40 meters, but without the shortwave broadcasters. Since everyone is limited to 50 W output, you're not butting heads with kilowatt-class stations. It's a level playing field where everyone has an equal opportunity for fun. For more information, check out the CQ 60 Meters site on the Web at **www.60meters.info/**.

On the 80-meter band there is little happening while the sun shines, but when night falls, look out! Eighty meters will open for conversations over hundreds and even thousands of miles. DX contacts don't come as easily as they do on 40 meters, but they are most definitely there. Thunderstorms in the spring and summer can kick up a fair amount of noise on 80 meters. That's not to say that operating is impossible during the warmer months, but fall and winter definitely are easier on the ears.

Our final stop is 160 meters, better known as "Topband." This nighttime band is another that's restricted to General, Advanced and Amateur Extras. It can be challenging for a variety of reasons. For example, lightning noise can be quite high, making 160 almost unusable during the summer. On the other hand, if you have a good antenna system, you can do some remarkable DXing on 160 in the winter. Distant signals will rise out of the noise like

ghosts, surprising you when you least expect it — or when you most expect it, since one of the time-tested tricks to using Topband for DXing is to follow the daylight/nighttime *terminator*, where propagation is enhanced, sometimes almost magically.

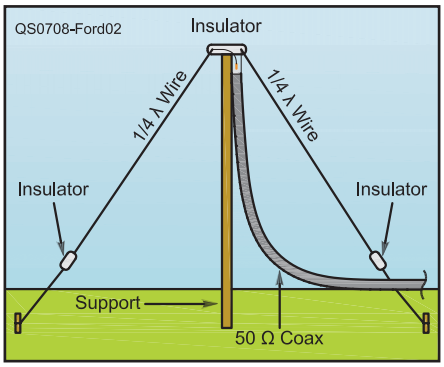


Figure 2 — An inverted V dipole only needs a support for the center insulator. The legs of the antenna slope downward and can be anchored close to the ground.

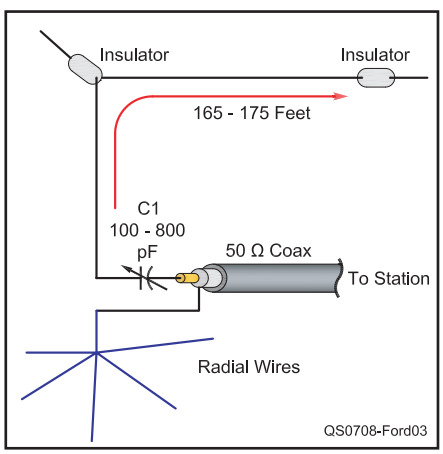


Figure 3 — The inverted L antenna is popular for 160-meter work.

Low Band Antenna Options

What is true on the low bands is true on any band: the most important part of your station is your antenna. You can own the best transceiver that money can buy, but if your antenna system is poor your investment is mostly wasted.

This doesn't mean that anything less than a monster antenna is inadequate. What it *does* mean is that you must erect the best antenna possible. If you live on a small lot, the best antenna possible may be a vertical, but don't forget that for best performance many vertical antennas require a network of radial wires on the ground beneath the antenna. You can make your own vertical from a ¼-wavelength conductor (see Figure 1), or you can purchase commercial verticals from several *QST* advertisers.

Another possibility is the venerable inverted V. This antenna is a wire dipole with legs that slope downward toward the ground. Its advantage is that it requires only a single support. See Figure 2. If you have enough room, an inverted-L antenna, such as the one shown in Figure 3, is a good choice if you want to explore 160 meters.

Perhaps the easiest antenna for the low bands is a simple wire dipole fed with 450-Ω ladder line and a wide-range antenna tuner with a balanced output (see Figure 4). If you can put up 66 feet of wire — not necessarily in a straight line, by the way — chances are good that you'll be able to use the antenna on 40, 60 and 80 meters. Put up 140 feet of wire and you may be able to load it on 160, 80, 60 and 40 meters. There are several variables involved, such as the height of the antenna above ground, so your mileage may vary, as they say.

Bottom line: Erect the best antenna your budget and real estate will allow. I don't have enough pages to describe every possible antenna variation, so I highly recommend that you purchase the new edition of *The ARRL Antenna Book*. You'll find it at ham dealers and also online at **www.arrl.org/shop/**.

If the best antenna possible falls short of the ideal, it's time to investigate the operating side of the equation.

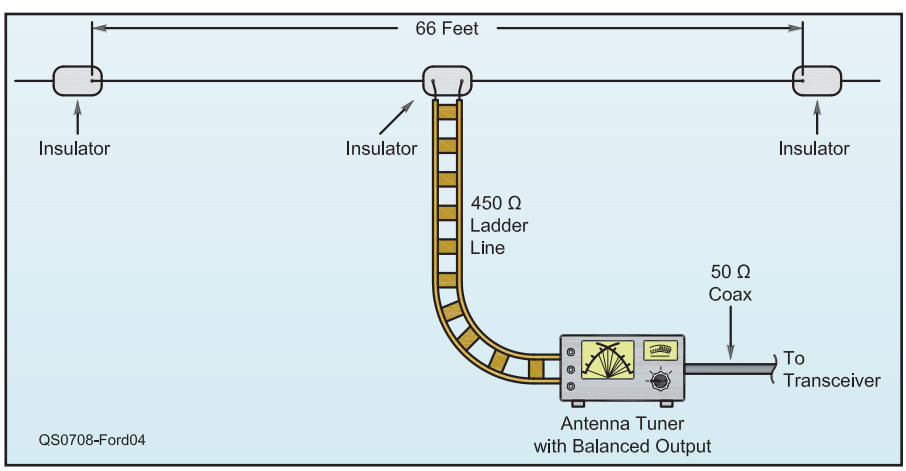


Figure 4 — Make a dipole 66 feet in length or longer and feed it in the center with 450-Ω ladder line. Connect a balanced output antenna tuner and you'll be in business on at least one of the low bands, possibly more.

Code Cuts Through

I enjoy having a voice chat as much as the next guy. The problem with voice on HF, however, is that it spreads the energy of your signal over several kilohertz of spectrum. In a sense, your signal becomes diluted, not unlike the way some bartenders add water to "stretch" supplies of otherwise good Scotch. (A pet peeve of mine!)

Because your signal spreads over several kilohertz, the guy listening to you has to operate his receiver with a wider bandwidth as well. This wider bandwidth allows unwelcome guests like noise and interference to walk through the door along with your signal. And because your signal energy is so dispersed, it may be difficult to understand your vocal profundities when the going gets rough.

If you want to be heard on a lousy band — high frequency, low frequency or in between — the easiest solution is a continuous wave (CW) transmission keyed on and off using Morse code. Instead of spreading your precious RF over 3 kHz or more, CW concentrates it like a laser beam into 100 Hz or less. On the receiving end, the listener can reduce his bandwidth tremendously, leaving most of the annoying noise and interference behind.

A CW signal can be plucked from an abysmal band that won't support anything close to a voice conversation. With the high efficiency of CW, combined with the extraordinary Morse decoder nestled between your ears, you can work a band long after everyone else has given up.

Yes, you'll need to learn Morse code — it kind of comes with the territory. But don't be intimidated by the speed demons you hear on the air. Just go as fast as your comfort will allow. You will find plenty of people willing to downshift to your speed.

Note to Technician licensees: Don't forget that you have CW privileges on two "low bands" — 80 and 40 meters.

Digital Dalliances

If you're into computers and don't mind conversing on a keyboard, you can go digital with great success, even on a band with marginal propagation. Tune your radio to 14070 kHz during the day, or 7070 kHz after nightfall, and you'll hear some unusual warbling sounds. That's the chorus of PSK31, a digital mode that occupies less than 50 Hz bandwidth.

Like CW, PSK31 signals are decodable

So When Will HF Propagation Get Better?

In mid 2007 we're close to the bottom of Solar Cycle 23 — or perhaps we're at the bottom, since scientists are not sure at this point. Scientists also have differing opinions about predicting how big the peak will be for the next one, Solar Cycle 24. One group says 90 will be the maximum around the year 2012, but another group says the peak will be 140, even higher than Solar Cycle 23. See Figure A.

All we hams can say with certainty is that propagation on the higher HF bands can only go up over the next couple of years as the new solar cycle ramps up.

I use a rule-of-thumb that the smoothed sunspot number (SSN) should be higher than 50 for propagation conditions on 10 meters to be good enough for worldwide DX. Using the average of the NOAA scientists' predictions, that should happen somewhere in 2010, some three years from now. Typically, a solar cycle will ramp up more quickly than it dies down after it hits its peak.

A *whole lot* of fun can be had on the 15 meter band even before we experience peak solar conditions. In 2009, just two years from now, you should see 15 meters staying open well on East-West mid-latitude paths, for example from the US East Coast and Europe, for SSN levels reaching about 25 or more. For SSN = 50, 15 meters should stay open to Europe for almost 10 hours, while 10 meters will sport moderate signals for about four hours on the same path. — *Dean Straw, N6BV, Senior Assistant Technical Editor*

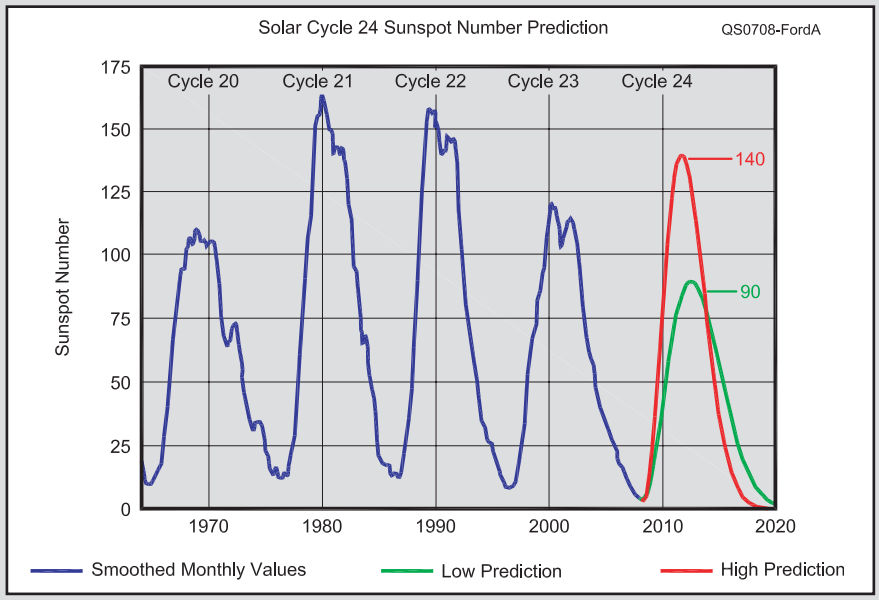


Figure A — April 25, 2007 Solar Cycle sunspot number predictions from NOAA.

under downright dreadful conditions. The signals appear as ghostly traces on the waterfall displays you find in PSK31 software applications (Figure 5). To try PSK31 all you need is a computer equipped with a sound card or built-in sound chipset. Chances are you probably own this hardware already. You'll also need a *sound card interface* to act as the middle man between your computer and your radio. These devices are legion and you'll find several for sale from *QST* advertisers. The final item on the shopping list is software, and there is an abundance to choose from. If you want to try PSK31 on the cheap, download the free *DigiPan* software for *Windows* at **www.digipan.net**.

PSK31 isn't the only digital mode that offers excellent performance under poor conditions. I've been highly impressed with the ability of MFSK16, Olivia and DominoEX to pull readable text out of the muck. With Olivia I've actually been able to copy clean text when I could no longer hear the signals. If you want to try these modes your best bet is a multimode application such as *MixW* (**www.mixw.net**) or *MultiPSK* (**f6cte.free.fr/index_anglais.htm**).

And don't forget good old radioteletype, better known as *RTTY*. You won't encounter many casual RTTY chats on the bands these days, but this classic mode is still the digital king of contesting and DXpeditions. With a good piece of software, such as the free *MMTTY* (downloadable at **mmhamsoft.amateur-radio.ca/mmtty/**), you can work stations where voice modes fear to tread.

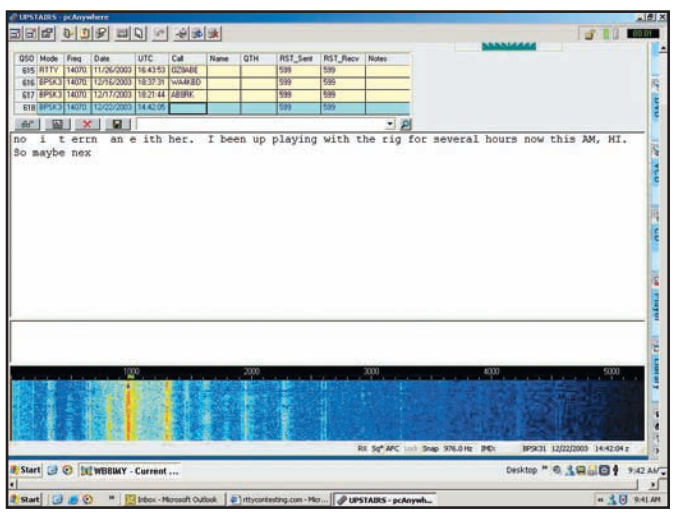


Figure 5 — The lines in this *MixW* waterfall display are all PSK31 signals. PSK31 is just one of many sound-card-based digital modes that offer outstanding performance under poor conditions.

These *Are* the Good Old Days

Amateur Radio, like any other pursuit in life, is mostly what you make it. We're fortunate to have a wide range of frequencies at our disposal, and many different ways to use them. If you want to work the world from your backyard, the world is still waiting. Put up the best antenna you can, use the most efficient communication modes available and you will have no end of enjoyment — even in the basement of the solar cycle.

Or you can let your radios gather dust for the next four years and start building one of my neutrino transceivers instead.

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

The Wake-Up Call

"The Russians launched a satellite!" reverberated across the country — and the world — a half century ago. As the Space Age dawned, W7ETS was among the thousands of hams who tuned in the beeping spacecraft.

John E. Foley, W7ETS

The ham station of John Foley, W7ETS, in which he monitored *Sputnik* on the morning of October 5, 1957. The receiver was a Hallicrafters S-40, transmitter a Heath DX-35, and VFO a Heath VF-1.

"Wake up," my Mom shouted as she rousted me out of bed early that Saturday morning 50 years ago, October 5, 1957, "The Russians launched a satellite! Maybe you can hear it on your radio."

She'd just learned of "Sputnik" on the early morning news from our local AM radio station, KMED, while making breakfast on our small farm in southern Oregon. The Russians had secretly launched the world's first artificial satellite of the Earth the previous day. In so doing, they had beaten our Nation into space.

She handed me a scrap of paper on which she'd scribbled a frequency *Sputnik* was transmitting on, "20.005 megacycles."

"I can tune that frequency!" I exclaimed as I scrambled out of bed and dashed to my Hallicrafters shortwave receiver.

In October 1957, I was 17 years old, a senior at Crater High School in Central Point, Oregon, and somewhat of a science and engineering "nerd." And because I was obsessed with radios and electronics, I'd gotten my General class ham ticket several months earlier and had assembled a modest radio station in the corner of my bedroom using equipment I'd scrounged, built and bought.

Milk(ing) Money Brings SW Receiver

My receiver was a second-hand, 10 year old Hallicrafters, model S-40 general coverage shortwave radio, which I'd purchased for $65 with money earned by selling milk from the two cows I'd raised as a 4-H Club project. One of my daily chores on our farm was to milk these cows, morning and evening. For a transmitter, I'd built a Heath DX-35 (50 W CW/AM) from a kit. My favorite band was 15 meters, and I'd strung all kinds of wire antennas between the branches of the tall oak trees in our backyard. And because in 1957 we were at the maximum of a sunspot cycle, DX conditions on the high frequency bands were fantastic. I loved working hams in the Pacific late in the evenings after QRM caused by stations in the eastern US had faded out.

Usually on a Saturday morning I could sleep a little later because I didn't have to go to school and could wait to milk the cows. But what my hardworking, no-nonsense parents considered as sleeping late, to me always seemed awfully early, especially if I'd been DXing late the evening before. And even though my ham radio activities frequently got in the way of me getting my chores done on time, my parents tolerated my science interests because they knew that in order to make a decent living after graduating from high school I would have to learn a profession other than farming. They understood all too well the world was changing rapidly and there would be fewer opportunities in the future for the small farmer.

In choosing 20.005 megacycles as Sputnik's frequency, the Russians had made it easy to tune in their satellite.

Life as they had lived it — real work is work done with your hands, by the sweat of your brow — was giving way to a new technologically based age. Science and engineering could be the ticket off the farm. And ham radio, they believed, had something to do with science and engineering, and, therefore, unlike most other teenage activities, wasn't a total waste of time.

My Hallicrafters S-40, like all receivers of that era, operated on vacuum tubes and drifted in frequency like crazy as it warmed up after being turned on. Also, because the S-40 was a general coverage receiver, tuning was done through a combination of a main dial for coarse tuning and a bandspread dial for fine adjustments. It was difficult to tune accurately without a reference signal to calibrate the main dial to. Most high-quality receivers came with quartz-crystal calibrators, but my little S-40 didn't have one.

However, in choosing 20.005 megacycles as *Sputnik*'s frequency, the Russians had made it easy to tune in their satellite. This frequency was just five kilocycles above the National Bureau of Standards radio station, WWV, which broadcasted time signals at precisely 20 megacycles. All I had to do to be on *Sputnik*'s frequency was to use WWV as the reference signal, then tune a few kilocycles higher. In retrospect, I suspect the Russians had specifically chosen this frequency to allow anyone with a shortwave receiver to hear *Sputnik*, thereby maximizing the political and propaganda impacts of their space accomplishments.

I Listen, Parents Hover

I fired up my S-40 receiver. And with my parents hovering in the background, I quickly zeroed in on WWV using the main tuning dial, then tuned the bandspread ever so slightly up frequency.

We listened.

At first all we heard was the normal background noise. As my S-40 warmed up, I had to keep tweaking the bandspread to compensate for drift to stay on frequency.

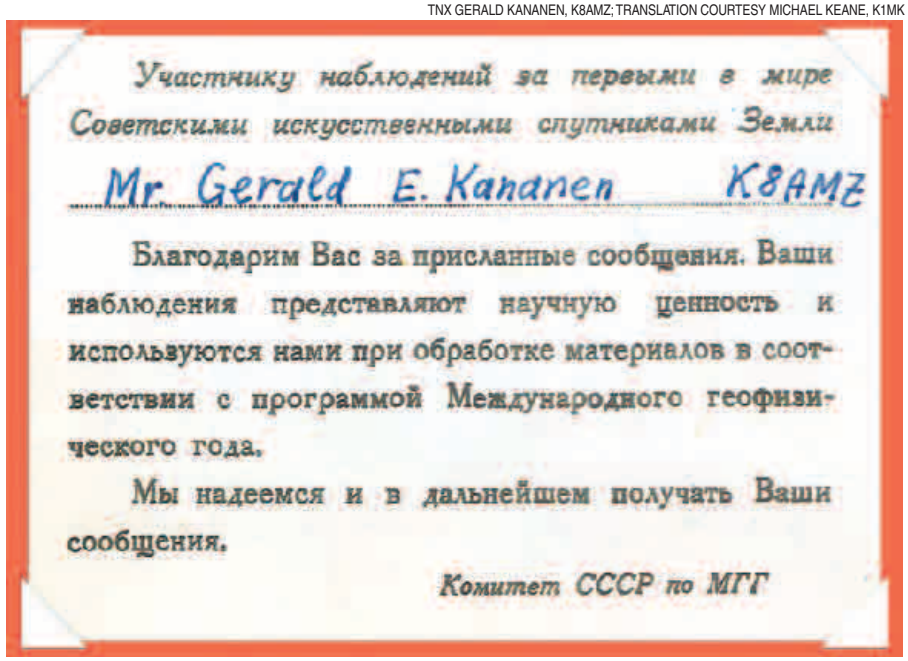
But then, after monitoring for only 15 minutes or so, we began to hear the faint "beep-beep-beep" CW-type signal from *Sputnik*, at a rate of about two beeps per second. Although initially weak, the signal increased to a steady S9+ within a minute or two.

Being totally mesmerized by what we were hearing, we listened in silence.

Beep-beep-beep-beep-beep . . .

And in a few more minutes, after the signal had faded into the background as *Sputnik* moved beyond the horizon, I broke

TNX GERALD KANANEN, K8AMZ; TRANSLATION COURTESY MICHAEL KEANE, K1MK


Участнику наблюдений за первыми в мире
Советскими искусственными спутниками Земли
Mr. Gerald E. Kananen K8AMZ
Благодарим Вас за присланные сообщения. Ваши наблюдения представляют научную ценность и используются нами при обработке материалов в соответствии с программой Международного геофизического года.
Мы надеемся и в дальнейшем получать Ваши сообщения.
Комитет СССР по МГГ

The front and back of a QSL card Gerald Kananen, K8AMZ (then and now) received for sending a *Sputnik* I signal report to the Soviet Union. The card reads: "Participant in observations of the first in the world Soviet artificial earth satellite — Mr. Gerald E. Kananen K8AMZ. Thank you for having sent a report. Your observations are of scientific value, and we have included them in the analysis in accordance with the program of the International Geophysical Year. We hope to continue receiving your reports. IGY Committee of the USSR.

our silence with a loud shout, "Wow! That was neat! It went right over our farm!"

My parents and I excitedly talked about what we had just experienced. We were amazed by how lucky we'd been to have heard *Sputnik* so easily.

We wondered if we would hear it again.

We wondered what it looked like and how big it was.

We wondered what it was doing up there . . .

They Had Beaten Us to Space

And the real significance of what we had just witnessed sunk in: If the Russians could orbit something like *Sputnik* over our little farm in southern Oregon, what else could they do?

Until now, the Cold War had seemed far away, something on the other side of the world. But in hearing firsthand the signals from *Sputnik* we began to realize how close to home it really was and how big a shadow it would cast.

Sputnik was not only a wake-up call for me that October morning, it was also a wake-up call for our Nation. We had fallen behind the Russians in math and science. There was a missile gap. They had beaten us into space.

And the Space Race was on.

Over the next decade our government responded to this challenge by providing all kinds of scholarships and employment opportunities — and, yes, even military service deferments — to kids like me, kids who were turned on by math, science, engineering, astronomy, rockets, and, of course, ham radio. We eventually joined the cadre of men and women who helped put men on the moon in 1969 and bring down the Berlin Wall in 1989. After high school, I earned degrees in physics and engineering, then went on to a career as a research scientist and manager at the nuclear laboratory in Los Alamos.

I broke our silence with a loud shout, "Wow! That was neat! It went right over our farm!"

Those disturbing insights we had about the nearness of the Cold War put a chill in the air that October morning half a century ago, as my parents and I were gathered around my ham station in my bedroom eavesdropping on the dawn of a new age. And not knowing what more to think or say or do about what the future might hold, my Mom withdrew to the kitchen, my Dad to the barn. They left *Sputnik* to me.

I Keep Listening…and Milking

About 90 minutes later, after *Sputnik* had circled the earth, I heard its signal again, but now only an S3. At first I was puzzled as to why it was so weak, but eventually I concluded it was due to the rotation of the Earth under the satellite's orbit. Hours later, in the evening, as our farm rotated back into *Sputnik*'s orbital plane, the signal was loud again.

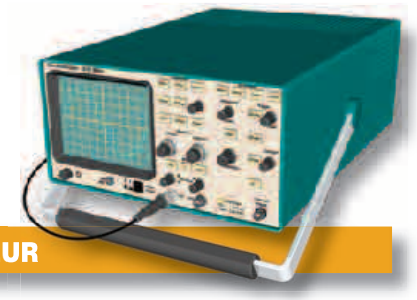
I monitored *Sputnik* late into the night and all the next day. Its signals came and went, rose and fell in strength. I figured out how to predict approximately the times I would hear it and how loud it would be.

And by Sunday evening when I crawled back into bed at the end of that amazing weekend, I felt good about what I had done with my little ham station, what I had learned, and what I could predict.

Then, early on Monday morning, as I also could have predicted, my no-nonsense Mom again woke me to milk the cows and go to school.

John Foley, W7ETS, has been licensed since 1956. He has a PhD in nuclear engineering and is retired from a career at the Los Alamos National Laboratory in Los Alamos, New Mexico. While living in New Mexico, his call sign was W5SVJ, and upon moving to Hood River, Oregon in 2001 he was able to get his original call sign back. In addition to ham radio, his hobbies include astronomy, antique clock repair and woodworking. John and his wife, Mary-Ethel, have three grown daughters and four grandchildren. He can be reached at 810 9th St, Hood River, OR 97031, **w7ets@aol.com**.

The Doctor is IN



PROJECTS AND INFORMATION FOR THE ACTIVE AMATEUR

Q Mike, WCØK, asks: I'm constructing the two element switchable broadside or end-fed array featured in the Figure 33, page 8-34 of *The ARRL Antenna Book*.[1] I would like to put the phasing lines and switching system in the shack. Can I attach two equal lengths of coax to the two verticals then attach the ¾ λ and ¼ λ phasing lines to the two equal lengths of coax?

A Mike, you "almost" can do what you want! This antenna (see Figure 1) is a handy two element array that can be remotely switched between the two bidirectional orientations. For the broadside direction, the mutual impedance between the elements is of the same sign and thus the net impedances at the two bases are the same. Because the impedances are the same, and the lengths are the same for the broadside case, whatever power goes to the array will divide between the two elements equally and you will get the expected pattern. The feed impedance may not be quite what you expect, due to the mutual impedances.

The end-fire case is more complicated. Here the sign of the mutual impedance is opposite in each, so the base impedances will not be equal and thus, unless extraordinary means are taken, the currents will not be equal in the two elements. This means that you will not get the pattern you expect. This antenna, as designed, uses the λ/4 method of forcing equal currents to the two elements. This is described on the right-hand column of page 8-15.

You can do what you propose if you make each of the two equal length lines exactly ½ or 1 λ long (or multiples of electrical length). In that way the impedances are repeated and the λ/4 method will still work. For other lengths, even though they are equal, you will not maintain the same current in each element.

For all phasing lines and critical length lines, I would suggest measuring with an antenna analyzer to make sure you have what you think you do, since the dielectric constant may not be exactly as published. For ¼ λ (or ¾ λ) sections, leave the far end open and look for a 0.0 Ω resistive impedance at the near end. For λ/2 (or full wave), short the far end and again trim for 0.0 Ω.

One disadvantage of the longer lines is that the impedance vs frequency function changes faster, so your pattern and matching will be more frequency dependent. It will still work. You just may find that your tuner needs more fiddling, and your pattern will get less clean as you move away from your optimum frequency.

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

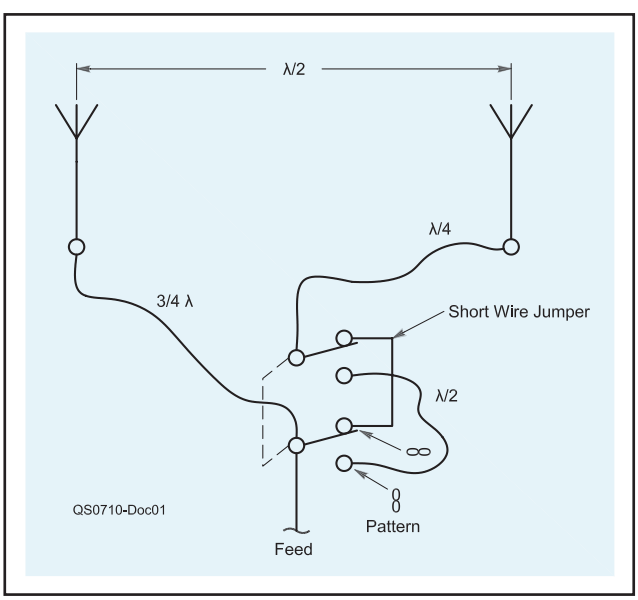


Figure 1 — Diagram of the two element switchable broadside or end-fire array from *The ARRL Antenna Book*.

Q Mack, W4MBA, notes: I am receiving motor noise on my mobile HF station installed in my '97 Dodge van. I bought some ferrite beads to try to solve the problem, but don't know the best place to put them. Can you help me?

A Mack, this is a common problem, especially with HF mobile operations. I have been lucky with my last two installs and haven't had to do anything except turn on the noise blanker in one of the setups!

One easy place to start before you begin your investigation is to go to your dealer and see if they have any service bulletins on RF noise in your vehicle. If you're really lucky, they may have a kit designed to make your vehicle "radio friendly." It's a long shot, but worth a call or visit.

If that doesn't do it, you will need to attack the problem. Before you can fix the problem, you will need to decide where the noise originates and how the noise gets into the radio. When you say "motor noise," there can be a number of kinds, and it's best to know which you are dealing with. The worst usually are:

- Ignition noise — usually a popping noise that increases with engine speed.
- Alternator whine — a rather high pitched noise that also follows engine speed. Unlike ignition noise, sometimes it changes sound as the battery gets charged and the regulator disconnects the charging circuit.

Then there can be other problems, often easier to identify because of the nature of their source:

- Electric fuel pump noise, comes on and off without much of a pattern — my wife's car has this problem.
- Windshield wiper, brake light, turn signal light and computer data noise — these can be identified because they only happen when you activate the subsystem.

The noise can get into the radio in two ways:

- It can be radiated and then picked up by the HF antenna.
- It can be conducted through the power line to the radio.

I suggest the following sequence to narrow it down:

- Disconnect the antenna at the radio and, if possible, replace it with a low power dummy load. See if you still have the problem with no antenna connection. If you don't, no amount of filtering on the power line to the

radio will help. If you do still have problems, disconnect all other wires and see if it changes (you will need to listen to the internal speaker for this test). It is most likely that disconnecting the antenna will make the most difference. If it doesn't, you need to filter whichever leads are bringing the noise into the radio — often the power leads. You can try wrapping turns of the power wire around a ferrite toroid, or using a bunch of ferrite beads strung on the power lead.

- If removing the antenna connection eliminates most of the noise, put the antenna connection back on and remove the antenna from the mount and try it. If you still have noise check the ground connection at the shield of the coax near the mount and make sure it is solid. Make sure the part of the body it is going to is tied to the chassis well and add additional straps to make sure. Once you have the radio quiet with the coax connected and the antenna off the mount, any other noise you have is radiating from the ignition system (usually) to the antenna.
- To reduce ignition radiation, make sure engine compartment grounding is solid, often a problem in an older vehicle that is subject to corrosion. Check or replace the strap from the negative battery terminal to the engine block. Check to make sure the hood is well bonded to the chassis around the hinges. Sometimes a bypass capacitor and/or ferrite beads on the primary lead going to the electronic ignition module can reduce the radiation from "antennas" connected to your engine.

It is important that you measure the noise level and keep a record of it on each band as you perform each step. It is quite possible that more than one source is contributing and by noting the amount of change, you can tell how much each has improved the situation.

Q Pete, KD8DMJ, asks: I am studying for the General class test and am having a hard time dealing with the relationship between frequency and wavelength. Is there a formula or an easy way to learn the "chart"?

A Pete, you're in luck. The wavelength is the distance a radio wave travels during one cycle. That can be found by dividing the frequency of the signal into the speed of light. If you are working in MHz, six zeros in each cancel out and the formula is simply:

- Wavelength in meters = 300 / frequency in MHz, or
- Frequency in MHz = 300 / wavelength in meters.

Note that this gives you the "exact" frequency and wavelength, not the usual band name, but you should be able to make the connection. For example, if you want to know the wavelength of 7 MHz, it would be 300/7 = 42.8 meters. Well, that's in the "40 meter" band. Exactly 40 meters is 300/40 = 7.5 MHz — not even in the band, which goes from 7 to 7.3 MHz.

Good luck with your upgrade. I hope to see you on HF soon!

Q Herb, WA3HGT, wonders what the best way is to figure out the hole size needed to be drilled to properly seat a rubber grommet. Is there a chart or some way to know how much bigger the hole should be than the hole in the grommet itself?

A Herb, your "doctor" doesn't know of a standard size of grommet wall thicknesses either. ARRL Senior Lab Engineer Zack Lau, W1VT, recommends measuring the grommet web size with the "outside" fingers of the usual dial or vernier calipers as shown in Figure 2. The hole should allow that dimension to rotate easily. The use of an inexpensive rubber grommet to protect wires going through a chassis is an excellent way to make sure that they don't chafe in time and short out.

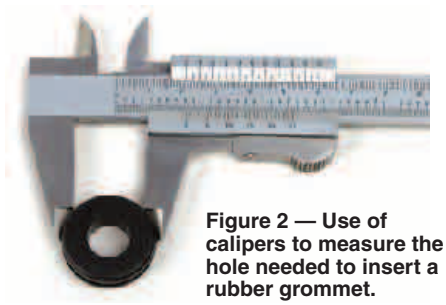


Figure 2 — Use of calipers to measure the hole needed to insert a rubber grommet.

Q Chester, KD5TFK, asks: I am considering purchasing a dual band antenna for 2 meters and 70 cm, but am puzzled as to which type offers a better performance. Does a J-pole provide better performance than a ground plane or vice versa? I plan to mast mount my antenna at a height of 25 feet.

A Chester, that should be an effective arrangement with either type of antenna, although as shown in Figures 3 and 4, *EZNEC* predicts that the 25 foot high J-pole does have an advantage over the ground plane of about a dB.[2] The analysis assumed typical ground conditions and that both antennas were constructed of ½ inch diameter aluminum. Either of these antennas, perhaps more likely an issue with the J-pole, can have their patterns distorted by radiation from the feed line. To make sure you get the pattern you expect, it is suggested that you choke off currents on the outside of the coax near the bottom of the antenna. Ferrite beads, a "bazooka" type balun (Figure 5) or even several turns of coax acting as a choke coil.

[2]**www.eznec.com.**

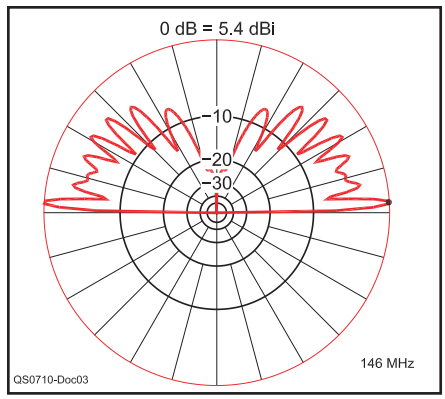


Figure 3 — Elevation pattern of a 2 meter ground plane 25 feet above typical ground.

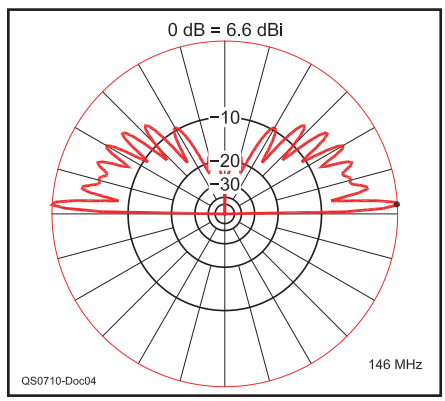


Figure 4 — Elevation pattern of a 2 meter J-pole 25 feet above typical ground.

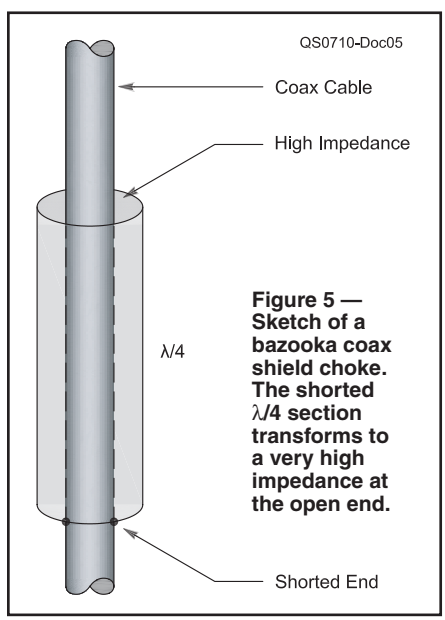


Figure 5 — Sketch of a bazooka coax shield choke. The shorted λ/4 section transforms to a very high impedance at the open end.

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

SHORT TAKES

MicroLog

Sometimes all you want is a simple station log. You're not in desperate need of a laundry list of complicated features, just an electronic log that gets the job done quickly and easily. A minimal selling price doesn't hurt, either.

MicroLog for *Windows* by WAØH fulfills all these requirements, yet still manages to offer an attractive, highly functional software package. The main screen offers the first clue to *MicroLog's* value (see Figure 1). On the left there is a map of the US with the states you've worked highlighted in red. To the right you see a world map that marks the DXCC entities you've contacted with red dots. It also shows which parts of the world are in daylight or darkness in real time. Different map view options are available at the click of your mouse.

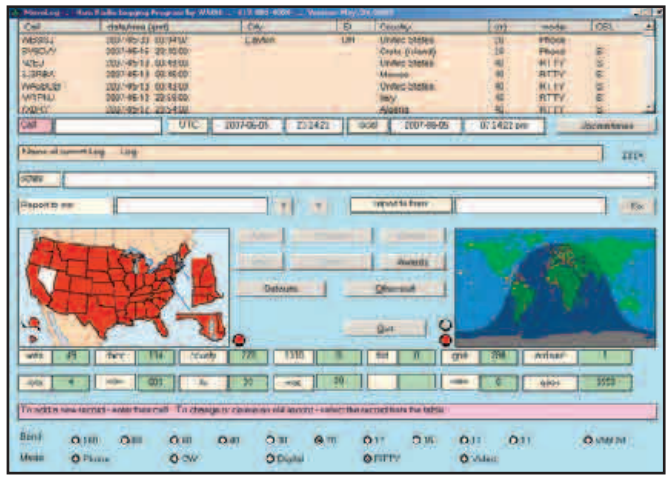


Figure 1 — The *MicroLog* main screen.

Adding a new record is as easy as typing in a call sign in the CALL field. (Pressing the TAB key will display all entries from that station that already exist in your log.) The band and mode are selected at the bottom of the window. Click the DETAILS button and you're presented with a screen full of fields that allow you to add additional information. If you've purchased *MicroLog* on CD-ROM, clicking the DETAILS button also automatically looks up the station's postal address.

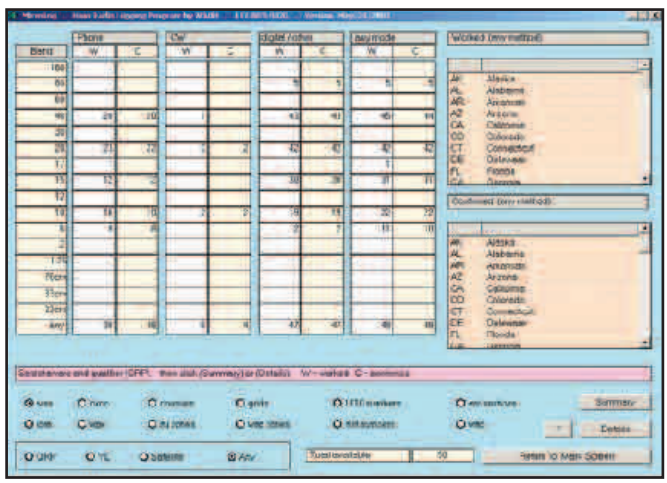


Figure 2 — The awards screen tracks your progress as you pursue various awards.

Award Tracking

MicroLog tracks your progress on several awards including DXCC, Worked All States, WPX, Worked All Zones, Islands on the Air, Worked All Continents and more (see Figure 2). Select your award and click the SUMMARY button to see the basic information, like how far you are from your goal in terms of "worked" vs "confirmed." Click the DETAILS button and you're presented with a new page that lets you see a further breakdown by selected band and mode.

"Other Stuff"

You have to admire an application that puts all the other features behind a button labeled OTHER STUFF. Why not?

On this page you are presented with a variety of options. Want to see a grid square map, or maps of ITU or CQ zones? Just click the appropriate button. If you've forgotten the frequency limits for the band you've selected, you can quickly see a band chart on this page.

"Other Stuff" gives you access to log printing, QSL label printing, log importing or exporting (ASCII or ADIF format), log merging and the ability to toggle or create a new log (*MicroLog* juggles several logs in case you want to have separate ones for different activities). You can also use *MicroLog* to create a file for uploading to ARRL's Logbook of The World.

Impressions

I installed *MicroLog* on an older 800 MHz Dell laptop running *Windows XP* and it ran smoothly. I also installed it on a *Windows Vista* machine and the only glitch occurred at the end of the installation process when *MicroLog* attempted to add a shortcut to the *Vista* desktop. *Vista* didn't like that, for whatever reason, and flashed an error message. I clicked the IGNORE button and the installation completed successfully (I added the desktop shortcut myself).

I gave the software a good workout by importing a log with 4000 records. Other than some understandable sluggishness when doing a sort through such a large database, *MicroLog* acquitted itself well.

When using *MicroLog* you have to resist the urge to close a window by clicking on the little X in the upper right corner. Individual windows are not independent of the main program. So, if you click that X, you'll close the entire application. Instead, always look for the RETURN TO MAIN SCREEN or GO BACK buttons.

And about that selling price? If you download *MicroLog* from the Web at **www.wa0h.com**, all this straightforward functionality is *free*. The catch is that the free *MicroLog* doesn't include the US and Canadian call sign databases and it won't integrate commercial call sign databases such as the *Radio Amateur Callbook*. If you order *MicroLog* on a CD for a mere $10, you get all this plus customer support from WAØH.

MicroLog won't interface with your radio, point your antennas, automatically upload to Logbook of The World or perform many of the other tricks you'll find in deluxe loggers. But as I said at the beginning, if you're searching for a highly affordable Amateur Radio logging application that includes the most commonly used features in an easy-to-operate format, *MicroLog* is certainly worth a look. QST

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

Motorola VHF Micor Radio Modifications — *Part 1*

A pair of articles describes how to put these retired commercial radios back to work in the amateur service.

Robert Conway, KAØVAN

Anyone who's been to a hamfest has probably seen Motorola Micor radios offered for sale and wondered what you could do with them. If you've been looking for a good radio to use for packet radio, the automatic position reporting system (APRS), or any other single channel service, they will likely work great. We have had one operating for almost seven years in an uncontrolled environment with temperatures ranging from 10 to 120° F. They seem to have a good history and normally are not hard to find since they seem to be widely available at hamfests. It's even possible you may have one somewhere collecting dust or holding up part of your workbench.

I discovered two limitations to these radios as I was putting some of these units into service as packet radio nodes. While these limitations make them a little difficult to adapt to amateur use as-is, this series of articles will provide straightforward methods to correct both problems.

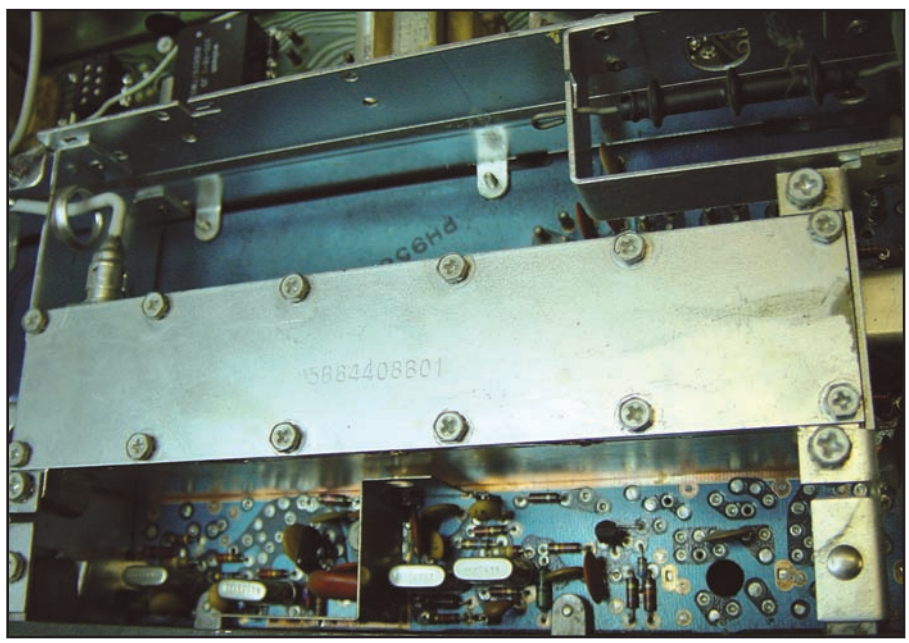


Figure 1 — View of the Micor radio helical resonator section with cover in place.

Limitations for Amateur Use

Low Receiver Sensitivity When Tuning Out of Band

The first limitation comes from converting them from the 150 MHz commercial band to the 146 MHz amateur band and keeping the same receiver sensitivity. As supplied, the adjustment range of the RF stages does not extend down quite far enough. The available radios I generally found, and successfully modified, were those including TLD8273B receiver unit, which covers 150.8 to 162 MHz. Some refer to this as the VHF high band.

Low Transmit Audio Deviation

The second limitation, a problem especially when using one with a packet terminal node controller (TNC), is that the transmit audio gain is too low to provide full modulation. This is an issue with all models of these radios. This will be addressed in Part 2 in a subsequent issue.

Single Channel Operation

For many flavors of VHF FM operation a single channel radio will be a limitation. You may encounter some four channel radios, but even four channels doesn't go very far in many areas. Single channel radios do work fine in some applications, particularly digital modes, such as packet or APRS.

Two Easy Modifications

One nice thing about these modifications is that they are both easy to do and require very few parts to complete. So if a low priced but reliable single channel radio system is needed, a modified Micor could be your answer. Once you have a radio on hand, the highest expense you'll have will be for the crystals to bring it onto the amateur frequency you want. The remaining modifications are very easy and inexpensive. I have performed the following two modifications on a number of radios and they have worked out very well. This article provides the details of how to modify the helical resonators in the receiver, while Part 2 tells how to improve the audio level so the deviation of the TNC can be set correctly.

RF Band Modifications

With the number of these radios still available and operating in the 150 MHz band wouldn't it be nice to use one in the 2 meter band without reduced receiver sensitivity or making a major change to the front end? One modification method I've seen involved adding an extra loop to the coil in each cavity. This meant modifying all five cavities, and that involved a good amount of time and effort.

Trial And Error Testing

Instead of increasing the inductance to lower the frequency, I thought it might be easier to effectively increase the capacitance. This can be done by modifying the tuning

Figure 2 — Steel wire wrapped around #6 screw and ready to be installed on a slug.

Figure 3 — Wire in place on end of a slug and ready to be inserted into coil.

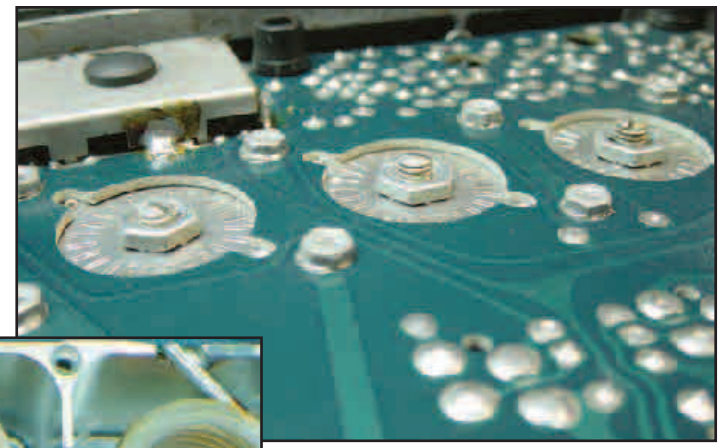


Figure 5 — Adjustment end protruding ⅛ to ¼ inch from the coil body.

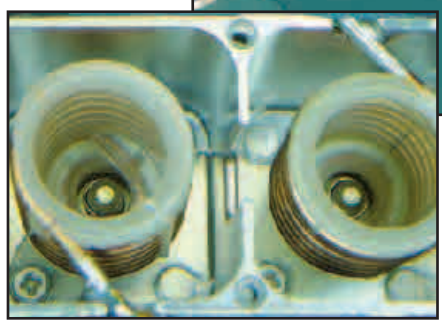


Figure 4 — Close-up of tuning slug reinstalled after the modification.

slugs. After first trying longer and different types of materials in place of the stock tuning slugs with poor results, I next experimented with increasing the diameter of the slugs with good results. This effectively increased the capacitance within the cavity, which in turn lowered the resonant frequency of each, without any noticeable effect in the receiver operation. The next step was to find a simple method that would be easy to do and take very little time.

Making it Happen

The tuning slugs in the helical resonators are simply all thread screws with a screwdriver slot cut in one end, and these same screws are used for this modification. Now the best part of this modification is the cost as all you need is six pieces of 0.030 to 0.035 inch diameter steel wire each about 4 inches long. This is the same wire that's used in wire welders and should be available at a welding or machine shop. The wire can be checked with a magnet to make sure it's steel.

Procedure

Remove the cover of the helical resonator as shown in Figure 1. On the circuit board side, remove the lock nuts and the tuning slugs. This modification will result in each of the slugs having a wire wrapped around the threads at the bottom part of the slug (away from the slot). Be sure the upper part of the threads on each slug is in good shape and that the adjustment slot hasn't been bent out of shape since these slugs will be reinstalled later from the bottom, or the cover side, of the unit.

Since these tuning slugs are the same as a #8 thread you can check the threads by using a #8 steel nut. If you can start the nut on the slotted side of the tuning slug you should have no trouble reinstalling them. The best way I found to get the wire to stay put on the slug is to use a #6 screw to pre-form the steel wire on and then screw the preformed wire onto the tuning slug. This is done by wrapping the piece of steel wire around the threads of the #6 screw. To make it easier to wrap the wire around the screw you can leave out ¼ inch of wire to give you something to hold on to while wrapping the rest of the wire around the screw.

Bend the loose pigtails into the threads of the screw when finished by using needle nose pliers. When finished the wire will easily screw off the number 6 screw and should look like Figure 2, which also shows the tuning slug. When threading the preformed steel wire on the tuning slug, you will need to hold the bottom of the preformed steel wire while installing it on the bottom part of the slug (end without the screwdriver slot). Notice that as you thread the steel wire on the slug, the steel wire will slightly increase in diameter as you install it. Watch during this installation so that the wire doesn't hang up somewhere and bend out of shape. Install the wire up past one or two threads.

When you are finished, this tuning slug adapter should look like Figure 3. Some type of glue may be used but is not needed, as the wire should be tight on the tuning slug. With the wire on the bottom part of the slug you'll need to thread the slug back into the cavity from the bottom of the cavity. The simplest way I found was to use a short piece of straight rubber or plastic tubing that just slips over the first thread or so on the bottom part of the slug. Use the tubing as an extension and thread the slug into the cavity slot first, about ¼ inch, add the retaining nut and then pull the tubing off the bottom of the slug.

Figure 4 shows the tuning slug reinstalled after the modification. After doing all five slugs and reinstalling the cover on the cavity you will be ready for alignment.

Alignment

Before alignment you may want to preset L108 and L109 out toward the circuit board 3 to 4 turns to get you started. These circuits do not need to be modified but are hard to tune in the first time, as there will be no output signal on your tuning meter for that section until both coils are passing some sort of signal. If needed and if you have a high frequency oscilloscope you can monitor the point between these two coils while tuning the first one to pass the new signal, then adjust the second. At this point you should have an indication on your tuning meter for that section. Follow normal alignment procedures and go back through the procedure several times as recommended in the manual. For proper transmitter operation only alignment per the manual is required.

The end result after doing a number of radios were that most slugs ended up ⅛ to ¼ inch out from the circuit board as shown in Figure 5. The resulting sensitivity met factory specifications. A couple of these modified radios have been operating for a number of years on packet. I have also completed a repeater using this modification and it's still going after several years.

Robert Conway, KAØVAN, studied electronics in high school and in four years of college. Robert retired as a US Navy Chief Aviation Electricians Mate after a career maintaining power, instrument, navigational and other aircraft systems. He now serves as an automotive technician in a family owned business.

Robert has been a licensed Amateur Radio operator since 1985 and currently holds an Amateur Extra class license. He is a member of the Chisholm Trail Amateur Radio Club and maintains the club's repeaters and systems. Robert can be reached at 921 W Walnut Ave, Duncan, OK 73533-4623. QST

W1ZR

GETTING TO KNOW YOUR RADIO

Keeping the Lid on with a Roofing Filter

Our challenge in receiving radio signals can be broken down into two parts: First — can we obtain a signal loud enough to hear? Second — can we keep other signals from interfering with our reception? The better we are able to meet the first challenge, the easier it will be to overcome the second — all things being equal.

Of course, in Amateur Radio all things are never equal — after all, we generally only have control of one end of the communications link and must put up with the signal we can extract. If that signal is just above the noise level, we often can "pull it out," at least until that unthinking bozo down the band fires up — or is the problem in our receiver?

How Can Our Receiver *Cause* the Interference?

We can divide the interference problem into two categories — signals *within* the passband we're listening to and those resulting from signals *outside* the passband of our receiver. The first type of interference is very straightforward — did someone start calling on the channel without remembering to ask if it were in use? Well, we can (politely works best) ask them to move, and often they will. If they are on the edge of our passband, we can apply sharper selectivity or use our PASSBAND TUNING control to eliminate the problem as we've discussed in previous columns.[1,2]

In the October 2006 column, "Fighting Interference and Noise with Filters," we discussed limiting receiver bandwidth to eliminate interference. We could call that kind of filtering "setting our operating bandwidth." This kind of filtering, especially with modern digital signal processing (DSP) filters, occurs well toward the back of many receivers, following many stages of amplification and usually multiple conversion steps.

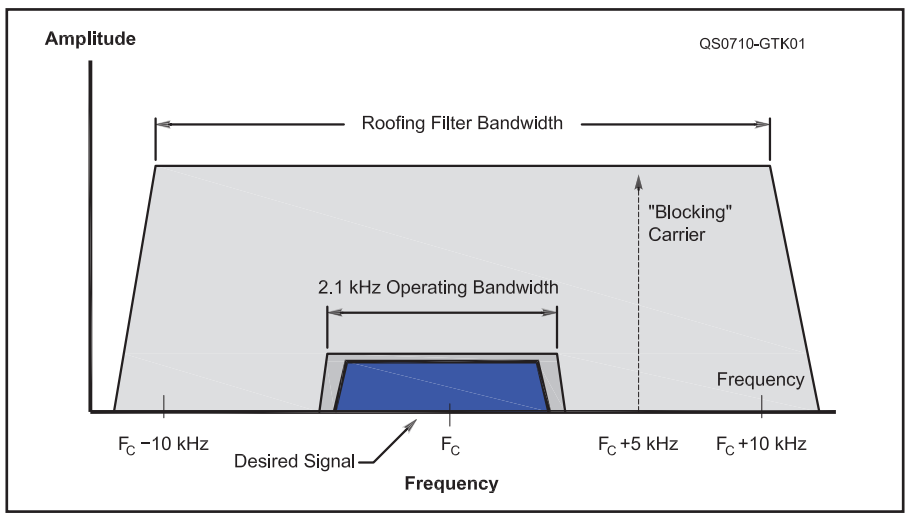


Figure 1 — The relationship between the operating bandwidth, roofing filter bandwidth and an interfering signal within the bandwidth of the roofing filter that can result in blocking.

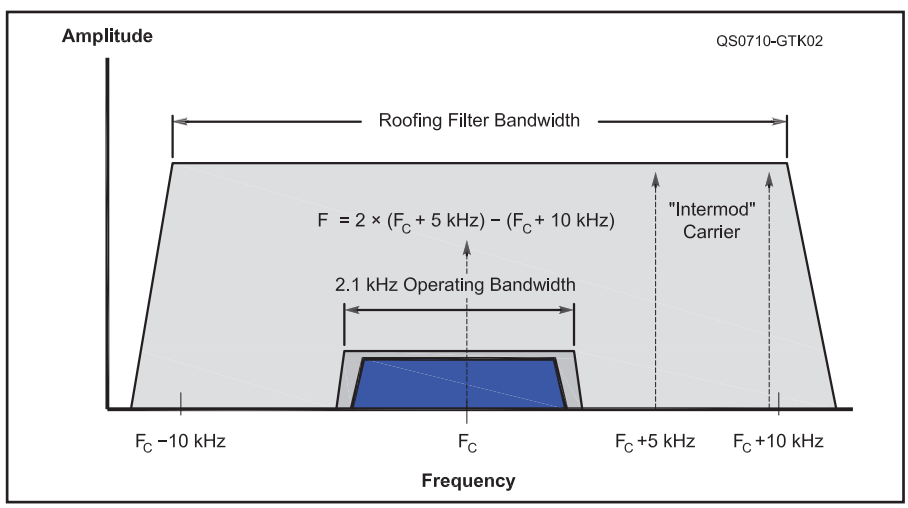


Figure 2 — The relationship between the operating bandwidth, roofing filter bandwidth and a pair of signals within the bandwidth of the roofing filter that can result in intermodulation distortion interference.

So What's the Problem?

Every time we amplify a signal or convert a signal to one on a different frequency we introduce a certain level of distortion. If the distortion occurs in audio amplifier stages, such as the clipping that happens if we put in too loud a signal, it is something we can detect with our ears as a raspy uncomfortable sound.

Distortion can also happen in radio frequency amplifiers and mixers, especially if they are subject to strong signals. Here the effects are much more subtle. Two primary effects that occur can cause problems with the reception of weak signals we want to hear, as follows:

Blocking

A very strong signal entering an amplifier can drive it beyond its operating

[1]J. Hallas, W1ZR, "Getting to Know Your Radio — Fighting Interference and Noise with Filters," *QST*, Oct 2006, pp 65-66.

[2]J. Hallas, W1ZR, "Getting to Know Your Radio — Passband Tuning," *QST*, Apr 2005, pp 56-57.

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

Figure 3 — The Yaesu FT-2000 graphically indicates which roofing filter (15, 6 or 3 kHz), *R.FLT*, is selected.

range, in a way similar to the clipping in an audio amplifier. This is called blocking. What happens is that the gain of the amplifier to other signals is reduced. Let's say we have our operating bandwidth set at 2.4 kHz to listen to an SSB signal. The bandwidth of our RF stages might be 100 kHz, passing up to 42 such signals through the receiver until 41, all but the one we want, are eliminated by our SSB filter. We can't hear the other signals, but if one of them is strong enough, it can overload an RF or IF amplifier, ahead of the DSP, reduce its gain and thus reduce the strength of the signal we want to hear.

Blocking Dynamic Range

The measure of how good a receiver is at avoiding blocking is called the *blocking dynamic range* (BDR). Very simply, BDR is determined by listening to the normal level signal and then inserting an interfering signal on another frequency. We raise the level of the interfering signal until our desired signal starts to get reduced. The difference in level between the desired signal and the blocking signal is called the BDR. Not surprisingly, the farther away the blocking signal's frequency from the signal we want to listen to, the less trouble it is likely to cause. In *QST* Product Reviews of HF transceivers, we measure BDR at 20, 5 and 2 kHz spacing. Measured BDR in HF receivers has ranged from about 70 to 140 dB, with the high numbers much better than the low — quite a difference.

The numbers are easy to understand. Let's say our receiver has a BDR of 70 dB, and the signal we are trying to listen to is just moving the S-meter (so it could be said to be "S-0"). A signal that reads "S-9 +16 dB" will be 70 dB higher (at the Collins standard 6 dB per S-unit) and could bother us even if it's not on the frequency we're listening to. On the other hand, a receiver with top BDR performance would need to have an off frequency signal at a level of S-9 +86 dB to bother us, quite a difference. Any interference resulting from such blocking should be considered a deficiency in *our* receiver! Figure 1 shows the relationship between the operating bandwidth, roofing filter bandwidth and an interfering signal within the bandwidth of the roofing filter that can result in blocking.

The reason for the difference is often in the selection of filters early in the receiver to eliminate signals before they cause problems. Called roofing filters, they set the roof on interference in the early low level receiver stages. Any such filter has to be wider than the later filter that sets the operating bandwidth, or information will be lost from the desired signal. Many receivers use a 20 kHz (± 10 kHz) roofing filter. This helps with BDR at a 10 kHz or wider spacing, but not at 5 or 2 kHz, often an issue in contests or DX pileups!

Intermodulation Distortion

The other effect is an undesired mixing product between two signals, both a ways away from the desired frequency. This may be even worse since it can result in a new signal (generated by your receiver) right on top of the one you are listening to! Let's say you are listening to a weak signal that is on 14,200 kHz. Let's say there are strong signals at 14,205 and 14,210 kHz, 5 and 10 kHz away from the signal you are trying to copy. You shouldn't hear either of these signals because they are outside the bandwidth of your SSB filter, and you won't if only one is there. But if both are there, the second harmonic of 14,205 — 28,410 — will mix with 14,210, perhaps in an RF amplifier, or more likely a mixer stage. A result will be a signal at the difference of 14,200, whoops, just where you don't want it, right on top of the signal you are trying to listen to! This is shown graphically in Figure 2.

In Product Review we report on this phenomenon, known as *third-order intermodulation dynamic range* — 3OIMD to its friends — by measuring how much stronger the interfering signals need to be to make a resulting on-frequency interfering signal that is just detectable. Most HF receivers we measure are in the range of 50 to 110 dB, quite a difference, and again the roofing filter will make a big difference in how close the interfering signals need to be before they cause problems.

Keep in mind that while Figure 2 and our Product Review data reflects the result of exactly two signals, in real life there can be many more, all combined together. Thus in addition to those at +5 and +10 kHz, there could be a pair at –2.5 and –5 kHz, +3 and +6, and so forth, all combining to make it hard to hear the signal you want to listen to. The problem can be even worse on CW because the narrow operating bandwidth can result in perhaps five times as many signals outside your operating bandwidth, but within the roofing filter.

In Summary

The two phenomena we have discussed limit receiver performance when there are strong signals about. One, BDR, reduces the sensitivity just when we want to hear that weak signal; the other, 3OIMD, results in extra signals throughout the band — generated within your receiver. Let's face it, there is already plenty of interference from signals that are really there!

There are many receiver design choices that will make a difference in BDR and 3OIMD. For any given design, a narrow roofing filter early in the receiver's signal path will result in better rejection of these undesired effects than a wide or nonexistent one. Manufacturers have taken notice and are now starting to provide choices of roofing filters. The relatively new Yaesu FT-2000, for example, provides a choice of three as shown in Figure 3. Other current radios with multiple roofing filters include the Elecraft K3, the ICOM IC-7800, the Ten-Tec Orion II and Omni VII and the Yaesu FTDX-9000 series. Just having the filters may not be enough; make sure you check the important BDR and IMD results in Product Review before you decide on that new radio. QST

Keeping Safe with Generators and Starting Batteries

How to keep that generator battery from blowing up in your face.

Clarence (Barney) Williams, KD4IPN

I have heard about generator starting batteries blowing up a few times, but I recently had a personal experience with just such an event. I hope that my experience can serve as a cautionary tale, saving you from the loss of your eyesight, your hearing or even your life.

I work for a cellular telephone provider in north Florida. As part of my responsibilities, I maintain 46 sites. I have opened up the doors of several generators to find the starting batteries split open, with pieces of the batteries strewn throughout the cabinet. In the past, I usually blamed this on lightning damage, but recently found out what really happened.

First Person Experience

On August 31, 2006, I was at a site performing my monthly generator inspection. This included starting and exercising the generator assembly, listening for unusual sounds and taking meter readings. After checking the oil and cooling water levels and looking the machine over, I changed the control panel from automatic to manual. I then flipped the START switch, expecting to hear the generator roar to life. Instead, I experienced the detonation of what amounts to a miniature hydrogen bomb. The now cracked battery is shown in Figures 1 and 2.

As I write this some two months later, I have still not regained my hearing fully. I was very fortunate that the large diesel engine was located between the battery and my body, since flying acid could have caused many burns, as well as possibly resulting in the loss of my eyesight.

I learned that a ham friend of mine here in Florida had the very same experience. I think it's time to warn others who may be using a backup generator.

The Cause of the Problem

- Battery chargers on some generators are of the *brute force* type. Unlike *smart* chargers that reduce charging current as the battery voltage increases, some generators will keep charging the battery even after it reaches its fully charged *float* level.
- Overcharging causes the acid solution to separate into hydrogen and oxygen gases, which are released to the atmosphere. After perhaps a month or two, if the electrolyte is not refilled, much of the solution may be boiled away, leaving a more explosive mixture than a liquid solution.
- If the automatic (or manual) start is initiated, there is a demand for a very high initial current (about 300 to 400 A in good weather, up to 600 to 800 A in cold climates) to crank the motor from a dead stop to spinning fast enough to start. This results in considerable heat generated inside the battery, with oxygen, hydrogen and heat — and finally an explosion.
- The electrolyte solution normally acts as a coolant inside the battery. The loss of water thus exacerbates the problem when the inside of the battery gets hot.

Figure 2 — Another view of the remains of the exploded battery.

Figure 1 — This is a view of what's left of the battery that caused the author to lose part of his hearing.

My Recommended Solution

- Wear eye, ear and any other recommended protection.
- Before cranking, always switch the generator out of automatic operation so it won't start before you are ready in the event of a power failure.
- Examine the electrolyte level in every battery and, if needed, fill to the proper level with distilled water. This may be purchased at any grocery store for about $1 per gallon.
- Check oil and coolant levels.
- Start the generator from a safe distance — if possible, while facing away from it.

Clarence (Barney) Williams, KD4IPN, was first licensed as a Novice in 1964 as WN2TOS in upstate New York. In 1993 he earned his Technician license and in the next year his General ticket. He enjoys 40, 17 and 6 meters when he has time to operate. You can reach Barney at 1462 SW Wilson Springs Rd, Fort White, FL 32038 or at **kd4ipn@windstream.net**.

N0AX

HANDS-ON RADIO

Experiment #57 — Double Stubs

Shorted and open transmission line stubs can be put to work in a lot of useful ways, but sometimes it takes more than a single stub to get the job done. This month, we're going to combine a pair of stubs to get more performance out of the same length of cable.

Terms to Learn

Sub-harmonic — Integer fraction of a fundamental frequency; $f_{FUN}/2$, $f_{FUN}/3$, $f_{FUN}/4$ and so forth.

Velocity factor — Fraction of the speed of light in a vacuum at which electromagnetic waves travel in a transmission line

Stub Basics Review

Start by rereading experiment #22 from November 2004 *QST*.[1] The mechanics of a basic transmission line stub are explained in that article. By choosing the right length for a stub and the type of termination — open or short — fundamentals and harmonics can be nulled or passed at various useful combinations of frequencies.

Table 1 in that first experiment lists useful types of stubs that act as filters on harmonically related amateur bands. Quarter wave (λ/4) shorted stubs attached to a main feed line pass energy at the fundamental frequency, f_{FUN}, at which the stub is λ/4 long, nulling even harmonics at which the stub is some integer multiple of λ/2 long. For example, an 80 meter, shorted λ/4 stub will null signals on 40, 20, and 10 meters. Attached to the main feed line at the same point, λ/2 open stubs pass the fundamental (at which they are λ/2 long) while nulling the first *sub-harmonic*, $f_{FUN}/2$, and its odd harmonics, $3\times f_{FUN}/2$, $5\times f_{FUN}/2$, $7\times f_{FUN}/2$, etc. A 7 MHz, 40 meter λ/2 open stub passes 40, 20, and 10 meters while nulling 80. Other nulls of this stub occur at 10.5, 17.5, 24.5 MHz and so forth, frequencies not in amateur bands.

A Resonant Pair

The pair of stubs in Figure 1 are λ/8 long — a new length that we haven't discussed before. Making an accounting of the phase delay incurred by energy traversing the stub, if the stub is open the total phase delay of the voltage is 45° + 0° (at the termination) + 45° for a total of 90°. This makes the stub look like a capacitive reactance because the voltage of the returning energy is delayed in phase with respect to the energy in the main feed line. Similarly, the shorted stub has a total phase shift of 45° + 180° + 45° = 270° = –90°, and it thus looks like an inductive reactance.

The inductive reactance presented by shorted stubs less than λ/4 long is a function of the coaxial cable's characteristic impedance (Z_0) and the electrical length of the stub in degrees (L_E):

$$X_L = Z_0 \tan (L_E)$$

Similarly, the capacitive reactance of open stubs less than λ/4 long is:

$$X_C = Z_0 \tan (L_E).$$

The λ/8 stub by itself does not work as a filter, but looks like a capacitive or inductive reactance. These can be combined to form resonant circuits. That is precisely what is created by the two λ/8 stubs connected in parallel and shown in Figure 1 — a parallel resonant circuit! At the fundamental frequency reactance from each stub cancels, just as in an LC tank circuit, so that the combination of stubs looks like an open circuit. Thus, energy at the fundamental frequency passes without any cancellation.

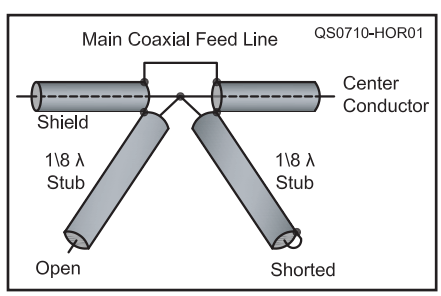


Figure 1 — An λ/8 stub can act like a capacitance or inductance when open or shorted, respectively. A pair of λ/8 stubs connected in parallel are resonant, just as a parallel LC circuit.

Unlike the capacitor and inductor in an LC circuit, transmission lines change their electrical characteristics as the frequency changes. At $2\times f_{FUN}$ and at all even harmonics, both stubs are some odd integer multiple of λ/4 so that one of the stubs acts as a short circuit to cancel the harmonic.

There is an added bonus to this configuration: At $2\times f_{FUN}$ the λ/8 shorted stub is a λ/4 shorted stub and cancels even harmonics of $2\times f_{FUN}$. (The open stub must be disconnected or switched out.) So from the same length of cable as a λ/4 stub, you can get the extra filtering behavior for the cost of a switch. Noted filter designer George Cutsogeorge, W2VJN, reports that the double stub even provides a few extra dB of cancellation!

Making a Filter

This configuration is definitely worth building! Compute the length of cable needed to create λ/8 stubs at 3.55 MHz and cut a pair of stubs that are a few percent long for trimming. A 1 λ stub has a length in feet = VF × 983.6 / f (in MHz), where VF is the *velocity factor* of the cable as shown in Table 1. At 3.55 MHz, for a VF of 0.75 a λ/8 stub will be 25.97 feet long. One caveat — there can be a fair amount of variation in VF between cables of the same construction. The *ARRL Handbook* shows VF of 0.78 to 0.86 for cables in the RG-8 class. Check the manufacturer's catalog or Web site to get VF for your cable. If you don't know the VF, assume the highest VF to ensure you'll "cut long" and can trim from there. For the cable in the example, I would cut the stub one foot too long and begin trimming.

To trim the stubs, short one end as shown in Figure 2, install a coax connector on the other end, and connect it to your SWR analyzer. Now sweep the frequency while watching the reactance value (X). Find the *lowest* frequency at which X dips to zero (or as low as it will go). This is the frequency at which the stub is λ/2 long. The stub is λ/8 long at ¼ of the measured frequency. For example, if you want the stub to be λ/8 long at

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

Table 1
Velocity Factor

Cable	*VF*	*Dielectric*
RG-58	0.665	Solid polyethylene
RG-58A	0.75	Foamed polyethylene
RG-213	0.665	Solid polyethylene
RG-8X	0.78	Foamed polyethylene
LMR-400	0.85	Foamed polyethylene

Source: *ARRL Handbook*

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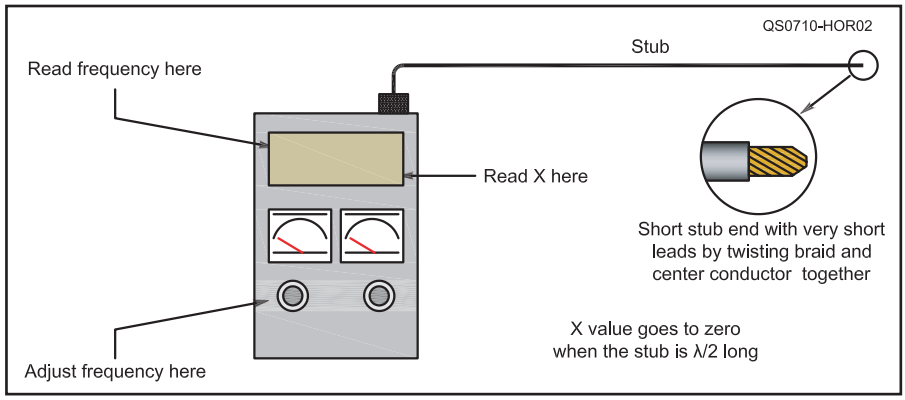

Figure 2 — An antenna SWR analyzer, such as the popular MFJ-259/269 series, is used to cut each stub to the proper electrical length. The stub is λ/2 long at the lowest frequency at which reactance (X) approaches zero.

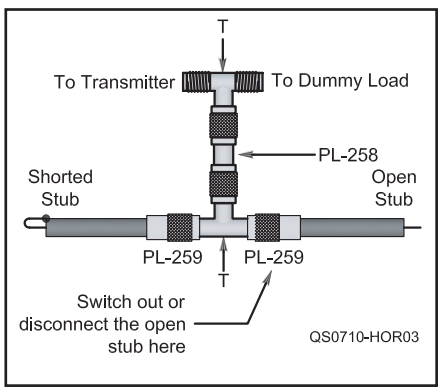

Figure 3 — Connect a pair of λ/8 stubs together using T and barrel adapters. The length of the adapters must be taken into account when trimming the stubs. A switch to disconnect the open stub can be inserted as shown, if needed.

3.55 MHz, the λ/2 frequency should be 4 × 3.55 = 14.2 MHz. Assuming your stub is a little long, trim an inch or two at a time, keeping the short circuit leads, well, short. Twisting the braid and center conductor together will do for determining resonant frequency.

You're not quite done because we still have to include the length of the adapters that connect the stubs to each other and to the main feed line as shown in Figure 3. Start by connecting the stubs together with a T adapter, then add a coax *barrel* (double female PL-258 adapter, sometimes called a splice) and a second T adapter for the main feed line. Connect one of the remaining open T connector positions to the analyzer with a short coax jumper or a double male UHF adapter.

Checking it Twice

Measure the lowest frequency at which the stubs create a null (where X approaches 0 Ω). This is the second harmonic frequency at which both stubs are λ/4 long and the open stub creates the null. For example, after you add the T connectors you might find the null at 7.050 MHz, meaning the fundamental has shifted down to 3.525 MHz. Trim both stubs at the same time in ½ inch increments until the fundamental frequency is again 3.55 MHz. Solder the short-circuit of the shorted stub. Protect the ends of both stubs by covering them with heat shrink tubing, leaving enough tubing free to fold back over the cable and wrap with electrical tape.

If you plan on switching out the open stub, you'll have to compensate for the length of the switch. Remove the open stub from the T connector and attach it to the analyzer. Find the stub's fundamental frequency as before and write it down. Attach the stub to the coax switch, place a double-female adapter on the switch's common connector and connect the switch to the analyzer. Find the fundamental frequency — it will be lower due to the extra length of the switch and adapter. Trim the stub until the fundamental frequency with the switch and adapter equals the frequency you recorded. Now you can reconnect the stub-plus-switch-plus-adapter to the T adapter.

Test your stubs by attaching the stub assembly to the feed line from your transmitter to a dummy load. (If you constructed the switchable stub set, the open stub should be switched in.) Transmit on the fundamental frequency you measured before and find its second harmonic on a receiver, noting signal strength in S-units. Repeat the process for the third, fourth, fifth, and sixth harmonics. Now disconnect the pair of stubs from the feed line. Repeat your measurements, comparing the strengths of the harmonics with and without the stubs. You'll find that the stub set nulls the harmonics on 40 and 20 meters, but not on 30 or 15 meters. (You can estimate the depth of the null by assuming each S-unit represents 6 dB.) If you added the coax switch to disconnect the open stub, change the transmitter frequency to 40 meters and confirm that the single stub nulls the harmonic on 20 and 10 meters.

Recommended Reading

As in the first experiment on stubs, I highly recommend W2VJN's *Managing Interstation Interference*.[2] George covers more than just stubs in this useful shack reference. Additional information on stubs is available on K1TTT's excellent Web site at **www.k1ttt.net/technote/techref.html#filters** (click "Filters" in the Topics list).

Next Month

Don't put the analyzer and cutter away quite yet! These two simple pieces of transmission line can do many useful things, but a few combinations of pass and null are off limits to them. One particularly desirable function is to null odd harmonics, such as the harmonic of a 40 meter signal on 15 meters at 21 MHz. Come back next month and find out how.

[2]G. Cutsogeorge, W2VJN, *Managing Interstation Interference*, Table 11, International Radio (**www.qth.com/inrad**). QST

New Products

PERSONAL BATTERY CADDY FROM TOOLS AVIATION

◊ The Personal Battery Caddy line is designed to store and organize batteries and could be used as part of an Amateur Radio emergency kit. Various Slim Line models can hold six AAA, four AA, four 9 V, four C, four D or four CR123 batteries. Other versions with higher capacity are available. Each battery is securely contained in its own locking sleeve to prevent lost batteries. To remove a battery, push it from the bottom and it slides out. The caddy protects batteries' terminals at both ends, preventing accidental discharge. Personal Battery Caddies come in a variety of colors, including glow-in-the-dark, which remains illuminated for hours after being exposed to just 30 minutes of light. For more information or to order, visit **www.personalbatterycaddy.com.**

WR1B

HINTS & KINKS

REPLACING DEFECTIVE METER MOVEMENTS

◊I suspect that all of us have used some type of equipment (such as a piece of test equipment) that incorporated an analog meter movement. If the meter movement fails and the equipment is sufficiently old, such that an identical replacement is unavailable, we are usually inclined to believe that we must "junk" the entire piece of equipment. There is a tendency to believe that each meter movement is a unique device. In one sense, it *is* unique. In another, it is a common device.

All analog meter movements use the same principle to project information. Two magnetic fields interact to cause a repulsive force. For most meter movements, these opposing fields are caused by a permanent magnet, and current through a coil. The resultant repulsive force pushes against a spring, causing the needle to rotate. The spring tends to keep the meter needle pegged against a stop when there is no current. See Figure 1.

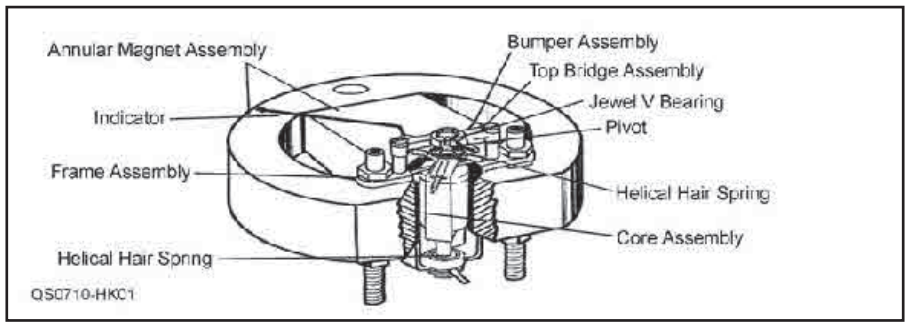

Figure 1 — This diagram shows a typical D'Arsonval meter movement.

So how does a meter movement in a voltmeter differ from one that is used in a tube tester? There are two ways they may differ: the electrical characteristics and the markings on the meter face. Are there special electrical characteristics that define that a particular meter movement must be used for a particular application? No! Since the meter — I will abbreviate the words "meter movement" to just the word "meter" — must derive power from some source to enable the needle to move up scale, it is desirable to use as low a power meter as possible. For most applications, three related electrical characteristics define the meter. They are the meter current sensitivity (current for full-scale deflection), I_{CS}, the meter resistance, R_M, and the voltage across the meter to achieve a full scale indication, V_{FS}.

To determine these parameters for an existing movement, we can either refer to documentation for the device or measure the parameters. The documentation may be information printed in a data sheet, printed on the meter movement or printed in a user's manual. If it becomes necessary to measure the parameters, the meter must be somewhat functional. Primarily, a full-scale needle deflection must be achievable.

To determine the electrical parameters of the meter, we will use the circuit of Figure 2. A somewhat high-voltage source is used. In this instance, a 9 V transistor radio battery is a high voltage compared with the V_{FS} for a meter movement (perhaps 30 mV to 200 mV). By adjusting the potentiometer such that a full scale needle deflection is noted, one can then measure (with a high impedance VOM), the voltage across the meter movement, the voltage across the resistor string, and after disconnecting the battery, the resistance of the resistor string, R_{Added}. With these data, we know V_{FS} and can compute I_{CS} plus R_M.

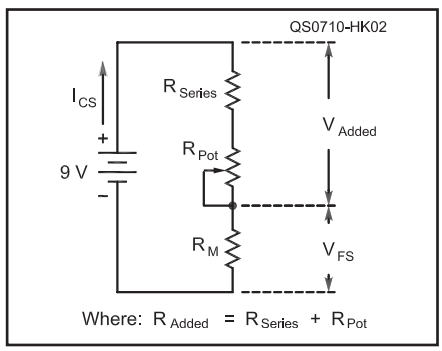

Figure 2 — This circuit is used to determine meter electrical parameters

$$I_{CS} = \frac{V_{Added}}{R_{Added}} = \frac{8.878\ V}{6.34\ k\Omega} = 1.4\ mA$$

$$R_M = \frac{V_{FS}}{I_{CS}} = \frac{0.112\ V}{1.4\ mA} = 0.08\ k\Omega$$

One may be inclined to suggest that a VOM could be used to determine the meter resistance. In some instances, VOM use can damage a meter movement, because the ohmmeter position may put too large a current through the meter.

Two associates from the Anne Arundel Radio Club (Anne Arundel County, Maryland), Oscar Ramsey and Tony Young, work as volunteers at the Bowie Radio And Television Museum, Bowie, Maryland. They obtain and test electron tubes and sell them to generate income for the Museum.

Oscar mentioned that the meter movement failed in one of the tube testers. He found data that stated that the meter current sensitivity was 1.4 mA and the meter resistance was 80 Ω. From these data, V_{FS} may be determined.

$V_{FS} = I_{CS} \times R_M = 1.4\ mA \times 0.08\ k\Omega$
$V_{FS} = 112\ mV$

We can also calculate the power dissipated in the meter coil:

$P_{FS} = 156\ \mu W$

It is appropriate to state that without knowing the Thevenin equivalent of the source feeding the meter movement, the following circuit and calculations will enable a lower power meter movement than the original to be substituted. What we are striving to accomplish is to replace the original meter with a different meter and appropriate resistors such that the replacement appears electrically the same as the original.

Some limitations on the replacement unit are that its full scale voltage and power be less than or equal to the original. For a replacement, let's choose a contemporary meter. The electrical parameters typically are/were $I_{CS} = 50\ \mu A$, $R_M = 1000\ \Omega$, $V_{FS} = 50\ mV$ and $P_{FS} = 2.5\ \mu W$. If we employ a circuit as shown in Figure 3, and select appropriate resistor values, we should be able to "fool" the original meter drive circuit into thinking that the original meter is still connected.

Larry D. Wolfgang, WR1B ♦ Senior Assistant Technical Editor ♦ h&k@arrl.org

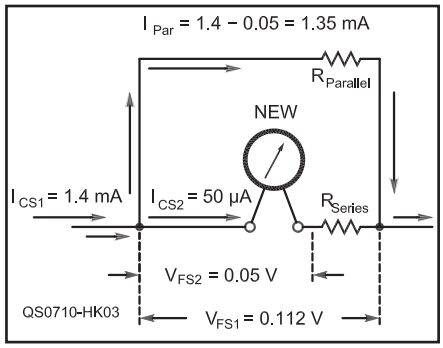

Figure 3 — This diagram illustrates the process of calculating the new meter parameters.

$$R_{Series} = \frac{V_{FS1} - V_{FS2}}{I_{CS2}}$$

$$R_{Series} = \frac{0.112 - 0.05}{50 \times 10^{-6}} = 1{,}240\ \Omega$$

(A standard carbon film resistor value is 1,200 Ω.)

$$R_{Parallel} = \frac{V_{FS1}}{I_{Par}} = \frac{V_{FS1}}{I_{CS1} - I_{CS2}}$$

$$R_{Parallel} = \frac{0.112}{1.35 \times 10^{-3}} = 82.96\ \Omega$$

(A standard carbon film resistor value is 82 Ω.)

From these calculations, we note that the original full scale current, I_{CS1} (1.4 mA) and full scale voltage, V_{FS1} (112 mV) are still delivered to the "load" of the new meter and two resistors.

The "deception" is complete!

A simple computer program to perform these calculations is available. Send a stamped, self-addressed envelope to W. Rynone, PO Box 4445, Annapolis, MD 21403. A floppy disk with a compiled computer program will be returned.

Acknowledgments: Mr Oscar Ramsey tested the meter movements to determine their electrical parameters. He also tested the replacement meter movement and corresponding circuitry in an electron tube tester that had a defective meter. My thanks also to Professor David Harding for reviewing the text and suggesting changes. Mr Ramy Benha of Simpson Electric kindly supplied line drawings of basic meter movements. — *William Rynone, PhD, PE*

A QUICK GROUND CONNECTION

◊ This idea for quick-connect antenna grounding was suggested by experience at the 2006 Vienna Wireless Society Field Day. Northern Virginia was doused by thunderstorms for a couple days preceding, and the same weather was promised through FD itself. At dinnertime Saturday the flashing and rumbling resumed and we decided to button up. That's when the problem reared its head. How do we ground the coaxial cables from all those high-flying Windoms, Vs and long-wire antennas — and do so very quickly?

Our stations were on picnic tables with ground rods driven in near them. There was no good way to get both the shields and conductors of the antenna leads solidly connected to the rods, though.

Here is the solution whispered to me by the Radio Muse:

Get a 2-foot RG-58 patch cable with PL-259 connectors on the ends. Cut it in half. Strip off a couple of inches of the outer insulation, push back the braid, remove the foam, twist the shield down tight against the center conductor and hammer everything flat. Tin the whole tab thus created into a nice, big short. Add a barrel connector to attach the antenna feed line quickly and easily. Do the same with the other half of that piece of coax, and have a pair of grounding stubs.

When you prepare ground rods for Field Day or other portable operations, attach one of these stubs just below the top of each rod with two radiator hose clamps or other type of grounding clamps you can cinch down tight (for the best in strength and connectivity without the need for a kilowatt soldering iron). You may have to enlarge the short tab for the clamps to get a good grip. Just wrap stranded wire around the length of the tab and add more solder. — *73, Alan Bosch, KO4ALA, 5832 20th St N, Arlington, VA 22205*; **ko4ala@arrl.net**

COPPER TAPE ON GLASS, A NEW WAY TO MAKE ANTENNAS

◊There are very few really new antenna designs as far as the actual theory or geometry are concerned. Most novel antennas are just new ways to build an existing design. This is no exception.

I have been experimenting with antennas made by using sticky copper tape on a dielectric supporting medium, mostly glass. I believe this approach has several advantages. Copper tape in various widths from less than ⅛ inch to ½ inch wide is available cheaply from hobby sources. It is provided for persons who make stained glass art. The tape is bright copper on one side with a sticky tape back side. The tape is meant to be applied to the edges of the colored glass pieces so that they can be soldered to each other. There are a number of sources on line.

This tape sticks to the flat surface of glass as well as to the edges. It is quite inexpensive and works well for antennas. The approach is to tape the copper to the glass in the desired shape and then solder leads to it as needed for the interconnections and the feed point.

Most modern homes have large expanses of glass. Even windows that seem to be broken up into separate panes are often two large sheets of plate glass with nonconductive plastic separators inside the dead air space. The inside and outside surface of the glass is flat and continuous. Many high rise apartments with limited antenna possibilities have a number of large glass windows. It makes no difference whether the antenna is laid out on the inside or the outside of the glass. If done neatly it can be family and landlord friendly.

Taping up a half wavelength dipole and connecting a lightweight coax such as RG-174 at the center makes a very useful and quick 2 meter antenna. A tape on glass vertical dipole is the default antenna for my 2 meter handheld radio, when at home. My experiments have all been at VHF but an HF loop would fit on a larger picture window. UHF bands would allow use of multi-element arrays. Of course, rotation is probably not in the cards, so high gain would be in only one direction. Perhaps a hinged glass door would make a rotating beam, but a sliding one would not!

There are a few things to learn. One is that glass has a rather high dielectric constant and even though it is on only one side of the copper, it will change the velocity factor. I have found that on the glass I use, 0.80 or 80% is close to the correct value. Thus, on 2 meters, a half wavelength would be closer to 80 cm than to 1 m in length. You may have to make a test dipole on your glass and measure its resonance with a bridge of some kind to determine the value for your windows. Be careful of "tinted" glass that has a film on it to reduce sun light. The film may be conductive. Don't overlook this technique for a no holes car antenna for the VHF/UHF bands.

K4ERO

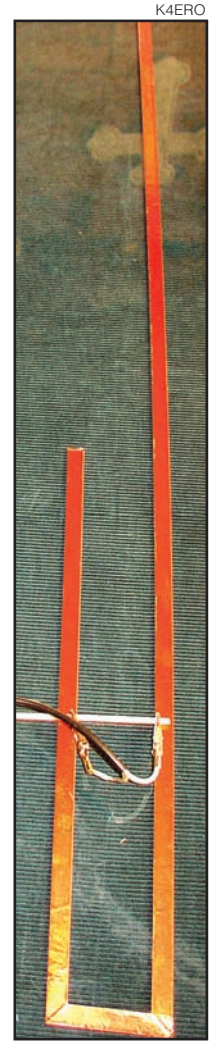

Figure 4 — This photo shows a 2 meter J-pole antenna made with copper tape applied to a piece of glass.

The copper tape is easy to work with. If you accidentally cut it too short, you can easily solder on an extension. On the other hand, it is so cheap, you can easily replace it. If you get the tape too hot and/or put a lot of force on it, the glue may fail. You will soon get a feel for this. If you pull a piece off, a new piece

K4ERO

Figure 5 — A short length of coaxial cable with alligator clips on one end makes a convenient test fixture for finding the feed point on the copper tape J-pole antenna.

is easily spliced in. If you remove an antenna, some sticky residue will be on the glass. This is easily removed with a single edged razor blade. I suppose you could break a window if you heated it too much in one spot, although this has never happened to me. Just use the minimum heat necessary and have the feed wires tinned beforehand. Since the tape has no thermal mass, solder flows very quickly and easily.

The J-pole is a popular antenna, so I will use it as an example. I laid out a J-pole with ½ inch tape. The total length was 49½ inches and the folded back section was 17 inches. The two tapes were separated by 2 inches. Figure 4 shows the antenna. At the corners, I folded the tape back on itself so that no solder joint would be needed, even though the tape solders easily. I simply moved the input coax up and down the doubled line until a good match was found at about 6 inches from the bottom. To make it easier to move the tap points evenly, I clipped the alligator clips on the end of a short piece of coax to a plastic insulated rod. The other end of the coax connects to my antenna analyzer. It was a simple matter to slide the insulated rod up and down along the J-pole base, with the back of the alligator clips touching the copper tape for electrical contact. It took 5 minutes to lay out the antenna and 2 minutes to find the match. See Figure 5.

The same technique would work on many dielectric surfaces, such as vinyl siding or fiberglass roofs. Copper tape can also be applied to indoor walls to make a stealth dipole for HF. This could be painted over and be almost totally invisible. Of course, RF safety considerations might limit this to receive only or QRP operation. To avoid noise keep away from hidden wiring in the wall. I have run copper tape up a fiberglass pole to make a vertical antenna. The tape can also be used to repair PC boards and even lay them out if you are very careful not to overheat. It also can be used to seal corners to make an RF tight box. When you get tired of all that, you can always make stained glass art. Hey, who will be the first to lay out a stained glass window that has gain on 2 meters? — *73, John Stanley, K4ERO, 524 White Pine Ln, Rising Fawn, GA 30738*; **k4ero@arrl.net**

PTT SWITCH ON SHIFT LEVER

♢Connecticut, along with many other states, has passed a new cell phone law and there appears to be some confusion regarding Amateur Radio operators using their radios while their vehicle is in motion. Police officers may see a ham operator using a radio while the vehicle is in motion and think the operator is on a cell phone.

I received a catalog from Ham Radio Outlet, and noticed an ad for a visor-mounted boom microphone with a PTT switch that is mounted on the shift lever. This allows me to operate while in motion without having to hold a microphone up to my face and give the appearance of being on a cell phone. It eliminates the chance of being stopped and accused of breaking the law. This might save me bothersome time and trouble. Even without a law against handheld cell phone operation, it makes mobile operation safer.

I mounted my microphone on the dash of my vehicle, where the mike hanger was, and found it to be excellent to use while driving. See Figure 6. The PTT switch must be held on to transmit so you can't leave it on by accident. You do not have to search for the mike hanger and take your eyes off the road. It's not perfect but a good alternative, and a lot safer.

The microphone system I purchased was made by Pryme Products some time ago, and I was told they still have some in stock. They told me that if they do receive requests for more they will be able to supply them in the future. — *73, Harry H. Abery Jr, AB1ER, 18 Dalewood Rd, Newington, CT 06111*; **ab1er@arrl.net**

WATCH WHERE YOU RUN THAT COAXIAL CABLE

♢Thomas Lally, W1NSS, of Lorton, Virginia, sent in the piece of RG-58 coaxial cable shown in the photo of Figure 7. Thomas had the coax suspended a few feet above ground, and believes it was destroyed by deer getting their antlers tangled in it, although your editor wonders if they might not also have been biting the line. The moral of the story is that you should either run your coax along the ground or safely buried, or else high enough above ground to be sure the deer can't reach it. — *Larry Wolfgang, WR1B, ARRL Senior Assistant Technical Editor*; **wr1b@arrl.org**

AB1ER

Figure 6 — The boom microphone is attached near the top of the dash, where the microphone clip had been attached previously. The PTT switch is attached to the shift lever.

WR1B

Figure 7 — Thomas Lally, W1NSS, says deer destroyed his coaxial cable. Whether they sliced it with their antlers or tried chewing on the cable, this was the result.

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PRODUCT REVIEW

Yaesu FT-2000D HF and 6 Meter Transceiver

Reviewed by Norm Fusaro, W3IZ
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In late 2006 I had an opportunity to try the Yaesu FT-2000 transceiver and write up my observations for the review that appeared in February 2007 *QST*.[1] I thought that the FT-2000 was a marked improvement over the FT-1000D and FT-1000MP series transceivers that had been the workhorse transceivers of many radio amateurs for more than a decade and a half.

The subject of this review, the FT-2000D, is the same radio as the FT-2000 with the addition of a 200 W power amplifier (PA) and an external power supply. (The base model is 100 W with internal supply.) We also ordered the companion DMU-2000 data management unit, two of the optional µ-Tune external preselectors and the YF-122C 500-Hz filter for the sub-receiver. The FT-2000D sells for about $600 more than the base FT-2000, and with the options the package price was just over $5000. (Prices will vary depending on where you shop and what, if any, promotions Yaesu is offering at the time.)

This review skips over some of the basics and assumes you have read the February 2007 review of the FT-2000. Check out that write-up to get the complete picture.

Firmware Updates

Since the initial review, Yaesu has upgraded the FT-2000 firmware. For example, I found that firmware upgrades fixed the problem with digital voice keyer delay mentioned in the February review. These upgrades are available to all FT-2000 and FT-2000D owners on Yaesu's Web site. Also, any FT-2000 returned for service is given the latest version.

Updating the firmware is a simple procedure described in a PDF file on the Web. Upgrades can be accomplished using the DB-9 serial cable used for computer control of the rig or by using Yaesu's optional CT-119 programming cable.

Firmware version 0133 was available from Yaesu's Web site as this was written. This version adds 5 Hz tuning dial steps to Menu 116 and adds a provision for displaying the firmware version number on the radio. The firmware revisions include all of the previous updates, so you only need the latest file. I couldn't locate a comprehensive history of which issues are fixed or what improvements have been made with the various versions, however.

So Why A "D"?

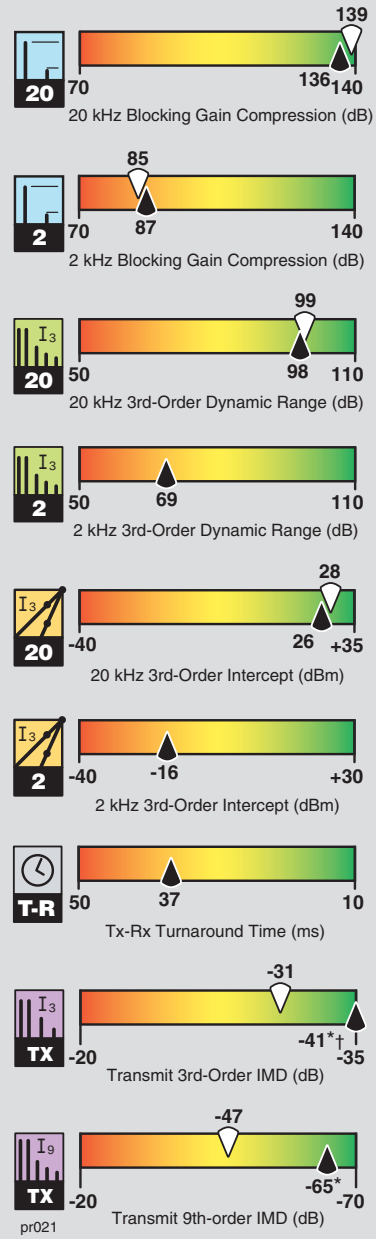
The only noticeable difference between the FT-2000 and '2000D is the external 50 V power supply included with the D version. There isn't even a "D" identifier on the front of the radio.

My amplifier doesn't require much more than 50 W drive to reach legal limit, so I would be the first to ask "Why would I need a 200 W transceiver?" After using it for a while, I was quite impressed with the extra punch that the '2000D offered during routine CW and SSB contacts compared to the 100 W version. This little extra punch is adequate for day to day operating. Digital operators will appreciate the heavy duty final stage. You can work RTTY at 100 W, using only 50% of rated power to keep the final transistors happy.

Another feature is that the FT-2000D can be operated in Class A at 75 W output. Although operating Class A runs the final transistors a bit warmer than normal, amplification is more linear with lower distortion

[1]J. Hallas, "Yaesu FT-2000 HF and 6 Meter Transceiver," Product Review, *QST*, Feb 2007, pp 72-78. *QST* Product reviews are available on the Web at **www.arrl.org/members-only/prodrev/**.

Key Measurements Summary



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

Bottom Line

The FT-2000D offers 200 W of transmitter power or a cleaner 75 W in Class A mode. It's similar to the base model FT-2000 in other respects, with a lot of flexibility that rewards the operator who takes the time to learn about and test its many features and settings.

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

products on the output signal. That means a cleaner signal to drive an external amplifier, as shown in Table 1.

Learning Curve

The FT-2000D and FT-2000 are computer driven radios in which the user interface is through various knobs, buttons and menu selections. It takes some time at the controls to truly appreciate the features of this sophisticated transceiver and to realize the assortment of features that the rig has to offer for diverse operating conditions. As an example I found the noise blanker to be very effective in stopping a variety of interfering electrical noises but it takes some getting used to master the digital control and how it operates.

Despite the large number of features and controls, you can take the FT-2000 out of the box and put it on the air quickly using the factory defaults. A few adjustments of unfamiliar controls may result in disappointment, but that's not the fault of the radio. Anyone who is willing to spend some time reading the manual and learning to use this innovative piece of equipment will be rewarded with operating pleasure.

QRM Tools

The operator who is willing to leave previous techniques behind and approach the FT-2000D with an open mind is the operator who will gain the most appreciation for what this transceiver is capable of. A better way of describing some of the interference fighting features on the FT-2000D is to refer to them as *signal enhancing* features. Fighting QRM and QRN is not a matter of quickly twisting an IF passband knob or notching out an interfering heterodyne.

I invited a ham who has been licensed only for three months to be a guest operator in my shack for the IARU HF World Championships in July. The new operator was quick to point out that the controls in the upper right section of the FT-2000D were the ones that we used to, as he put it, "make the other guy easier to hear." This observation by someone who has no history with operating HF transceivers illustrates the point that the FT-2000D not only reduces unwanted signals and noise, but also has the ability to enhance the desired signal. The various controls can make it possible to copy even weak signals under not so perfect conditions.

In addition to the standard IF shift, width and notch controls, the FT-2000 and FT-2000D offer some very useful digital signal processing (DSP) features. On many occasions I was able to use the variety of features to make the received signal sound like it was the only thing on the band. This was extremely helpful when trying to copy a net control station (NCS) on an 80 meter net that I occasionally check into. In spite of the interference, the NCS was very easy to copy.

Table 1
Yaesu FT-2000D, serial number 7D170533

Manufacturer's Specifications	Measured in the ARRL Lab
Frequency coverage: Receive, 0.03-60 MHz; transmit, 1.8-2, 3.5-4, 5.3305, 5.3465, 5.3665, 5.3715, 5.4035, 7-7.3, 10.1-10.15, 14-14.35, 18.068-18.168, 21-21.45, 24.89-24.99, 28-29.7, 50-54 MHz.	Receive, as specified (sensitivity degrades below 1 MHz). Transmit, as specified.
Power requirement: 90-132, 180-264 V ac; receive, 80 VA (signal present); transmit, 720 VA (200 W out).	As specified.
Modes of operation: SSB, CW, AM, FM, FSK, AFSK.	As specified.

Receiver	Receiver Dynamic Testing
SSB/CW sensitivity, 2.4 kHz bandwidth, 10 dB S+N/N: 0.1-1.8 MHz, 2.0 μV; 1.8-30 MHz, 0.2 μV; 50-54 MHz, 0.125 μV.	Noise Floor (MDS), 500 Hz bandwidth: *Preamp* / *Off* / *1* / *2* 1.0 MHz / –109 / –120 / –126 dBm 3.5 MHz / –122 / –131 / –136 dBm 14 MHz / –122 / –132 / –135 dBm 50 MHz / –122 / –131 / –137 dBm *μ-Tune (preamp off):* 3.5 MHz, –118; 14 MHz, –112 dBm 14 MHz, preamp off/1/2: 25, 15, 12 dB.
Noise figure: Not specified:	
AM sensitivity, 6 kHz bandwidth, 10 dB S+N/N: 0.1-1.8 MHz , 6 μV; 1.8-30 MHz, 2 μV; 50-54 MHz, 1 μV.	10 dB (S+N)/N, 1 kHz, 30% modulation: *Preamp* / *Off* / *1* / *2* 1.0 MHz / 16 / 4.8 / 2.2 μV 3.8 MHz / 2.7 / 0.93 / 0.65 μV 50 MHz / 4.8 / 1.7 / 1.3 μV
FM sensitivity, 15 kHz bandwidth, 12 dB SINAD: 28-30 MHz, 0.5 μV; 50-54 MHz, 0.35 μV.	For 12 dB SINAD: *Preamp* / *Off* / *1* / *2* 29 MHz / 2.5 / 0.69 / 0.32 μV 52 MHz / 2.3 / 0.79 / 0.60 μV
Blocking gain compression: Not specified.	Gain compression, 500 Hz bandwidth: *20 kHz offset Preamp off/1/2* / *5/2 kHz offset Preamp off* 3.5 MHz 139/134/130 dB / 105/85 dB 14 MHz 136/135/127 dB / 106/87 dB 50 MHz 127/130/129 dB / 98/79 dB *μ-Tune (preamp off):* 3.5 MHz (20/5/2 kHz): >138*/104/86 dB 14 MHz (20/5/2 kHz): 127/105/87 dB
Reciprocal mixing (500 Hz BW): Not specified.	20/5/2 kHz offset: –103/–86/–76 dBc.

Two-Tone IMD Testing**

Band/Preamp	*Spacing*	*Input level*	*Measured IMD level*	*Calculated IP3*
3.5 MHz/Off	20 kHz	–23 dBm	–122 dBm	+27 dBm
		–14 dBm	–97 dBm	+28 dBm
14 MHz/Off	20 kHz	–24 dBm	–122 dBm	+25 dBm
		–15 dBm	–97 dBm	+26 dBm
		0 dBm	–57 dBm	+29 dBm
14 MHz/2	20 kHz	–40 dBm	–135 dBm	+8 dBm
		–27 dBm	–97 dBm	+8 dBm
		0 dBm	–13 dBm	+7 dBm
14 MHz/Off	5 kHz	–29 dBm	–122 dBm	+18 dBm
		–21 dBm	–97 dBm	+17 dBm
		0 dBm	–46 dBm	+23 dBm
14 MHz/Off	2 kHz	–53 dBm	–122 dBm	–19 dBm
		–43 dBm	–97 dBm	–16 dBm
		0 dBm	–29 dBm	+15 dBm
50 MHz/Off	20 kHz	–37 dBm	–122 dBm	+6 dBm
		–27 dBm	–97 dBm	+8 dBm

Let's look at some of the features.

Contour Control

One of the most underutilized features among new FT-2000 owners is the CONTOUR control. This feature can enhance or suppress certain frequency components in the IF passband, improving the sound or readability of the signal being copied. The front panel control allows the operator to move a "low Q notch" across the passband. Menu settings 90 and 91 determine the peak/null and width of the notch. By using the CUSTOM SWITCH, a feature that lets the user select a predeter-

With μ-Tune (preamp off): Band	Spacing	Input level	Measured IMD level	Calculated IP3
3.5 MHz	20 kHz	–26 dBm	–118 dBm	+20 dBm
		–15 dBm	–97 dBm	+26 dBm
14 MHz	20 kHz	–16 dBm	–112 dBm	+32 dBm
		–15 dBm	–97 dBm	+33 dBm
		0 dBm	–68 dBm	+34 dBm
14 MHz	5 kHz	–17 dBm	–112 dBm	+30 dBm
		–21 dBm	–97 dBm	+33 dBm
		0 dBm	–62 dBm	+31 dBm
14 MHz	2 kHz	–43 dBm	–112 dBm	–8 dBm
		–33 dBm	–97 dBm	–1 dBm
		0 dBm	–44 dBm	+22 dBm

Second-order intercept: Not specified.	Preamp off/1/2: +73/+71/+71 dBm.**
FM adjacent channel rejection: Not specified.	20 kHz offset, preamps on: 29 MHz, 78 dB; 52 MHz, 76 dB.
FM two-tone, third-order IMD dynamic range: Not specified.	20 kHz offset, preamps on: 29 MHz, 78 dB†; 52 MHz, 76 dB;† 10 MHz offset: 52 MHz, 92 dB.
S-meter sensitivity: Not specified.	S9 signal at 14.2 MHz: preamp off, 240 μV; preamp 1, 54 μV; preamp 2, 21 μV; 50 MHz, preamp off, 180 μV; preamp 1, 47 μV; preamp 2, 21 μV.
Squelch sensitivity: SSB, 2.0 μV; FM, 1.0 μV.	At threshold, preamp on: SSB, 14 MHz, 1.5 μV; FM, 29 MHz, 0.14 μV; 52 MHz, 0.26 μV.
Audio output power: 2.5 W into 4 Ω at 10% THD.	4.4 W at 10% THD into 4 Ω.
IF/audio response: Not specified.	Range at –6 dB points, (bandwidth): CW (500 Hz): 446-943 Hz (497 Hz)‡; Equivalent Rectangular BW: 455 Hz; USB: 274-2380 Hz (2106 Hz); LSB: 259-1724 Hz (1465 Hz); AM: 45-2112 Hz (2067 Hz).
Spurious and image rejection: HF, 70 dB; 50 MHz, 60 dB.	First IF rejection, 14 MHz, 103 dB; 50 MHz, 96 dB; image rejection, 14 MHz, 85 dB; 50 MHz, 85 dB.

Transmitter

Transmitter Dynamic Testing

Power output: HF & 50 MHz: SSB, CW, FM, 200 W (high), 10 W (low); AM, 50 W (high), 5 W (low); Class A SSB, 75 W (high), 10 W	HF: CW, SSB, FM, typically 205 W high, 5 W low; SSB, Class A, typ 75 W high, < 1W low; AM, typ 44 W high, <1 W low; 50 MHz: CW, SSB, FM, typ 175 W high, <1 W low; AM, typ 78 W high, <1 W low.
Spurious and harmonic suppression: >60 dB.	HF, 62 dB; VHF, 72 dB. Meets FCC requirements.
SSB carrier suppression: >60 dB.	HF, 62 dB; VHF, 61 dB.
Undesired sideband suppression: >60 dB.	HF, 62 dB; VHF, 69 dB.
Third-order intermodulation distortion (IMD) products: –31 dB PEP at 200 W; –45 dB PEP at 75 W (Class A).	3rd/5th/7th/9th order (worst case band): HF, –31/–47/–52/–47 dB PEP; VHF, –38/–48/–57/–62 dB PEP; Class A,–41/–65/>–65/>–65 dB PEP.
CW keyer speed range: Not specified.	4 to 56 WPM.
CW keying characteristics: Not specified.	See Figures 1 and 2.
Transmit-receive turnaround time (PTT release to 50% audio output): Not specified.	S9 signal, 24 ms.
Receive-transmit turnaround time (tx delay): Not specified.	SSB, 37 ms; FM, 37 ms. Unit is suitable for use on AMTOR.
Composite transmitted noise: Not specified.	See Figure 3.

Size (height, width, depth): 5.3 × 16.1 × 13.8 inches; weight, 34.1 pounds. (not including power supply or accessories).

Price: FT-2000D, $3100; DMU-2000 data management unit, $1000; μ-Tune kit A (160), B (80/40) or C (30/20 meters), $500 each; YF-122C 500 Hz CW filter, $170.

*The maximum input of +20 dBm did not cause blocking.

**ARRL Product Review testing now includes Two-Tone IMD results at several signal levels. See the accompanying sidebar for more information on these tests. Two-Tone, 3rd-Order Dynamic Range figures comparable to previous reviews can be calculated by subtracting the "Input Level" from the "Measured IMD Level" on the first line in each group. For example, on 3.5 MHz, preamp off, 20 kHz spacing it is (–122) – (–23) = 99 dB. The "IP3" column is the calculated Third-Order Input Intercept Point. Second-order intercept points were determined using –97 dBm reference.

†Measurement was noise-limited at the value indicated.

‡Varies with pitch control setting.

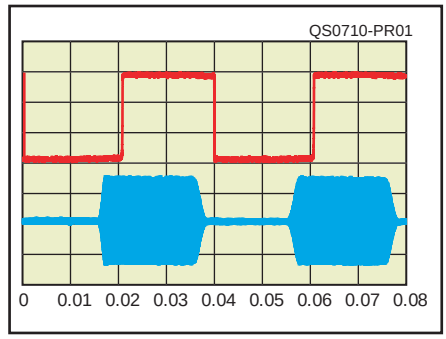


Figure 1—CW keying waveform for the Yaesu FT-2000D showing the first two dits in full-break-in (QSK) mode using external keying. Equivalent keying speed is 60 WPM. The upper trace is the actual key closure; the lower trace is the RF envelope. (Note that the first key closure starts at the left edge of the figure.) Horizontal divisions are 10 ms. The transceiver was being operated at 200 W output at 14.2 MHz at the default 4 ms setting.

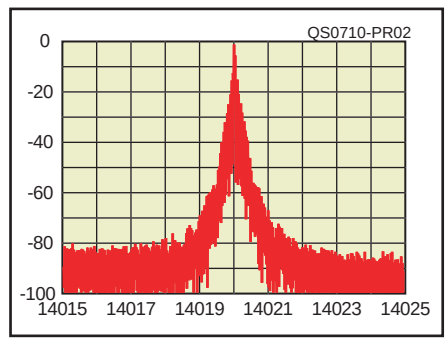


Figure 2 — Worst-case spectral display of the Yaesu FT-2000D transmitter during keying sideband testing. Equivalent keying speed is 60 WPM using external keying. Spectrum analyzer resolution bandwidth is 10 Hz, and the sweep time is 30 seconds. The transmitter was being operated at 200 W PEP output at 14.2 MHz at the default 4 ms setting.

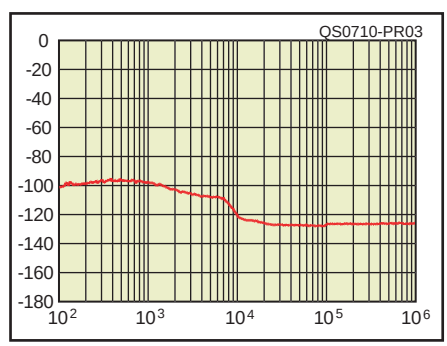


Figure 3 — Worst-case spectral display of the Yaesu FT-2000D transmitter output during composite-noise testing. For the black trace, power output is 200 W at 14.2 MHz; the blue trace is 100 W at 50 MHz. The carrier, off the left edge of the plot, is not shown. This plot shows composite transmitted noise 100 Hz to 1 MHz from the carrier.

mined menu item with the push of a single button, I am able to quickly adjust the CONTOUR control parameters and make a signal seemingly jump right out of the noise. Altering the passband response is a much more effective technique for enhancing readability than simply tightening the bandwidth.

Digital Noise Reduction

The digital noise reduction system (DNR) is a first line of defense for enhancing a received signal. It is a digital signal processing feature that uses sixteen separate and different processing algorithms design to attack different noise profiles.

The control knob operates smoothly (no detents), so there is no physical indication when you change from one processing step to the next. What the operator experiences is an audible change as the as each of the sixteen points is crossed while moving the control knob slowly across its range from one end to the other end. As each processing stage is activated, it takes a second or two for the signal to be processed and there is a noticeable decay in noise as the desired part of the signal tends to rise from the quieter background.

Experimentation with this control is imperative and it should not be turned quickly or you will surely miss the optimum setting. There is no right or wrong setting for the DNR control. Remember that this is a digital function. It moves from one step to the next, so "tweaking" the knob is not going to affect performance as it would with an analog control.

Notch Filters

The FT-2000s are equipped with two IF notch filters — a manual notch filter with coarse and fine adjustments, and a digital notch filter. The instructions suggest that the operator use the manual notch filter as a first line of defense for heterodyne type interference (tones in the passband). We measured a notch depth of more than 60 dB, and the manually operated notch filter is very good for eliminating a single source of interference within the passband. Once activated, a quick twist of the coarse adjustment knob can substantially reduce the interference. Wise use of the fine tune adjustment will eliminate or substantially reduce the interfering signal even more.

The digital notch filter (DNF) is intended to clean up several tones at once. Unfortunately, as we found in the original FT-2000 review, the DNF notched a single tone by 60 dB when nothing else is in the passband, but its effectiveness is reduced with noise or signals in the passband. With more than one tone, it adds audible distortion products and notches the upper tone only 5 dB. Also, you can enable the DNF in CW mode. Doing so notches out desired CW signals as soon as they are tuned in.

Here is a situation where I have to heed my own suggestion that the FT-2000 is not the transceiver that I have grown accustomed to. I have discovered that the band stacking registers offered on the FT-2000 are very useful in preventing a type of operator error. Each band has three registers that store frequency, mode, filter selection and other settings. Rather than switch modes, I set up the registers for a band to allow me to push a single button to change mode and the related features. Say I'm operating on 20 meter SSB and want to switch to CW. I simply push the 14 MHz band switch and I am in the CW portion of the band with all of my preferred settings for filters, break-in (QSK), internal keyer and so on. Another push on the 14 MHz button takes me to the digital sub band with all of my preferences for this mode. One more push of the button and I am back in the phone band again.

Noise Blanker

I found the noise blanker to be extremely effective in eliminating a variety of electrical interference. Pressing the NB button momentarily activates the noise blanker to eradicate ignition or buzz type noise. After holding the noise blanker button in for two seconds the NB indicator light will blink for approximately five seconds indicating that the noise blanker is now in the mode to reduce or eliminate pulse noise.

Regardless of the type of noise that is causing interference, remember that the noise blanker control is digital, not analog. Once you find the "sweet spot" when turning the NB knob you are finished. There is no fine tuning, nor should you quickly twist the control from one end to the other and assume that the noise blanker is not working.

Roofing Filters

In the last couple of years there has been a lot of discussion of roofing filters. When we say "roofing filter," we mean the filter at the first IF (in this case, 69.45 MHz). Use of a narrow-bandwidth roofing filter, say 6 kHz, for SSB and CW — rather than the 15 kHz wide (or thereabouts) filters in older designs — reduces the demands on the other receiver amplifiers and mixers and on the DSP selectivity filtering at the last IF. You should hear fewer spurious signals and other "crud" generated inside the receiver because the roofing filter prevents many strong off-frequency signals from getting to later receiver stages. For an in-depth look at roofing filters and modern receiver design, see "Getting to Know Your Radio" by *QST* Technical Editor Joel Hallas, W1ZR, elsewhere in this *QST*.

The FT-2000 and FT-2000D include 6 kHz and 3 kHz roofing filters that can be switched in. In Lab IMD performance measurements, narrower roofing filters should result in better performance at narrower signal spacings. For example, at 5 kHz spacing you should see noticeably better IMD dynamic range with these narrower filters. During IMD testing at 5 kHz offset, the FT-2000D measures about 10 dB better than the FT-1000MP, with its 12 kHz wide roofing filter, and about the same as the '1000 at 2 kHz offset. We noticed little difference in performance between the 3 and 6 kHz roofing filters in any of the FT-2000s tested, though, at any signal spacing.

How's My Audio?

The audio from the FT-2000D is beautiful. I have used several microphones from various manufacturers, and by adjusting the transceiver's parametric equalizer I was able to make them all sound great. Audio equalization is another area that requires some familiarization to use it properly. With all of variables available to adjust the transmitted audio, the total number of possible combinations is in the thousands. Surely there is a group of settings that will work with your microphone and your voice. Just remember that with so much adjustment, some of the combinations won't sound very good. Take the time to find the ones that work best for you.

Users can tailor the frequency response of the transmitted audio by selecting menu items 123 to 131. The menu includes options for 33 cutoff frequencies across three bands, as well as the ability to vary the bandwidth and gain (or attenuation) for each of the equalizer bands. An additional three bands are available through the rig's parametric equalizer settings in menu items 132 to 140. The parametric equalizer settings are activated when using the speech processor.

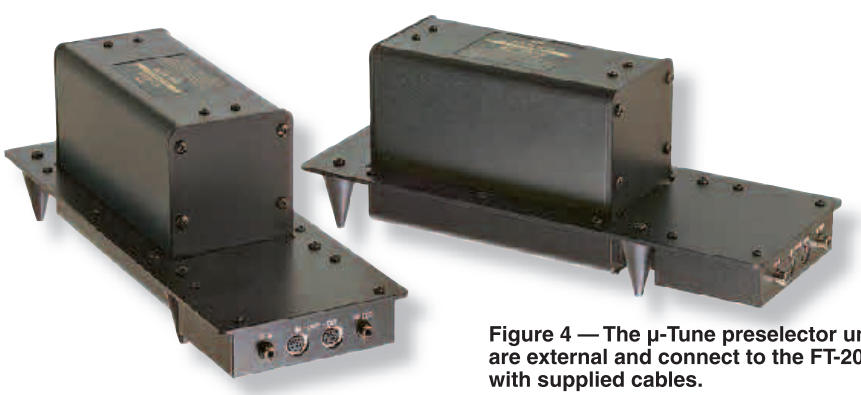


Figure 4 — The µ-Tune preselector units are external and connect to the FT-2000D with supplied cables.

Setting up the speech processor is a bit tricky. I found the front panel meter inadequate for this procedure. The speech processor knob could only be adjusted to about the 9 or 10 o'clock position before distorting the audio, yet the COMPRESSION meter showed no deflection when the control was within this range. Every microphone that I used with the FT-2000D sounded great with the proper equalizer settings, but using the processor was a delicate adjustment with all of the microphones used. Perhaps a future upgrade will modify the range of the processor control and increase the sensitivity of the meter to show some deflection at the lower range of the control.

In addition to the 18 EQ menu options, the FT-2000D allows for six transmitted audio bandwidth settings. These range from a very tight 400-2600 Hz to a higher fidelity 3 kHz wide setting.

Because the monitor feature samples the signal after the IF stage, what is heard in the headphones is very close to what is heard on the air so using the monitor for adjusting the transmitted audio is very useful. It is recommended that any adjustments be made with the transceiver connected to a dummy load to reduce interference on the already crowded bands.

DMU-2000 Data Management Unit

Yaesu's flagship transceiver, the FTDX9000D, has a data management feature built into the rig.[2] For the FT-2000 and FT-2000D, Yaesu offers the optional DMU-2000 to provide similar functions. To use the DMU-2000 with the FT-2000 series transceivers, it is necessary to install a small PC board inside the rig. This is a simple plug-in installation that requires removal of the covers.

[2]J. Hallas, "Yaesu FTDX9000D HF and 6 Meter Transceiver," Product Review, *QST*, Aug 2005, pp 53-59.

The DMU-2000 is housed in a package similar to the FT-2000D's power supply, reminiscent of the outboard accessories that were common to many manufacturer's lines at one time. DMU operation requires a user supplied video monitor and computer keyboard. I used a 15-inch flat panel monitor to provide a very attractive display. Switching to a 19-inch wide-screen monitor makes the eye candy even sweeter.

The DMU-2000 uses a compact flash (CF) drive to save and restore settings in the transceiver and for this it performed well. The CF card can store all of the transceiver's settings so that they can be reloaded after a master reset — a procedure that is always done after a firmware upgrade — or if the rig is used by other operators who would have their own favorites. To use the CF card with the DMU-2000, the card must be inserted face down. This is not a standard procedure, so be careful not to damage pins inside the DMU's card slot.

The DMU offers a world clock with timer and alarm; a spectrum scope, audio scope and oscilloscope; log book software; a great circle map and a world map with real time gray line indicator; control for Yaesu rotators; plus memory channel and menu management. When powered up, the DMU goes through a boot sequence like a computer does when it first starts up. After the internal programs are loaded the DMU is ready to display a variety of information.

The DMU world clock is preset at the factory for Tokyo local time. The instructions in the manual are not very clear on changing the time, and trying to do so was frustrating. After I finally set the clock to my local time and date, I tried to navigate through some of the other DMU features. This is an annoying process because all of the navigation is done via the very small push buttons located on the lower left front panel of the transceiver. They're near the bottom edge, below some rows of protruding dual control knobs. In addition to being tiny, hard to get to and difficult to see, the buttons perform multiple functions. You have to toggle one of the tiny buttons to select the function of the bank of other small buttons. At first I thought that I would be able to use the keyboard to navigate the DMU-2000 but quickly discovered that was not the case.

Frustration with the user interface aside, the DMU has lots of features to appeal to a variety of operating styles. For example, the spectrum scope (see Figure 5) does a good job at providing a real-time picture of activity on the band above and below the operating frequency. The audio scope and oscilloscope display transmitted and received waveforms (Figure 6). Besides providing visual entertainment when you're not actually working stations, the DMU is a useful tool for adjusting microphone settings. The audio scope provided a nice visual representation of the transmitted audio waveform.

The logbook automatically fills in information like time and date, mode and operating frequency. This is one feature where the keyboard can be used to navigate through the fields displayed on the monitor. The logbook can be configured to accommodate multiple logs for up to five users and it features a contest mode for the casual operator who just wants to make a few contacts. The file is limited to 500 entries and does not have templates for individual contests, nor does it have the ability to score a contest, so it's not really intended for competitive operating.

Logs from the DMU can be exported to the CF card in several popular formats. Provided that you have a CF card reader on your PC, this export feature is useful for sharing log data with other logging programs or for uploading QSOs to Logbook of The World. There is no provision for printing QSL labels or tracking DXCC entities or other information important to awards chasers. Don't plan to give up your regular logging or contesting software.

One feature not included in the DMU-2000 operating system is the ability to send and receive RTTY. Having a keyboard,

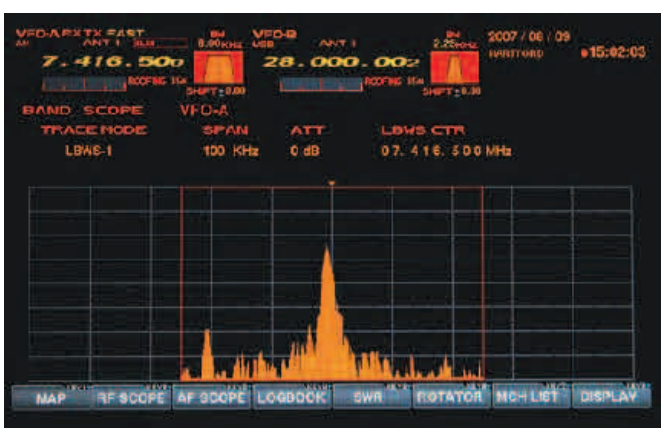


Figure 5 — Here's the DMU spectrum scope looking at a 100 kHz slice at 7 MHz. The DMU simultaneously displays frequency and other transceiver operating parameters. DMU functions are selected by the buttons at the bottom of the screen.

Figure 6 — The DMU oscilloscope allows you to monitor the waveform of received signals.

monitor and what appears to be a PC would lead me to believe that RTTY operation could be added to the package.

μ-Tune Units

Optional μ-Tune units are hi-Q motorized preselector circuits designed to enhance weak signal operating. The μ-Tune units use precision stepper motors to continually tune the preselector components, following along as the transceiver tunes up and down a band. When powering up the FT-2000D, the motors in the μ-Tune units can be heard spinning as they set the units to the right frequency.

There are three units available to cover the 160, 80/40 and 30/20 meter bands. We ordered the 80/40 and 30/20 meter modules. The units require some assembly of the enclosures and plug in modules. Assembly is straightforward, no soldering required, and takes about a half hour. Connections for RF in and out and control are made by the supplied cables. When more than one μ-Tune unit is used, the modules are connected in daisy chain fashion with the output of the first unit connected to the input of the next unit and so on with the last module completing the loop back to the transceiver.

The units are controlled from the FT-2000D by activating the VRF control. As shown in Table 1, use of the μ-Tune units makes a noticeable improvement in third order intercept in many cases. On the air, when the μ-Tune unit is engaged I found a noticeable increase in the readability of the received signal. For example, during the IARU HF Championships contest, I found it easier to hear the last remaining stations on 20 meters before the band closed with the μ-Tune unit switched on. Summertime conditions didn't allow much testing on 80 meters, where a preselector might make a big difference in hearing weak signals in the presence of many rock-crushing local signals.

Overall Performance

Having much experience with the FT-2000 made operating the FT-2000D a pleasure. The extra power was nice to have when I did not feel like running the amplifier and being able to reduce the power to 50% and still have 100 W output was nice when operating digital modes like RTTY and MT-63. I always received compliments on the transmitted audio, and using the signal enhancing features made copying even weak signals a joy. The built-in CW memory keyer and voice keyer played well in a contest environment. One minor point: For very loud signals, it is difficult to find a comfortable volume control setting because, at the threshold point, the volume drops by about 20 dB in one big step.

The optional μ-Tune units are a great tool for those operators who troll the bands for weak signals. The DMU-2000 adds visual enhancement to the station and lets the operator see the effects when some of the controls are changed. The graphic meter display on the DMU permits the operator to monitor the temperature and voltage of the PA along with SWR.

In spite of all the features and technology packed into the FT-2000D, the transceiver can be easy to use. Familiarization with the many functions of the radio is essential to fully appreciate the performance. For contesting, DXing or any other activity the FT-2000D is a terrific transceiver that fits just about any operating style.

Manufacturer: Vertex Standard, 10900 Walker St, Cypress, CA 90630; tel 714-827-7600; **www.yaesu.com**.

Changes to ARRL Receiver Tests

Michael Tracy, KC1SX
ARRL Lab Test Engineer

In this month's Product Review, the ARRL Lab is introducing a series of significant new receiver tests. These are the result of development work and discussions with professionals in the radio industry over a period of several years.

Receiver Blocking Gain Compression and Reciprocal Mixing

In August 2004 *QST*, I described Blocking Dynamic Range (BDR) as "a condition in which the weak [desired] signal is 'blocked' or suppressed" by a strong interfering signal.[3] This is also known as *desense* or *overload*. In some cases, the cause is a reduction in receiver gain.

In other cases ("noise limited" measurements), the cause is an increase in the receiver's internal noise due to the noise sidebands of the local oscillator mixing together with the strong interferer (also known as "reciprocal mixing"). The level of the noise masks the gain reduction effect on the desired signal. Instead of reporting the BDR as a noise limited measurement, the Lab will now be using narrow-band measurement techniques to "dig out" the desired signal on noise-limited measurements and determine the point of gain reduction.

[3]M. Tracy, "*QST* Product Reviews—In Depth, In English," *QST*, Aug 2004, pp 32-36.

To distinguish from earlier measurements, the name will be changed to "Blocking Gain Compression." A separate reciprocal mixing test indicates the level of noise increase within the receiver caused by the interfering signal. Together, these two measurements provide more information about how the receiver behaves with a single strong interfering signal.

Receiver Intermodulation Distortion (IMD) Dynamic Range and Intercept Point

When more than one radio signal is introduced into an electronic device or a system of devices, and that system is not perfectly linear, distortion products are created on other frequencies. Sometimes, such as in the case of mixers, these products are desirable; most of the time they are unwanted. The simplest example is shown in Figure A. Here, two equal-amplitude signals are connected to the input of an amplifier and, at the output, the amplified signals are observed along with the intermodulation distortion (IMD) products. The products closest in frequency to the original signals are known as *third-order* IMD because the mathematical relationship of the frequencies is a third-order algebraic equation. The formulas that give the spurious frequencies are $(2 \times F1) - F2$ and $(2 \times F2) - F1$. For signal frequencies of 14.02 and 14.04 MHz, this gives 14.00 and 14.06 MHz for third-order IMD products.

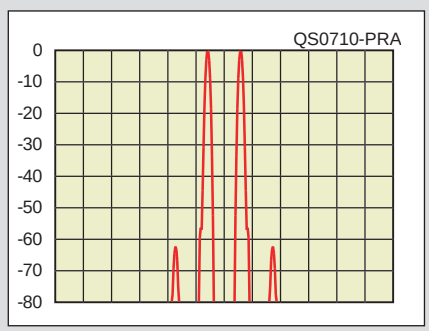


Figure A — Two equal signals and their third-order intermodulation products.

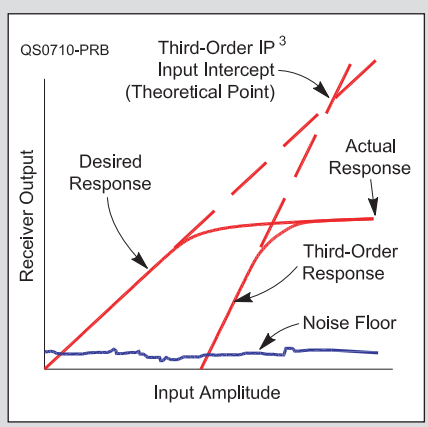


Figure B — A plot of the receiver characteristics that determine third-order intercept.

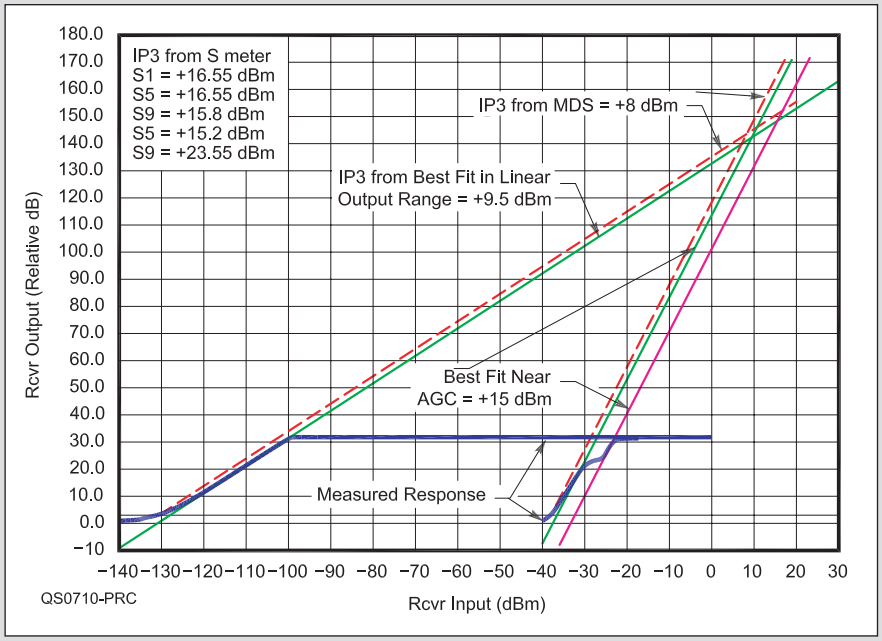


Figure C — The irregular third-order intermodulation response of a real receiver.

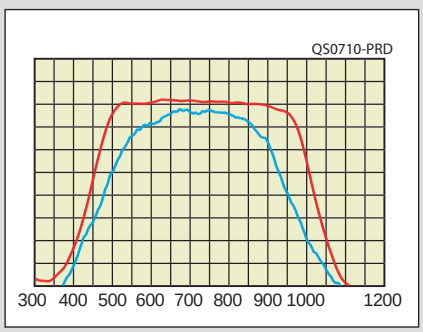


Figure D — Passband response of two filters with similar bandwidths but different skirt shapes.

As the level of the signals at the input to the amplifier are varied, the level of the amplified signals at the output vary accordingly, in a linear fashion, as long as the amplifier is being used in its normal operating range. However, because the IMD products are nonlinear, their amplitude varies by a different rate. In the case of 3rd order IMD, the relationship is a 3:1 slope (see Figure B). The lines of desired response and IMD response can be plotted on the same graph, and if they are extended beyond the receiver's operating range far enough, they will reach a point where they intersect. This point is called the *intercept point*, and the point specific to 3rd order IMD is called the *third-order intercept*, which is usually abbreviated IP3.

The IP3 can be calculated using a formula IP3 = (3 × SIG – IMD)/2 where "SIG" is the level of the interference signals producing the intermodulation distortion (false signal) and "IMD" is the level of false signal that their mixing creates. As an example, if a pair of off-channel (undesired) signals at –10 dBm produces a distortion product of –110 dBm on the desired frequency, then the IP3 = [(3 × –10) – (–110)]/2 = +40 dBm.

In a simple system such as a single-stage amplifier, the desired and 3rd-order responses often present a "textbook" match to the responses shown in Figure B. For more complex systems (such as a double- or triple-conversion radio receiver), the responses can exhibit irregularities due to the way the stages interact, as shown in Figure C. The net effect is that the result of calculating the IP3 formula at different input levels will produce different results.

From 1983 onward, Product Review published IP3 figures for receivers based on a noise floor IMD response level. In 1993, the level was changed to a response that produced an S5 reading on the receiver's own S-meter. The decision was based largely on this being a more typical average of signals that would be found on the bands. The drawbacks to this approach are that there is a great variation in S-meters from receiver to receiver (see Product Review, April 2005) and it overlooks the significant change that can often be observed in receivers at higher signal levels (as shown in Figure C).

With this in mind, the ARRL Lab has decided to measure and report IP3 at three levels. The lowest level measurement is made at the noise floor, as has been done in the past. The middle level is done at a standard level of –97 dBm, defined as S5 in the IARU Region 1 standard for S-meters. For the highest level, instead of selecting a particular receiver response, the maximum level of expected interferer will be set to 0 dBm (S9 + 73 dB by the IARU standard, a loud signal indeed!).

These three levels taken together should present the best overall view of a receiver's total performance, with each level being most useful in a particular context. For example, someone doing SSB or CW work on VHF would care most about the receiver performance at the noise floor, while on HF, an S5 level would be more useful.

Equivalent Rectangular Bandwidth (ERBW)

From time to time, members ask why manufacturer's sensitivity specifications are given in microvolts but our measurements are reported in dBm (decibels relative to a milliwatt). The chief reason is that manufacturers typically do not include a bandwidth in their specification, and measurements in different bandwidths are not directly comparable. All other things being equal, there is more noise power in a 3 kHz bandwidth than a 2.4 kHz bandwidth. To overcome that limitation, the sensitivity testing is done with a 500 Hz bandwidth filter, or as close to that as is available. This permits reasonable comparisons of different receivers.

With different filter types and with a range of filter skirt slopes (see Figure D), even two "500 Hz" filters are not exactly the same. Additionally, some receivers may only have a choice of 400 Hz or 700 Hz widths. Although the filters that a receiver has cannot be changed, the variation in actual bandwidth can be determined by calculating the Equivalent Rectangular Bandwidth (ERBW). This is the width that the filter would have if it passed the same noise power and possessed the "ideal" shape of vertical sides and a flat passband response.

Noise Figure (NF)

Nothing is perfect. Everything generates noise, from expensive receivers to dummy loads. The lab standard for noise is a 50 Ω dummy load at room temperature. Noise figure is an indication of how much noise is generated by a device, when connected to a 50 Ω dummy load, compared to an ideal device. An ideal receiver would just amplify the thermal noise generated by the resistor by its gain, while real receivers add extra noise. To make sense of noise figure, you need to know the noise ahead of the receiver — if it is much less than the thermal noise, the noise of the receiver becomes more important. This is the case on UHF. Conversely, with noisy antennas, such as a full sized 80 meter dipole, receiver noise becomes a much smaller factor. In the absence of manmade noise, 2 meters is the crossover band in which noise picked up by the antenna may be comparable to that generated by a dummy load. Noise figure is a common measurement on VHF+ equipment. Including it in HF equipment reviews shows in a more obvious manner how HF equipment compares to VHF equipment in this respect.

TECHNICAL CORRESPONDENCE

BUILD YOUR OWN 600 W HF AMPLIFIER

◊ Dear ARRL,

I read with interest the construction article "Homebrew Solid-State 600 W HF Amplifier" by KØGKD, published in the June 2006 issue of *QST*.

Having recently constructed the same Motorola design from a set of components from the US based company Communication Concepts, I do have a number of extra construction hints (in no particular order) that may aid future builders.

1) The generic diagram shown in the *QST* article from the EB104 Engineering Bulletin differs slightly from the actual circuit used when constructed on the printed circuit board (PCB) supplied. Also the EB104 Bias Configuration, as redrawn by Communication Concepts, is slightly in error.

2) The value of R15-R18 has been changed to 2.7 Ω (as supplied by Communication Concepts). The power ratings of R19 and R20 may have to be increased for heavy key down applications.

3) Due to the very close spacing between the PCB and the copper heat spreader, ensure that all solder joints are cropped to within 2 mm on the lower side of the circuit board.

4) C17 and C18 are the four physically thickest 0.1 µF chip capacitors, and sit on the top surface of the PCB. Only thin chip capacitors are fitted to the underside.

[The *QST* article lists C17 and C18 each as two 0.01 µF capacitors in parallel for a total capacitance of 0.02 µF. The original App Note, EB104, lists them as two 0.1 µF capacitors in parallel for a total capacitance of 0.2 µF. Both places list them as 100 V ceramic, ATC 200/823 or equivalent, which is the correct designation. — *Ed.*]

5) M3 bolts and nuts can be used to mount the PCB to the copper spreader. M3 nuts used as spacers provide the correct clearance between the two surfaces.

6) Use a socket for U1, the MC1723C IC, to allow easy replacement.

7) The four ferrite beads used to create L1 and L2 are electrically conductive and must be mounted so that they do not touch the ground plane. Otherwise you will have a fire on your hands!

8) The phasing on T2 is critical; the red and orange leads need to be on opposite sides at the top and bottom of the transformer. If you have any doubt, phone Marlis at Communication Concepts for advice before proceeding with the construction.

9) Trim pots R1 to R4 need to be fitted slightly up in the air to ensure clearance for other components.

10) When all components are fitted to the PCB, double test that there are no shorts on the 50 V rail. You may have to remove a very small section of the PCB copper in close proximity to the MRF150 FETs and other areas to avoid this problem.

11) Only use silver loaded heat sink compound to ensure maximum heat transfer. Use two large diameter (4¾ in / 120 mm) 1400 RPM fans to provide adequate cooling and low noise.

12) The current bias stability of the MRF150 FETs is greatly improved if the output of the voltage regulator (U1) is reduced from 7 V to 5 or 5.5 V (via R5) and the thermistor (R25) is mounted in close thermal contact with one of the MRF150 transistors. I clamped the lead of one end of the thermistor close to its body under an extra nut on one of the securing bolts of the output transistors.

13) The Motorola data sheet suggests 0.25 A per device as a suitable bias current.

14) The bias voltage for the amplifier may be derived from the 50 V supply, and any relays and control circuitry can be powered by the existing 13.8 V power supply used by your transceiver.

15) For those in Europe, a suitable toroidal mains transformer (40 V + 40 V at 12.5 A each winding 1000 VA) can be sourced at a very reasonable price from Clairtronic Ltd in the UK. Contact them at **sales@clairtronic.co.uk** or by phone at +44 (0) 1234 330775. Use 63 V capacitors in the power supply, as the supply will be approximately 57 V without a load.

16) Provide a suitable 20 to 25 A fuse in the +50 V lead, and fit a rectifier diode (of adequate surge rating) with its cathode connected to the amplifier side of the fuse and its anode to ground, to protect the amplifier from reversed power supply leads.

17) When testing for the first time, ensure that pots R1 to R4 have their sliders at ground potential, and that a low current, fast blow fuse (2 A) is substituted for the normal one. If the fuse blows at turn on, test for shorts. If it blows when setting up the bias current, however, you may have the phasing of T2 incorrect. That will turn the amplifier into a high powered oscillator!

18) Do not forget that because of the high power gain you will require only around 6 W or so to drive the amplifier to 600 W output.

19) Extra circuitry for ALC control and other features may be required, depending on usage. A 50 Ω input attenuator (5 to 7 dB) feeding the amplifier is desirable, and can be protected from gross overload by a suitable fuse. A peak reading power meter needs to be incorporated either internally or externally to the amplifier.

20) If the RF unit and power supply are constructed as separate units (my preference), the power supply will sit very neatly under the bench alongside the transceiver supply. The solid state amplifier, with output filters, is small and light enough to stand on the back of the average transceiver, if required.

21) Communication Concepts also supply suitable LP output filters at reasonable cost, and which are simple to construct. These appear to be perfectly satisfactory at least up to the 400 W legal limit imposed in the UK.

Have fun! — *Colin Darby, MØOTT, Brookfield, Forest Green, Surrey RH5 5SG, UK*; **ColinDarby@FatRose.fsnet.co.uk**

◊ The subject article inspired me to build the EB104 kit. I was always skeptical of the push-pull parallel FETs, but knowing Ameritron was using the design "put me over the edge." The hints received from Colin Darby, MØOTT, via Communication Concepts were helpful. I have a few more to add, which might be useful to others building this amplifier.

In Figure 1, the main points of interest are the location of the thermistor and the two

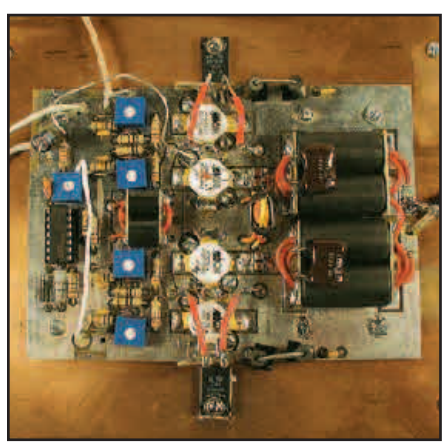


Figure 1 — This photo shows a top view of the completed amplifier board mounted on the copper spreader, which is in turn attached to the aluminum heat sink.

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

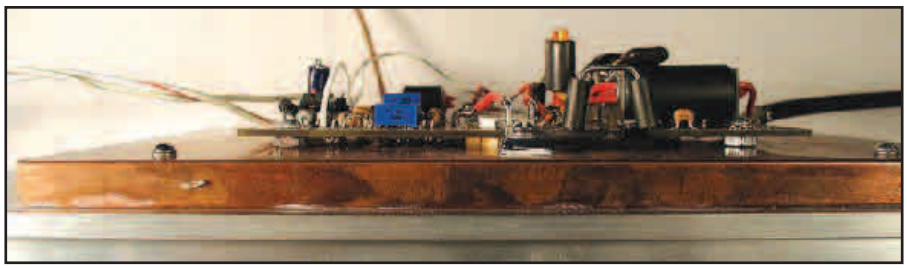


Figure 2 — This side view of the board/spreader/heat sink shows how the pieces stack up, and also shows the board spacing from the copper spreader.

30 W, 10 Ω feedback resistors. The thermistor is mounted to the second FET down from the top, which is closest to the board center and closest to the R10 E point, where the high side of the thermistor connects, in order to sense one of the higher temperature FETs. This will also minimize the wire length to the thermistor. The thermistor ground lead is connected to a ground lug under the mounting screw of that FET (as Colin suggested).

With the bias voltage set to 6 V the bias current changes very little. The supplied 2 W, 10 Ω feedback resistors for R19 and R20 appear to be very underrated, especially for CW or RTTY type use as suggested in the application note. I calculate they each can dissipate about 30 W key down at 600 W output! For SSB the supplied 2 W resistors may be okay, because the duty cycle is low. I elected to change these resistors to Caddock Electronics Inc 30 W MP930-10-1%, which have very low inductance, important to maintain feedback stability at high frequencies. They have a TO-220 case style for good power dissipation. These resistors are mounted on the copper spreader near the board, and wired to the R19 and R20 pads using short pieces of 18 gauge wire (red), as shown in the photo of Figure 1. These resistors run quite cool with key down conditions, and the risk of frying the supplied 2 W resistors with likely dramatic consequences is removed.

Figure 2 shows an edge view of the aluminum finned heat sink, copper spreader; no. 6-32 nut spacers (4) and the FET board, as stacked up from bottom to top. I decided to tap holes in the copper heat spreader to mount the board and FETs to the spreader. This required a total of 12 holes, and helps to minimize any degradation to the copper/aluminum interface. An alternative approach is to use 4-40 screws and nuts to hold the board and FETs to the spreader. I wanted to avoid the necessity for this approach of countersinking the copper spreader, thereby reducing the interface surface area (slightly). After breaking two taps in the copper after only five holes tapped, I was having second thoughts. A local machine shop helped me get the buried taps out and I was able to continue on my original approach. I've tapped many holes in aluminum without problems but not so with copper. I found it is very easy to break the taps. It is important to go very slow, backing the tap out often to clear the threads and minimizing hole depth (⅜ inch 4-40 for the FETs and ½ inch 4-40 for the board). I've since learned that McMaster Carr offers a spiral tap, which may be better for copper.

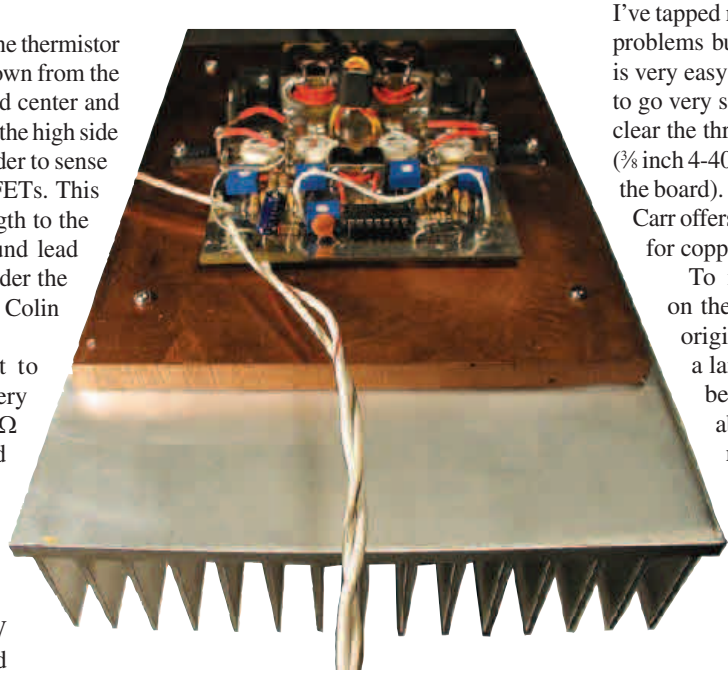


Figure 3 — An end view of the assembly.

To minimize any upward stress on the FET tabs, as called out in the original Motorola application notes, a large pattern no. 6-32 nut offered better board to spreader spacing, about 0.105 inch rather than the recommended 0.12 inch spacer.

Figure 3 shows an end view of the finned aluminum heat sink, with the copper spreader and circuit board mounted to it.

I connected an old re-wound TV transformer and two large filament transformers in series to get about 50 V dc for testing while waiting for the Ameritron transformer. See Figure 4. When ordering the transformer from Ameritron, I was informed the correct part number is 406-1246.

I hope this is helpful. — *73, Lindsley (Bud) Colclough, K1LC, 11 Patriots Way, Hingham, MA 02043*; **k1lc@arrl.net**

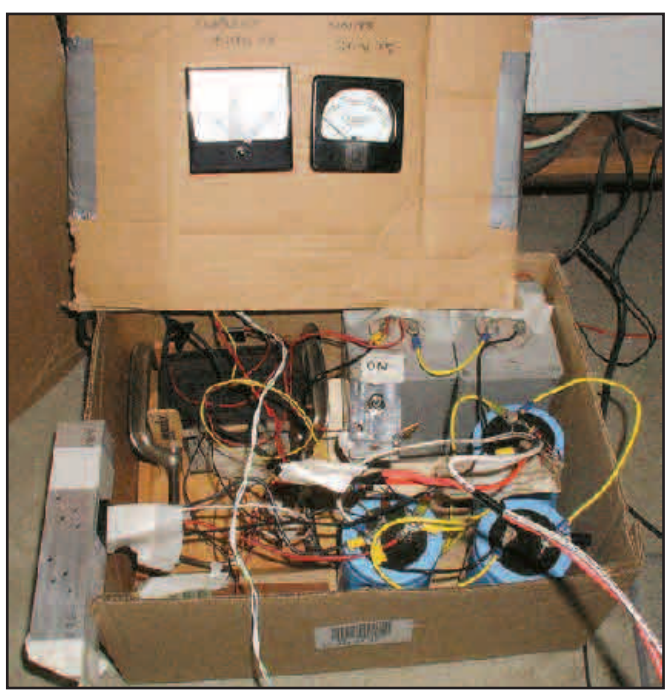


Figure 4 — This photo shows a temporary breadboard (or should that be cardboard?) power supply.

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

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

ARRL Files Federal Court of Appeals Reply Brief over BPL

On July 31, the ARRL filed its reply brief at the US Court of Appeals for the District of Columbia Circuit. This brief follows the FCC's brief that attempted to rebut the ARRL's challenge to the FCC's Broadband over Power Line (BPL) rules enacted in late 2004 and affirmed by the agency in 2006. According to ARRL General Counsel Chris Imlay, W3KD, "The FCC's brief does not accurately describe ARRL's arguments concerning harmful interference." The ARRL, in its reply brief, accuses the FCC of "engaging in misdirection — rebutting hyperbolic arguments ARRL never made, refusing to address the precedents ARRL cited and attempting to rewrite the *Orders* as if they made factual rather than legal determinations."

The League's reply brief, according to Imlay, "focuses largely on the FCC's unprecedented failure to protect mobile stations from interference if the BPL operator reduces its radiated emissions by 20 dB below the Part 15 maxima, even if harmful interference persists thereafter. The reply brief also addresses the inapplicability of the 40 dB per decade of distance extrapolation factor applied to BPL system measurements in the high frequency bands."

The ARRL's reply brief looked at four main points:

- The FCC's failure to reconcile the *Orders* with the FCC's decades-old interpretation of Section 301.
- The FCC's failure to justify its nondisclosures of portions of the studies on which the *Orders* were expressly based.
- The FCC's failure to justify its refusal to consider contrary evidence, as well as a proposed alternative to its extrapolation factor for measuring interference.
- The FCC's failure to justify its summary dismissal of an alternative that could have accommodated BPL without causing the same harmful interference.

Pointing out the "multiple legal errors in the *Orders*," the ARRL stated in the brief that the case "require[s] a remand. When the Court remands the *Orders*, it should direct the FCC to give this alternative the careful consideration required by law."

THE 2007 ARRL TEACHERS INSTITUTES REACH 45 SCHOOLS

Forty-eight teachers representing 45 schools from around the country attended the 2007 ARRL Teachers Institutes, held this summer in Rocklin, California, Spokane, Washington and at ARRL Headquarters in Newington. Each class of 12, ranging from pre-school teachers to college professors, got the opportunity to explore and experience firsthand wireless technology basics, how to teach basic electronics concepts integral to microcontrollers and robots, as well as how to bring space technology into the classroom. The four day course culminated with building and programming a robot.

Education and Technology Program Coordinator and Director of the ARRL Teachers Institute Mark Spencer, WA8SME, said, "We had a good range of students this year. We had a higher percentage of hams than we have seen in the past. These were slightly older teachers, ranging in all levels of experience. We even had a student teacher at one of the sessions, something I am really excited about."

Spencer said his four "instructional pillars"— Science of radio, Space in the classroom, Microcontrollers and Robotics — are "ever-present" during the Teachers Institute. "Each day is packed with lectures, hands-on activities and demonstrations, building, programming and a robotics competition. The first two days include instruction on how to teach wireless technology. Day three covers microcontrollers and the finale is how to teach basic robotics. The class materials are a mix of basic theory coupled with teaching strategies these instructors can use immediately when they return to the classroom."

Mark Spencer, WA8SME, shows a Teachers Institute participant how to find and track a satellite.

While the emphasis of the course is not Amateur Radio and teachers need not be hams to attend the all-expenses-paid sessions, some do go ahead and take the Technician license exam. Seven have received their Technician license and two have upgraded to General this year alone. "About 80 percent of the non-ham teachers have gone on to get their Amateur Radio license. They get really 'jazzed up' about ham radio while they are here. Since the genesis of the Teachers Institute, each participant that has taken their Amateur Radio license exam has passed on their first attempt," Spencer said.

Spencer said the Teachers Institute curricula are constantly being tweaked. "Right now, we are at a maturing stage, doing the grunt work and sustaining the program. Next year we are looking at adding Amateur Radio Television and making

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

FCC News

FCC Enforcement Actions

The FCC's Enforcement Bureau released new Amateur Radio enforcement actions on July 25.

♦ John C. Kimbrough, WR3S, of Murfreesboro, Tennessee, received notification from the FCC's Atlanta District Director that his automatic control privileges had been removed. This followed up on a letter sent by Special Counsel for the Enforcement Bureau Riley Hollingsworth that listed various and numerous complaints about Kimbrough concerning "apparent violations of the Commission's rules, including inadequate station control, interference and failure to properly identify." The Letter went on to say that Kimbrough may not resume automatic control until notified by the Atlanta office. "If WR3S is operated under automatic control prior to notification from this office, enforcement action will be taken against your Amateur operator and station licenses for WR3S. This action may include designation of those licenses for a revocation and suspension hearing, and a monetary forfeiture."

♦ Robert J. Langston, W2ENY, of Cornwall on Hudson, New York, received a request from the FCC for information concerning "allege[d] transmission of recordings, including recordings of the radio transmissions of other operators, and false identification of transmissions," and called into account "serious questions regarding your ability to retain an Amateur license." The FCC gave Langston 20 days to respond to the allegations.

♦ Robert A. DiMezza, W2GGI, of Delray Beach, Florida, received an FCC request for information concerning complaints that allege "among other things, poor signal quality and refusal to make corrections," and was given 20 days to respond.

♦ Frank Richards, of Mooers, New York, received a *Memorandum Opinion and Order* from the FCC regarding his apparent attempted 1995 hijack of an Amateur Radio license from Frank C. Richards, KB4VU, of Ft Meyers, Florida. The New York Richards was initially successful, and the FCC granted him KG2IC, but after the Florida Richards contacted the FCC to say he'd never moved nor modified his license, the FCC directed the New York Richards to explain. In June 2004, the New York Richards turned in his license. While the FCC did not pursue further enforcement action then, it did tell the New York Richards that the circumstances of the apparent abuse of the license system could become a factor if he ever applied for an Amateur Radio ticket in the future. The New York Richards applied for a Technician license June 28, 2006 and accompanied his application with a letter.

The FCC Enforcement Bureau said it was unable to determine whether the Wireless Telecommunications Bureau should grant the application, however, so it now has been designated for a hearing. The FCC's Enforcement Bureau's Motion to Dismiss Application with Prejudice and Terminate Hearing, filed June 25, had a deadline of July 10 for any opposition to be filed. As of July 18, no written appearance had been filed by, or on behalf of, Richards, and no one attended or entered an appearance on Richards' behalf at a prehearing conference July 10. Therefore, Richards' Amateur Radio license application was dismissed with prejudice.

♦ Frederick C. Severa, AH8I, of Folsom, California, received a warning notice claiming "that Commission monitoring information indicates that on February 12, 2007 at 0221 UTC, you operated in the SSB mode on 7.055 MHz from a location near Reading [*sic*], CA. That mode is not authorized to you on that frequency under Commission rules." The FCC sent Severa a letter notifying him of this; it was returned as undeliverable. Saying that "such operation may reflect adversely on your qualifications to retain an Amateur Radio license," the FCC gave him 30 days to respond and to verify his current address.

an umbrella activity board that ties all four of the instructional pillars together. I am already looking at expanding the program for next year."

ARRL FILES OBJECTION TO AMBIENT'S BPL EXPERIMENTAL AUTHORIZATION RENEWAL REQUEST

On July 25, the ARRL filed an *Informal Objection* to Ambient Corporation's request for a renewal of their nationwide experimental authorization that allows them to operate broadband over power line (BPL) operations anywhere in the country they choose. Ambient has been operating its BPL equipment under experimental authorizations for more than five years, an unusual amount of time for an experimental authorization. An *Informal Objection* is the procedure dictated by the FCC's Part 5 rules protesting the renewal of an experimental authorization. Currently, Ambient operates a BPL system in Briarcliff Manor in Westchester County, New York. Other installations have apparently been shut down by Ambient.

Ambient has been using experimental authorization WD2XEQ, issued in 2005, and its predecessor WB9XQT, issued on June 24, 2002. WB9XQT covered the BPL operation in Briarcliff Manor. It was replaced by WD2XEQ on July 28, 2003, a two-year authorization that was twice extended, most recently through August 1, 2007.

The ARRL states in its Objection that "since the issuance of the first experimental authorization, rules have been enacted for the regular Part 15 operation of BPL systems and there is nothing that has been filed by Ambient which could justify the continuation of experimental operation of this system rather than operation pursuant to the Commission's rules governing virtually all other BPL systems."

The terms of Ambient's experimental authorization require that if "any interference" results from its operation, the holder of the authorization will be subject to immediate shutdown. The ARRL stipulates that harmful interference has repeatedly occurred, and such interference has even been witnessed and verified by a member of the FCC's Enforcement Bureau staff, yet the FCC has failed to take any action against Ambient in response to any of these complaints. The ARRL continued: "[i]t would be unconscionable for the Commission to further renew this experimental authorization in the face of these unresolved complaints of interference."

By mandating that Ambient operate in accordance with the "long-ago-enacted BPL rules rather than allowing it to hide behind an experimental authorization," Ambient would at least be subject to the FCC's regulatory plan for BPL, "however inadequate that plan is in terms of interference avoidance," the ARRL said in its *Objection*. If forced to comply with the Part 15 rules, as other BPL systems must do, "perhaps at least some of the abundance of unresolved and unaddressed interference problems caused by Ambient would be reduced."

DENNIS DURA, K2DCD, JOINS ARRL STAFF

The ARRL is pleased to welcome Emergency Preparedness and Response Manager Dennis Dura, K2DCD, to the Headquarters staff in Newington. Dura's major responsibilities include addressing the development and implementation of an organizational disaster response plan as well as a continuity operations plan, complete with supporting procedures and training. Integral to these plans are the recommendations of the National Emergency Response Planning

Dennis Dura, K2DCD

Committee (NERPC) report.

"By instituting these base components for the organization, the emergency communications resources of Amateur Radio and the League will become truly disaster resilient on all fronts," Dura said. "Emergency communications cannot stand alone. As an organization, we must have disaster plans in place and know what we must do to continue operations when they are impacted. Without this, our support to the field will be lacking."

Dura also will play an integral part in the management of ARES, and in future negotiations with served agencies with whom ARRL shares or creates *Memoranda of Understanding*.

Dura comes to the ARRL with more than 26 years of experience in the emergency management field. He started as a volunteer coordinator in his home township's emergency management program and turned this experience and training into a consulting career, working on off-site emergency plans for nuclear power plants and the jurisdictions where they are sited around the country. At the same time, he joined the American Red Cross as a volunteer Disaster Consultant in New Jersey, leading to paid positions as Manager of Disaster Services in St Louis, Director of Disaster Preparedness in Chicago and a Disaster Preparedness Specialist in New Jersey.

Excited to be working at ARRL Headquarters, Dura said, "It is a tremendous opportunity to take my many years of emergency management experience and apply all of it to the ARRL. It wasn't a hard move [to the ARRL] at all — take the disaster experiences and meld them with a tremendous volunteer service…that ends up serving the nation and the world."

In Brief

Larry Wolfgang, WR1B

♦ **Larry Wolfgang, WR1B, new *QEX* Editor:** ARRL Publications Manager Steve Ford, WB8IMY, announced July 17 that he has named long-time ARRL Headquarters staffer Larry Wolfgang, WR1B, as the new *QEX* Editor. *QEX* is ARRL's forum for communications experimenters. Wolfgang takes over Editorial duties from Doug Smith, KF6DX. Smith had filled the position since the September/October 1998 issue, when he took over for Rudy Severns, N6LF.

Wolfgang said, "Being named *QEX* Editor is quite an honor, and also a huge challenge. When I reviewed the list of previous Editors, starting with Paul Rinaldo, W4RI, in 1981, I realized what an awesome responsibility it will be to guide *QEX*. The magazine is an experimenters' exchange, so I want to encourage more authors to write about projects on which they are working. While we like construction-type articles, this is also a place to share 'projects in the works' and exchange stories about successes and failures. I also want to find some ways to increase our readership."

Readers can find more information about *QEX*, published six times a year, at the *QEX* Web site at **www.arrl.org/qex**. The site features cover images for the past two years, as well as the Table of Contents and Letters columns from those issues. A sample article from each of those issues is available for free download.

Barbara Morgan, KD5VNP

♦ **KD5VNP on Board Space Shuttle *Endeavour***: Barbara Morgan, KD5VNP, launched into space August 8 as part of the seven-member crew on board *Endeavour* (STS-118). Morgan is the mission's Educator Astronaut. She was selected for the astronaut corps 22 years after first being selected as Christa McAuliffe's backup in the Teacher in Space Project. McAuliffe and the rest of the seven-member crew on board the space shuttle *Challenger* (STS-51-L) perished on January 28, 1986, a mere 73 seconds after launch. Morgan said, "Both the 'Educator Astronaut' and the 'Teacher in Space' are teachers. And, they experience space, and then they share that experience through a teacher's perspective and through the eyes, the ears, the hearts, the minds of teachers. The educator astronaut is also a fully trained astronaut who does the jobs, does the duties that an astronaut does. Astronauts and teachers learn and share; they explore; they discover and then they go learn and share some more. And that's what this is all about." While in space, Morgan plans to answer questions from schoolchildren. She received her Amateur Radio license in March 2003. STS-118 landed at Kennedy Space Center August 21.

SECTION MANAGER NOMINATION NOTICE

To all ARRL members in the Eastern New York, Eastern Pennsylvania, Louisiana, North Carolina, Pacific, San Diego, South Dakota and Virginia Sections: You are hereby solicited for nominating petitions pursuant to an election for Section Manager (SM). Incumbents are listed on page 16 of this issue.

To be valid, a petition must contain the signatures of five or more full ARRL members residing in the Section concerned. 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 7, 2007. If more than one member is nominated in a single Section, ballots will be mailed from Headquarters on or before January 2, 2008, to full members of record as of December 7, 2007, which is the closing date for nominations. Returns will be counted February 19, 2008. Section Managers elected as a result of the above procedure will take office April 1, 2008.

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, 2008. If *no* petitions are received from a Section by the specified closing date, such Section will be resolicited in the April 2008 *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

A Tour of a Modern County EOC

Rick Palm, K1CE
k1ce@arrl.net

FLAGLER COUNTY EOC STAFF

Flagler County's new emergency operations center.

Flagler County has been the fastest growing county in the country. Located on the upper-central east coast of Florida, between famous Daytona Beach and historic St Augustine, it has 19 miles of coastline, and a rural western aspect of lakes, creeks and farmland. The county is 485 square miles, with a population of 67,200, mostly along or near the coast.

It is also a ground zero for natural disaster, exposed to the ferocity of hurricanes, tornadoes and even tsunamis. As the county's population and consequent tax base increased, new infrastructure was needed, approved and developed, including a new emergency operations center (EOC) for county emergency management. At a cost of $7.2 million, it is a technological and ergonomic marvel, a modern bunker of communications and other equipment, which serves as home to the county Emergency Management Division. Under the respected leadership of Troy Harper, and emergency management technician Bob Pickering, KB4RSY, a former county employee of the year, a complement of experts in various emergency management functions converge at the EOC for drills, day-to-day monitoring and activity, and when it hits the fan here in severe weather alley.

Several communication services are in place at the new EOC, including ARES. For the efficacy of ARES operations, it is imperative that radio amateurs appreciate their role at the EOC, and have a good working knowledge of all aspects of EOC functioning. Let's take a tour with this goal in mind.

Location, Location, Location

The EOC building is strategically sited away from the immediate coastline by 5 miles, but close to other government offices and facilities in the county seat of Bunnell. Built on a large open parcel, it is less likely to be hit by flying debris and fire. It is a storm-fortified structure, with few windows: it looks more like a prison. Indeed, it probably seems like a prison for the disaster functionaries when locked down during a major situation.

From the lobby, a large meeting room on the right serves as a training center. State of the art multimedia technology provides for effective presentations. Off the left of the lobby is the Media Room, where journalists and reporters receive status reports and feed their home bases. On the other side of a locked door, the Dispatch Center (911) has six dispatchers managed by the Sheriff's Office for Fire, Rescue and Police functioning. A 24 hour warning point for public schools (each school also has a weather alert radio) is run from the Dispatch Center.

The EOC uses two primary communication systems for these functions: a new state of the art analog/digital 800 MHz trunking system and a good, old-fashioned VHF FM system. This flexibility is essential as Fire/Rescue services are on the VHF system only, as is the Division of Forestry, another critical component in the mostly forested county. The Fire Flight Helicopter, which includes a med-evac function, has 800 MHz, VHF and UHF assets. The 800 MHz system includes six antenna towers and simulcasts on the VHF channels.

Down the hall is the Broadcast Studio, where officials can voice public warnings and information over the standard commercial broadcasting frequencies on the AM and FM bands.

Communications Room

Next is the Communications Room, which also serves as Pickering's office. Wall-to-wall radios include four dual-band mobile-style radios, an HF radio (Kenwood TS-520S), numerous handheld transceivers on charge docks, GMRS radios, and CB-REACT radios. An EMWIN system for receiving and displaying technical weather information and radar images is up on a computer monitor. A 60 foot conduit for coax runs to a hardened antenna farm on the south side of the building. Antennas sit atop a 55 foot collapsible US Towers tower, and a smaller section of Rohn 45.

The Break Room is just what its name suggests, and features an industrial, restaurant-scale kitchen for feeding "shut-ins" for an extended period of time. The Bunk Room offers comfortable bunks for downtime, sleeping 120. The physical plant is on city water, with no well, but has its own fuel farm for self-sufficiency over the potential long haul.

Hub

The hub of the EOC is the Operations Room, a large room with desks arranged in classroom style facing the front of the room where two larger desks host the command and control officials in charge. Each desk has a telephone system, and a laptop. The desks are dedicated to emergency support functions (ESFs) (see sidebar), and certain

Emergency Support Functions at the Flagler EOC

ESF 1 — Transportation
ESF 2 — Communications and Technology
ESF 3 — Public Works
ESF 4 — Fire
ESF 5 — Information and Planning
ESF 6 — Mass Care
ESF 7 — Resource Support
ESF 8 — Health/Medical
ESF 9 — Search and Rescue
ESF 10 — HAZMAT
ESF 11 — Food/Water
ESF 12 — Energy and Utilities
ESF 13 — Military Support
ESF 14 — Public Information
ESF 15 — Volunteers and Donations
ESF 16 — Law Enforcement
ESF 17 — Animal Services
ESF 18 — Special Needs
ESF 19 — Business and Industry
ESF 20 — Damage Assessment

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

principal geographic areas of the county such as Beverly Beach, Flagler Beach, Palm Coast, Marineland, and Bunnell.

Other positions include desks for Utilities, Finance, Logistics and Planning. A position and desk are also present for the Florida Department of Transportation (FDOT) and the Florida Department of Law Enforcement (FDLE), both state agencies. Finally, a separate position/desk is located in the back of the room for the Public Information official, where he or she can see all of the activity.

Affixed to the walls of the Operations Room are huge LCD monitors displaying EMWIN, NOAA Weather Radar, CNN and other information channels. Cameras record hub activity.

The EOC uses E-Team software for computer management of operations.

The entire physical plant can be powered by 35,000 W generators housed in bunkers on the south side of the building.

Communications with Tallahassee

The telephone is the first choice for EOC communications with the Florida State EOC at Tallahassee. If telephone service is not available, the staff turns to its ESATCOM satellite-based phone and EAS system, which will be replaced soon by the National Warning System (NAWAS), a comprehensive party line network of telephone circuits connecting state and Federal warning points throughout the United States, funded by FEMA. Although NAWAS is a national system, the day-to-day operation is under the control of individual states. Other satellite phone services are also available. AM radio is also a backup system.

Amateur Radio Supports the EOC

And, of course, Amateur Radio can also be used: In a major incident, ARES operators at the EOC check into the Northern Florida ARES Net on 3950 kHz, and communicate directly with their state counterparts and officials including well-known EOC technicians John Fleming, WD4FFX, and Kimo Montague, K4IMO, at the Tallahassee facility.

Flagler county has two major Amateur Radio organizations, the Flagler Emergency Communications Association (FECA), which is comprised of ARES, GMRS, SKYWARN and REACT operators and hardware assets; and the Flagler Palm Coast Amateur Radio Club (FPCARC), which is more of a general interest club with members supporting the EOC as needed, and the CERT program in specific neighborhoods. The FPCARC also has a repeater. Both entities are devoted to serving the public in times of need.

EOC Leadership

The Flagler amateur community has been fortunate to have leaders, especially Pickering, at the EOC who have the foresight to include Amateur Radio in their emergency operations plans. It has been a symbiotic relationship: Amateur Radio supports the EOC and is included in planning, training, drills and actual events, and in turn, interest in Amateur Radio is engendered in the public, and more are licensed through local VE sessions sponsored by both Amateur Radio clubs.

The Radio Amateur Volunteer at the EOC

The ARES or other volunteer amateur operator at the EOC must not only know his or her Amateur Radio system and organization, but also know the rest of the systems and functions of the center if he/she is to fulfill his or her potential for utility to the emergency management officials. Make it a priority to fully understand and know the functions of all aspects of your EOC. Only then will you be able to make the fullest contribution possible.

Field Organization Reports

Public Service Honor Roll
July 2007

This listing is to recognize radio amateurs whose public service performance during the month indicated qualifies for 70 or more total points in the following 6 categories (as reported to their Section Managers). Please note the maximum points for each category:
1) Participating in a public service net, using any mode. —1 point per net session; maximum 40.
2) Handling formal messages (radiograms) via any mode. —1 point for each message handled; maximum 40.
3) Serving in an ARRL-sponsored volunteer position: ARRL Field Organization appointee or Section Manager, NTS Net Manager, TCC Director, TCC member, NTS official or appointee above the Section level. —10 points for each position; maximum 30.
4) Participation in scheduled short-term public service events such as walk-a-thons, bike-a-thons, parades, simulated emergency tests and related practice events. This includes off-the-air meetings and coordination efforts with related emergency groups and served agencies. —5 points per hour (or any portion thereof) of time spent in either coordinating and/or operating in the public service event; no limit.
5) Participation in an unplanned emergency response when the Amateur Radio operator is on the scene. This also includes unplanned incident requests by public or served agencies for Amateur Radio participation. —5 points per hour (or any portion thereof) of time spent directly involved in the emergency operation; no limit.
6) Providing and maintaining a) an automated digital system that handles ARRL radiogram-formatted messages; b) a Web page or e-mail list server oriented toward Amateur Radio public service—10 points per item.

Amateur Radio stations that qualify for PSHR 12 consecutive months, or 18 out of a 24-month period, will be awarded a certificate from Headquarters upon written notification of qualifying months to the Public Service Branch of Membership & Volunteer Programs at ARRL HQ.

532 W2LTB
490 KG4TND
450 WA2WMJ
410 KB9KEG
372 KD8BGQ
334 KA2ZNZ
321 KB2ETO
310 N2LTC
290 K2DYB W2MTA
250 W2LC
248 NØYR
230 AK2Z
223 KK1X
220 KØIBS
204 K4DND
200 KD1LE
195 WA2BSS K8MFK
185 N7CM
180 K7EAJ
172 N9DN
160 KGØGG NØUKO
156 KB1LCS
155 KA2GJV WU8Y WB8RCR
150 N4VAD
WB5ZED K9LGU
148 W5PY
146 W2DWR
145 WB9JSR AA3SB K3CSX
140 KA8ZGY KE5HYW KD5TXD K7BFL WB2KNS KK3F W3YVQ
135 KC2LIX NIØI AG9G
130 WØSJS N2QZ W7EKB K8RDN WØSJS
127 N2GJ
125 K4GK WA4UJC WB6UZX K9FHI K8AMR
120 KA4FZI W8UL KW1U W1GMF K1YCQ
KC9IED N1UMJ NN7H KC5OZT KA5KLU W7IG NN7D
115 WX4H
114 W4ZJY
110 WV8RG N8IO KØBLR WØLAW N1IQI K2UL K4FQU W5ESE N7XG N7YSS KK5GY W7GB N7BEC K8AE WB2LEZ K5MC N7IE
108 N5KWB W3CB
106 K7BC WD9FLJ
105 KE5DLZ NUØF N3RB
104 N2VC K6JT
103 WB8OIF
WAØVKC
101 W3ZQN
100 N4MEH WA2YL WA4EIC K2TV KB2KLH W2DSX N9MN W4TY WA8SSI N1LKJ W3TWV AD4BL NX1Q N5OUJ NØMEA N4MEH W7GHT K2AN KC8WSE K4SCL KF7GC KM1N
98 NR4DW
97 W5GKH
96 N2JRS KC2ANN
95 K2GW WG8Z AB8SY
93 KC2IYC
92 W2CC
91 KV4AN
KB3OOJ
90 WA2CUW WB4BIK W3GQJ W8IM K1JPG KF4WIJ KI4JQB WD8DHC W8IVF KA8WNO WD8Q N8OD N8DD WB8SIQ KG1A N3SW WE2G KA1RMV KA1GWE WØCLS KD7ZLF WB2IJH KC2PFV N1JX WB6OTS N3ZOC KB3LFG
89 AB5WF W8CPG AL7N KK7TN
88 NA7G
83 WA5OUV
82 AA4BN KB5PGY
81 KA4LRM W9XAN
80 W5XX KE5DKV NØMHJ W5CU K8KV K3IN KA4LRM
79 WDØGUF K8ZJU
78 NR2F
77 W4CAC K1HEJ
76 K8GA W4NTI WA1JVV
75 KD7THV KG2D
74 W4QAT
73 W4DGH
72 KBØDTI
71 K6RAU
70 W4YE KAØFUI KØDUW WØWSP NØDUW NØDUX KCØZQC NØNLE KB7ZUP

The following stations qualified for PSHR in previous months but were not recognized in this column: (Jun) KA2ZNZ 349, N2LTC 310, W2MTA 284, KD1SM 270, K2DYB 245, AK2Z 230, WB1CHU 224, KB2ETO 189, N2JRS 187, KI4RBB 180, K2ABX 168, KC2MQU 150, KA2GJV 145, KC3SX 125, K6XLT 120, KC2PCG 118, K2AN 100, AF2K 94, N3SU 90, WB2IJH 90. (May) KA2ZNZ 335, K2DYB 320, N2LTC 310, W2MTA 222, KB2ETO 209, K2ABX 197, AK2Z 180, KC2MQU 160, KA2GJV 137, K2AN 100, K6XLT 100, AF2K 98, K2GD 90, WB2IJH 90, N2OMK 89, N2JRS 74. (Mar) K2DYB 400.

Section Traffic Manager Reports
July 2007

The following ARRL Section Traffic Managers reported: AK, AL, AR, AZ, CO, CT, EB, EMA, ENY, EPA, EWA, GA, ID, IL, LA, KS, MDC, MI, MN, MO, MS, NC, NFL, NH, NLI, NNJ, NNY, NTX, OH, OK, OR, SC, SFL, SD, SJV, SNJ, STX, TN, UT, VA, WI, WNY, WV, WY.

Section Emergency Coordinator Reports
July 2007

The following ARRL Section Emergency Coordinators reported: AK, AR, AZ, EMA, EWA, GA, KY, IL, IN, KS, LA, MDC, ME, MI, MO, NC, NNJ, NV, OH, OK, SD, SFL, SJV, SNJ, STX, SV, VA, WTX, WV, WWA.

Brass Pounders League
July 2007

The BPL is open to all amateurs in the US, Canada and US possessions who report to their SMs a total of 500 points or a sum of 100 or more origination and delivery points for any calendar month. All messages must be handled on amateur frequencies within 48 hours of receipt in standard ARRL radiogram format.

Call	*Orig*	*Rcvd*	*Sent*	*Dlvd*	*Total*
WB5ZED	18	1545	1841	33	3437
W4ZJY	0	1034	993	0	2027
N1IQI	0	341	1184	0	1531
KA9EKG	54	698	654	38	1444
W8UL	0	524	631	4	1159
W1GMF	0	156	991	0	1147
WB5NKC	58	223	759	4	1044
WB5NKD	23	136	118	0	877
KW1U	0	406	407	0	813
KK3F	17	398	388	10	813
N1UMJ	25	356	360	6	747
KA5KLU	0	368	333	0	701
W4UEF	8	215	2	430	655
KB9KEG	3	289	34	289	615
N8IXF	0	329	270	6	605
WB9JSR	0	288	285	12	585
WX4H	0	313	261	8	582
KK5GY	0	246	52	230	528
N2LTC	0	253	235	37	525

The following station qualified for BPL with 100 or more originations plus deliveries: KK5GY 214. The following station qualified for BPL in June but was not recognized in the appropriate month's column: KA9EKG 1428.

W3ZZ

THE WORLD ABOVE 50 MHz

Contest Musings

As a follow-up to the last column, this month I would like to discuss a few contest related issues.

Value of Rovers

Everyone knows that by going to rare grids and providing many extra contacts, rovers greatly increase the fun in VHF contests. In the less populated sections, in a contest with little or no 6 m E-skip, they are often what keep the contest going when you have worked out the few dozen stations within normal range. But have you ever wondered just how valuable they are to your final score? I have, and for this past June I analyzed the K8GP log by comparing the score and total QSOs (Qs), Q points and grids in the submitted score versus a log from which all rover contacts were deleted. The results of several comparisons are shown in Table 1.

We operate in an area where there is quite a bit of rover activity. By actual count, we worked 41 different rovers at least once in June. While 6 m E_s conditions were sub par, tropo was excellent, so to get an idea of what can be worked with enhanced propagation we should eliminate five rovers worked on 2 m and above in the enhanced zone and four rovers worked over 1000 km away only on 6 m. That still leaves 32 rovers plying their trade in New England, the mid-Atlantic, TN, OH/MI and VE3.

Fully one-sixth of our contacts came from rovers. Without their contribution, our score would have been reduced by over 31%. They supplied an additional 889 Q points and 71 grids. Many rovers activate bands from grids that would otherwise not be worked, especially on the microwave (MW) bands. The major contribution was on these bands: almost a third of the MW contacts, over a third of the grids and over 40% of the Q points. Still it is a tribute to the growth of MW activity that non-rovers supplied 177 of 300 contacts.

So beyond making the contest more interesting, rovers provide an important chunk of everyone's score. Operating as a rover is not an easy task, and given the price of fuel, not cheap either. So, we Grid Pirates raise a flagon of ale to ye; we couldn't do without ye.

El Roboto

Those who tried to submit logs immediately after the June VHF contest found that the ARRL robot is not always accommodating. Operators received extended error messages, which at first glance implied a new Cabrillo format was now required, without any indication of exactly what. Problems were detected with band and mode identifiers and 6-character grids were rejected. Odd messages appeared like, "I do not recognize 'FM' as a valid mode." It didn't recognize RY as a substitute for WSJT digital either. After some animated discussion on the VHF Contesting Reflector, the (incorrect) consensus was that the robot was now requiring some modified version of Cabrillo v.3.

Wrong approach! After I called ARRL Headquarters, I was told that the participants should use Cabrillo v.2 format, the same as always. But clearly that wasn't working. The code had been modified so that the robot would accept v.2 formatted logs but convert them seamlessly into v.3 format in a manner that should have been invisible to the participants. But there were undetected problems in the code because the new software was not checked sufficiently before the contest. Don't blame the software writer — someone else is supposed to do the beta checking whenever significant changes are made. If you don't get operational feedback in the software development process before public release, you are setting yourself up for failure. In the future let's hope they do more testing. They can do it since Logbook of the World, a vastly more complicated system, works pretty reliably.

What should you do if the robot appears to have indigestion? Don't panic! If you get back a message with just a few errors, read the error messages. They are usually quite informative and if you do what they say, your log will go through properly. If you receive a huge error message, however, it is likely something is wrong you can't fix. You need to contact the Contest Branch Manager so he can see that it is fixed. Then wait a few days to see if it is fixed.

Calling Frequencies in Contests

There aren't very many operating conventions in the VHF world. Who calls first and for how long in scripted exchanges like meteor scatter and EME, whether by analog or digital transmission; reserving the DX

This Month

October 3	432 MHz Sprint
October 7	Good EME conditions*
October 13	Microwave Sprint
October 18-20	Microwave Update, Valley Forge, PA
October 20	50 MHz Sprint
October 27-28	ARRL International EME Contest 50-1296 MHz

*Moon data from W5LUU

Table 1
The Role of Rovers in the Total Score and Microwave Performance at K8GP

LOG	*Q*	*Q pts*	*Grids*	*Total*
Submitted	2645	4024	602	2,422,228
– Rovers	2204	3135	531	1,664,685
	441	889	71	757,543
Percent	–16.7%	–22.1%	–11.8%	–31.3%
MW submitted	300	1057	131	
– Rovers	177	616	84	
	123	441	47	
Pct	–31.0%	–41.7%	–35.9%	

Δ = Difference between submitted score and score with rovers removed

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window for working DX on 6 m; and the use of specific frequencies for calling CQ during periods of inactivity are among those that come to mind. All of these have specific reasons for their adoption. With extremely weak or sporadic signals like MS or EME, unless only one station is calling at a time, no one will ever be worked. DX signals are often weak and propagation is often squirrelly at best over long distances. So it makes sense to reserve a small amount of spectrum only for making contacts with DX stations.

This brings me to the use of calling frequencies. If the band is dead and there is no activity, it would be useful to have a single place to call CQ, where everyone would listen. Once contact is made the stations are supposed to QSY off the calling frequency far enough that they will not interfere with someone else calling on the calling frequency. [Hint: this means more than 5 kHz; 20 kHz would be better.] But what if there is activity — actually a lot of activity — which is the case during contests? Here we will consider only 6 and 2 m because the vast majority of contacts on the bands above those are made these days by passes from either 6 or 2 m.

The choice for 6 m is the lesser problem. First, many newcomers, being HF converts, have always tuned because if they didn't tune they wouldn't work anyone on HF. Most, but not all, longtime denizens of the magic band have also learned to tune. So there is no preferable frequency on 6 m. Second, it can get awfully crowded around 50.125. There is no lack of big stations with large antennas that operate around 50.127, and whose sidebands render the 6 m calling frequency a cacophonous zoo. Finally, 50.125 is the edge of the 6 m DX window. Sidebands from 50.125 bleed down into the DX window, something that is to be avoided if possible.

What about 144.200 MHz, the 2 m calling frequency? In the Northeast corridor, the calling frequency and for several kilohertz on either side is an absolute mess. There are obviously stations that use those frequencies, but at K8GP we have tried 144.196, for instance, and found it difficult to make contacts toward the population centers. Since every contact we make in New England approaches 600 km or more, that is not so surprising. We have found something in the 144.180 to 144.185 range a lot more useful. But operating habits on 2 m are very regional. In the Northeast, everyone has learned to tune around. On non-contest days the calling frequency is used for calling in a classical manner, complete with QSY. For those who forget, and ragchew on the calling frequency, someone is sure to remind them to move.

What happens south of Virginia or west of the Appalachians? One has only to read the recurring threads on the VHF reflectors to get the answer. Although everyone decries the practice, almost no one tunes off 144.200 MHz. They act as if their VFOs were rusted in place. The serious VHF contesters in those regions do tune, and so if you are in a location where you can reach them under normal conditions, you will work them. But the vast majority of stations in those regions, even if you were capable of working them, would never find you. They are listening on 144.200 and they never move. And it's worse when the opening appears not to have been strong enough for the smaller stations to realize that enhancement was there.

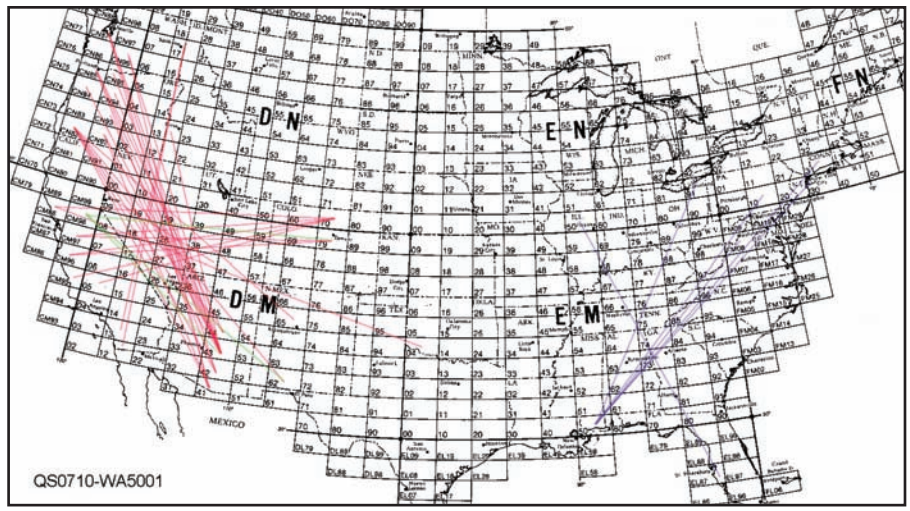

Figure 1 — Two meter E_s openings of July 10-11 (Blue) and July 14 (E_s = Red; FAI = Green).

None of this causes any problem until there is enhanced propagation. Aurora is no problem because those stations do tune. [Or maybe, since you seem to always work the same stations in an aurora, they are the only ones who tune?] Tropo openings present a real problem — a clash of cultures if you will — between those who tune and those who don't. How can you reach the stations who don't tune without staying on the calling frequency? The answer is, you can't. At K8GP this June, once we realized that the band was enhanced to the west, we found that every time we moved even a few kHz off 144.200 MHz, the rate immediately dropped to zero. When we returned to 144.200 we would work stations again. So after a few fitful moves up or down, we remained on 144.200 for quite a few hours. Is this something we like to do? No. Did it give us a lot of contacts toward New York and New England [we transmit in three directions at once and can listen on any combination of antennas]? No indeed, and as usual, the opening to the west locked us out of much to the Northeast.

Given the choice of working mostly the same large stations we always work and missing all the others not only on 2 m, but not having them to pass to the higher bands, we chose to stay on 144.200. This may have made some people unhappy but a contest is a competition and the calling frequencies serve no useful purpose when there is a decent amount of activity.

ARRL VHF Contest Records

Would you like to know the highest scores in each category made in each call area in the June and September VHF QSO Parties since grid squares were adopted for use in the contest? Thanks to the efforts and data of Curt Roseman, K9AKS, and Webmaster Andy Zwirko, K1RA, you can, by going to **www.vhfscores.info**. That URL is linked from the World Above 50 MHz Web page at **www.arrl.org/qst/worldabove/**. The highest number of grids and highest number of contacts by band and call area should have been added by the time you read this. Take a look — it's a fascinating set of data.

ON THE BANDS

The highlight this month is one of the most sustained North American E_s openings in recent memory on July 29. This came too late in the month for the detailed coverage it deserves so look for it next month, along with a recap of the summer 6 m DXpeditions.

6 Meters

We return to the details from June, for which we had no space last month. First look at the summaries reported last month. Then note that June was marked by a few really good days for working DX. The last week of the month was outstanding after a disappointing Field Day. The big day was June 25, with US stations well into the Midwest, Southwest and West working more than 24 European countries. Fred, K3ZO, reports that the FMTV DXers heard transatlantic signals as high as 83.259 MHz. Mario, K2ZD, had 59 Qs in 21 countries. Ken, AC4TO (EM70) worked 105 Europeans with an ODX to SP4MDB (KO03). Vic, WB4SLM (EM82) had 50 in 2.5 hours. Sam, K5SW (EM25) had

8 European countries; John, W5UWB (EL17) had 7; John, AA5JG (EM04) worked CT/CT2 and Bob, W4GCB (EM73) worked 6. In the Midwest, Chuck, KG9N (EN50) had 17 Europeans in 3 countries; Jay, KA9CFD (EN40) worked 18 in 6 countries, Bob, W9JDT (EM79) worked 5 in 4 countries and Steve, WA9JNM (EN60) worked his first Europeans (5) with 10 W. Farther west, N2IC (DM62) worked CT and Jerry, W6XI (DM42) worked CT and ON. California worked no Europeans that I saw but later that day K6QXY (CM88) worked several JAs.

The following day, June 26, started well to Europe with Bill, KØHA (EN10) working SV1DH; Carl, AA4H (EM86) working 6 European countries, Steve, W5KI (EM36) working 4 and W4GCB, WB4SLM and K5SW adding to their previous totals. Bill, WAØKBZ (EM48) worked his first European of the season via digital modes. The band faded in that direction, to be followed by an enormous transcontinental double hop opening for the rest of the day. Larry, W6OMF (DM98) worked 25 double hop grids and Tom, N6RA (CM87) worked 50 double hop two way E_s Qs. Late on the 26th a strong and widespread JA opening developed. Jay, KØGU, had 27 JAs in JA1, 2, 3, 6 and 7; W5KI worked three JAs and AA5JG worked his first JA. As the JAs migrated across the Midwest, Al, K3TKJ (FM28) had a partial with JE1BMJ. The only East coast station to work JA on summer E_s remains N4BAA (FM16) from last year.

June 28-29 featured strong openings to the Caribbean, as noted by Pierre, VE2PIJ (FN35), WB4SLM and WAØKBZ. On June 30 there was a very long distance opening reaching far to the west. KØGU worked 23 Europeans in 10 countries. Ken, WØETT worked his first two E_s Europeans and reports contact with Europe by NØKE (DM69), KØDU (DM59), W7TS (DN70) and KU7Z (DN41) in Utah. Ned, AA7A (DM43) worked Europe for only the third time in 33 years and Paul, K7CW, worked Italy from the Pacific Northwest. KØGU reports that EA7KW worked stations in NV, ID and MT, all likely new states for José.

Overall, the second half of the month was much better than the first half. Strong Caribbean openings were noted by Dave, N3DB (FM18) and Larry, NØLL (EM09) on the 19th as far as northern Brazil for Dave, and by Owen, K3CB (FM28) on the 22nd, and by Paul, K7CW (CN87) and Dave, N7DB (CN85) on the 24th. Europe was open well to the west in the US on many days, as noted by Pat, W5OZI (EM00), Scott, W4SO (EL96), Terry, K4RX (EM70), Matt, W3UUM (EL29) and Vic, K5XX (EM21).

Turning now to July, I thank the propagation reflectors at DX Summit and **www.dxworld.com**, and correspondents K3XA, K4QI, K6LMN, KØHA and NØJK not otherwise mentioned. There was E-skip essentially every day, but not always very much. Someone in the States worked stations in the Caribbean 14 days and in Europe on 11 days or more. Double hop within the continental US was observed on 7 different days. The most widespread opening was on the 29th. Dave, N7DB reports over 8 hours of mostly double hop from the Pacific Northwest, and Brock, W6GMT/Ø (EN37) had a strong double hop opening into CA. Tad, K3TD (EM10) worked 64 grids with his new 6 m loop, and Al, KG4IRO (EL96) had a strong double hop opening into CA and the Northwest. From opposite ends of the US, Chip, K7JA (DM04) and David, N2SLO (FN31) enjoyed the strong double hop opening on the 26th. European DX was spotty and appeared to favor southern tier stations such as Bob, W4GCB (EM73), Vic, WB4SLM (EM82) and John, W5UWB (EL17). KØGU (DN70) picked up only a few Europeans this month. OX was in evidence for Kaz, K8KS (EN82) on the 16th and 19th, and for Tom, N4TL (FM05) on the 21st. One of the best days was July 21 during the CQ WW VHF contest when Lefty, K1TOL (FN44) worked 11 European countries and EA8.

2 Meter E-Skip

Shelby, W8WN, notes that the **www.dxworld.com** reflector reported two reflecting E_s clouds around 00Z July 11. EL96 worked FN10, 30, 31, EN92 and FM08. At the same time EN50 was working EL87. On July 14 there was a strong opening centered in the West. This one had orthogonal paths N/S and E/W and appeared to last for almost 2 hours. Ned, AA7A (DM43) worked 9 grids in the Pacific Northwest (PNW) and CM98 via FAI. Al, K7ICW (DM62) worked into CN82, 93, 94, 95 and CM98 (FAI). In the PNW, Frank, K3UHF (portable in CN92) worked three stations in AZ/NM with a 2-m halo and 100 W. Paul, K7CW (CN87) worked DM41, 42, 43 in AZ. Doug, W7MQY (CN82) was into DM41, DM42, DM43, DM44, DM62 and DM65 in AZ and NM. A summary from N7DB notes contacts from the PNW to DM41, 42, 43, 44 and 65 as well as DM09 to DM37 and DM13 to DN17. In the E/W direction KØGU worked nine stations in DM05, CM88, 95, 96, 97 and Greg, KJ6KO (CM98) worked DM43, 62 and 79 via FAI. Figure 1 shows the 2 m E_s map.

Tropospheric Ducting

Marshall, K5QE (EM31) notes some excellent 2 m tropo as far as eastern Ohio during the CQ WW VHF contest on July 21 and 22. At K8GP (FM08), tropo conditions were flat except for a very short opening to EL96 in eastern FL on the 22nd. On the 23rd, Edd, N8LIQ (EN56) in the Michigan Upper Peninsula worked EM36, 48, EN40 and 50.

HERE AND THERE

2007 ARRL International EME Contest

This contest's second full 48-hour period covers 50 through 1296 MHz from 0000Z to 2359Z October 27-28 on CW, SSB or digital modes. Major changes in the categories, use of packet cluster and loggers among other items have been made in the rules described in the September column. Participants are urged to read the full set of rules at **www.arrl.org/contests/rules/2007/eme.html**.

FROM RN6BN'S WEB SITE, **WWW.73.RU/EQUIPMENT/144_64/144_64_3.JPG**

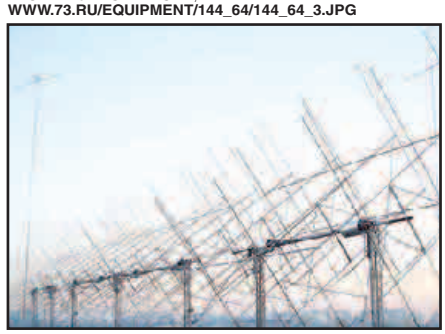

Figure 2 — The ARRL EME Contest is under way and even small stations have a chance to do moonbounce. Here is currently the largest 2 meter EME array, used by Sam, RN6BN (KN95) — 64 15-element cross-polarized Yagis stacked 4 high and 16 wide.

Fall Sprints

The 432 MHz Sprint is October 3 from 7 to 11 PM local time; the Microwave Sprint is 6 AM-12 noon October 13; and the 50 MHz Sprint is 2300Z October 21-0300Z October 22. More complete details were in last month's column.

Microwave Update (MUD)

The 2007 MUD in Valley Forge, Pennsylvania is sponsored by the Mount Airy VHF Radio Club (Pack Rats), one of the best known VHF/microwave clubs. Festivities begin October 18 and technical presentations extend from the 19th to the 20th. This is the premier microwave event of the year. Full details are available at **www.microwaveupdate.org**. QST

VHF/UHF Century Club Awards

Compiled by Eileen Sapko
Awards Manager

The ARRL VUCC numbered certificate is awarded to amateurs who submit written confirmation for contacts with the minimum number of Maidenhead grid locators (indicated in italics) for each band listing. The numbers preceding call signs are the assigned award numbers. The numbers following the call signs indicate claimed endorsement levels. The totals shown are for credits given from June 9 to August 9, 2007.

The VUCC application form, field sheets and complete list of VHF Awards Managers can be found on the VUCC Web site at **www.arrl.org/awards/vucc**. An SASE to ARRL is required if you cannot download these forms. If you have questions relating to VUCC, send an e-mail to **vucc@arrl.org**.

50 MHz
100

1572	N3AIU/DM45
1573	AC0FT
1574	KC0MEA
1575	N4CAG
1576	LA2QM
1577	K8ZIZ
1578	CT3FT
1579	WA2IIE
1580	K8VFV
1581	KC5GSK
1582	KI4TZ
KØCS	525
NØAKC	325
KAØJGH	650
N4HN	375
N4CH	800
K4CMS	200
WD5K	1100
K5UR	1100
WA5LFD	350
KB6NAN	700

144 MHz
100

676	EB3JT
677	W9VNE
NØAKC	275
KC6ZWT	225

222 MHz
50

136	KC6ZWT

432 MHz
50

322	KØVXM

5.7 GHz
5

57	W4ZRZ

24 GHz
5

32	W6OYJ

Satellite
100

157	K4CMS
158	EB3JT

QST

W3UR

HOW'S DX?

3C — Equatorial Guinea

Equatorial Guinea is a small nation in West Africa between Cameroon to the north and Gabon to the south.

The Republic of Equatorial Guinea (formerly known as Spanish Guinea), located in West Africa, is made up of two parts: Mbini, which is positioned on the African mainland between Cameroon (TJ) on the north and Gabon (TR) on the east and south, and Bioko Island (formerly Fernando Poo), which is about 100 miles NW of Mbini. Bioko is also the seat of the Equatorial Guinea capital city of Malabo.

Bioko Island was discovered by the Portuguese in 1472. The island and the mainland were ceded to Spain in 1778. In 1827 the island of Bioko was under British administration but was later returned to Spain in 1843. Equatorial Guinea gained limited self-government status in 1963 and full independence by 1968, under the dictatorship of its first president Francisco Macías Nguemo in 1971. During this period of time the country was nicknamed "the Auschwitz of Africa" as the brutal dictator had many political executions as well as multiple acts of genocide. On August 3, 1979 the "President for Life" was overthrown in a coup led by his nephew Teodoro Obiang Nguema Mbasogo, who has been the President ever since. His uncle was tried and executed on September 29 of that year.

Equatorial Guinea was listed on the original DXCC list in November 1945 as Spanish Guinea with the first activities during the early '50s using the prefix EAØ. By 1969 the prefix had changed to 3C. Equatorial Guinea is the parent DXCC to Annobon Island (3CØ), formerly Pagalu Island, which was not added to the DXCC list until 1971. Annobon is the rarer of the two DXCC countries.

Elmo, EA5BYP, announced a DXpedition to Bioko Island (AF-010), Republic of Equatorial Guinea. It has been about five years since the last activity from this semi-rare one. The 3C7Y operation is expected to take place October 5-14. Team members of this one include KH7Y, EA5YN, EA5BRE and EA5BYP. Plans are to have two stations QRV for 10 days on all bands on CW, SSB and RTTY. "We will have 6 meters with us and will be QRV SSB/CW with 100 watts and a 5 element antenna" says Fred, KH7Y. The QSL manager will be EA5BYP.

NOT JUST ANOTHER DXPEDITION: LIBERIA 2007

By Arie Kleingeld, PA3A

What inspires people to travel to a country, where others advise you not to go, where it is much too warm, where there's hardly any comfort, no standard gas, electricity or water and where you are ashamed yourself that you are so rich. What inspires people to sacrifice their holidays for benevolence, pay for their travel and stay, and work hard everyday (except Sunday), often under cumbersome circumstances.

Fortunately these people exist. An organization which facilitates this, and that itself is run by volunteers, is Mercy Ships. Mercy Ships programs promote health and well-being by serving the urgent surgical needs of the forgotten poor, and empowering developing communities. For this Mercy Ships uses seagoing hospital ships. On these hospital ships and bases ashore volunteers use their professional skills to make a difference. The new flagship of this organization is the *Africa Mercy*. With six operating rooms, laboratories and patient rooms for 78 patients, 7000 operations can be performed per year and teams can go ashore to carry out different projects. At this moment the *Africa Mercy* is visiting the African country Liberia, which is being rebuilt after a number of tearing civil wars.

A Dutch group of radio amateurs, united in the DAGOE (Dutch Amateurs Going On Expedition) Foundation, will support the work of Mercy Ships and at the same time help the Liberian radio amateur community. During the first week of October Arie, PA3A; Henk, PA3AWW; Ad, PA8AD, and Arie, PA3AN, will leave for Africa. The goal is to bring Liberia as a DXCC entity on the air on all HF bands on SSB and CW, and at the same time bring the good work of Mercy Ships to the attention of the worldwide Amateur Radio community so that their projects will get more worldwide support.

Very special about this DXpedition is that the sponsoring (for example QSL green stamps or operating material) will be partly donated to the Liberian radio amateur community and partly to the rebuilding and development projects of Mercy Ships in Liberia. The expedition will arrive in Liberia on October 3 and a couple of days later will be on the air. Departure date is set for October 24.

For further information about this DAGOE DXpedition, its objectives and sponsorships, see **www.liberia2007.com**. Further information on the DAGOE Foundation is at **www.dagoe.com**. QSL via PA3AWW.

The flagship of Mercy Ships: the *Africa Mercy* in the harbor of Rotterdam, the Netherlands, before leaving for Liberia.

KOSOVO

B92, a Serbian news agency, says Reuters is reporting Kosovo's Prime Minister Agim Ceku said "The province should declare unilateral independence from Serbia on Novem-

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Liberia DXpedition team members: Standing left to right Arie, PA3AN, and Henk PA3AWW. Sitting left to right Ad, PA8AD, and Arie, PA3A.

ber 28." This after months of what he calls "a Western bid to steer its secession through the United Nations had failed." Ceku is now recommending for the Kosovo Parliament to "adopt a resolution setting the date on his return from Washington." Kosovo has been a UN protectorate (UNMIK) since 1999. The November date is not official but it does raise the level of significance. DXers will no doubt be closely following this one.

DX NEWS AROUND THE GLOBE

4K — AZERBAIJAN

Leon, 4K8F, plans to operate in the CQ World Wide RTTY DX Contest on September 29 and 30. He'll do single-op all-band. Leon also has plans to operate the CW event November 24 and 25 in the same category. QSL via 4K8F.

4O — MONTENEGRO

Ranko Boca, 4O3A (ex-YT6A), reports as of July 16, 2007 all Montenegrin Amateur Radio operators' old Serbian calls have expired. Amateur Radio ops from the fledgling nation have been or will be assigned the new 4O (Four Oscar) prefix call signs. Dragan Djordjevic, formerly YT6Y, is now 4O4A. The International Telecommunication Union (ITU) assigned Montenegro the 4O prefix in mid-May 2007 and took back Serbia's 4N and YZ prefixes. Serbia is no longer using the 4O prefix. No word on when Serbia will discontinue using the old YZ and 4N prefixes, which the ITU has taken back for future use.

6W — SENEGAL

Jovica, T98A (ST2A/ST0RM) left the Sudan in July and has a new assignment with UNHCR (United Nations High Commissioner for Refugees) in Dakar, Senegal, effective September 1. His new assignment will cover all of West Africa and he hopes to activate most of the countries in the region.

8P — BARBADOS ISLAND

G3RWL will be operating as 8P6DR from Barbados between September 23 and October 13.

8Q — MALDIVES

Andrew, G7COD, will be QRV for the third time from Embudu, South Male Atoll, Maldives as 8Q7AK for approximately two weeks during the beginning of October 2007. The exact dates and expected frequencies will be given prior to departure. "Note that all QSLs received from the last 2 activations of 8Q7AK in October 2006 and January/February 2007 have now been posted direct if IRC or Green Stamp included" reports Andrew. Those with no IRC or $ will be returned via the bureau. All QSLs received via the bureau will also be sent the same way.

C5 THE GAMBIA

The OMØC Contest Crew is planning an expedition to Gambia, C5. The six ops will be there October 17-30, 2007, operating on 160-6M, emphasizing the low bands, especially 160. The call sign will be C52C. They will have up to four stations on the air all at once and will be in the CQWW SSB. For more: **www.om0c.com/gambia**.

EI — IRELAND

In celebration of the 75th anniversary of the founding of the Ireland Radio Transmitters Society (IRTS) a 24 hour jubilee will take place September 29 and 30. The CQIR event will begin at 1200Z on the 29th. One lucky participant will win a trip to Ireland. Check out the complete rules at **www.irts.ie**.

OHØ — ALAND ISLANDS

The CQ RTTY Contest will take place on September 29 and 30 and Juha, OH9MM, is expected to be operating as OHØZ. QSL via WØMM.

P2 — PAPUA NEW GUINEA

Hans, SM6CVX, updates us on the upcoming IOTA DXpedition to several Papua New Guinea islands taking place in late September and early October. G4EDG and CT1AGF will be joining SM6CVX and G3KHZ for their IOTA trip to Papua New Guinea September 23-October 5. They will sign P29VCX from Nukumanu Island, OC-284, September 23-29 and P29NI from Takuu Island, OC-283, September 30-October 5. They may then go to the Tulun Islands, OC-256, October 6-9, call sign not determined yet. Look for them on all bands, including 160 and 80, with three stations, two amps, verticals and a multi-band dipole. QSL P29VCX via SM6CVX and P29NI via G3KHZ.

T31 & T33 — CENTRAL KIRIBATI & BANABA

Toshi, JA8BMK, is scheduled to go to Canton Island in Central Kiribati and operate as T31XX in late October. He will stay a minimum of one week, maybe as much as two, and will operate on 160-6M SSB, CW and RTTY. Toshi has started putting the equipment together, generator, antennas, food, for another trip, Tarawa in Western Kiribati. He plans to leave Japan in September for T30, via 3D2, and will leave T30 for T31 in mid-October, reaching T31 after a week of sailing. He may be able to get on for the CQWW phone contest. Toshi says if he has extra time he will visit Banaba Island and operate as T33ZZ, before or after T31. He says the tour is very costly if he goes along, so he is looking for anyone else who may have time to go along. He says all the call signs are in order, assigned last year. And donations are very much appreciated. His phone or fax is 81-135-21-6711.

T8 — PALAU

Francesco Di Michele, I2DMI, and his wife Giovanna plan to spend their Christmas Holiday in Palau. Frank plans to be QRV as T88RY on RTTY only December 26-January 1. While there he'll be putting an emphasis on working Europe and North America in his spare time. He is looking for comments on propagation, which can be sent to **t88ry@yahoo.com**. In September Frank will update his T88RY listing on QRZ.com including suggested frequencies. He will also have an online log search. QSL via I2DMI, Francesco Di Michele, PO Box 55, 22063 Cantu, Italy.

V3 — BELIZE

V31FB, Belize, Ambergris Caye, NA-073, will be on October 25-31, with W5JON and his wife, W5HAM, on site. John will be on 160-10M SSB in the CQWW SSB. He says years ago his wife Cathy said he could operate any contest from anywhere, "as long as it is warm and there is a beach." This will be their fifth year on Ambergris Caye. QSL to their home call signs.

VK9L — LORD HOWE ISLAND

Haru Uchida, JA1XGI/W8XGI, will be on the air October 19-22, just 3½ days, from Lord Howe Island, with the call sign VK9GLX. Haru will be on 40, 30 and 20M. He has asked for permission for lower bands. His modes will be CW, SSB, RTTY and SSTV. QSL via JA1XGI, bureau or direct, or W8XGI direct only.

YK — SYRIA

Amateur Radio operators from Syria will be celebrating the 60th anniversary of Amateur Radio in YK. To commemorate the event Amateur Radio operators from Syria will be using special prefix 6C6Ø (that is Six Charlie Six Zero) October 15-November 11.

Z3 — MACEDONIA

Operators from Macedonia's Radio Club Nikola Tesla, Z37M, ex-Z3ØM, are using a special call sign, Z36ØM (three numbers in the call) through the end of the year. This marks the 60th anniversary of the club in Stip, Macedonia.

ZD7 — ST HELENA ISLAND

Tom Callas, KCØW, has a new call sign, ZD7X. Tom is moving from Minnesota to St Helena Island September 5 for a long stay. He plans to be on the air by September 15 and will be on all bands 160-6, CW, SSB, RTTY and PSK. He will give special attention, he says, to 160, 80 and 30, taking part in all major contests and general DXing.

WRAP UP

That is it for this month. A special thanks to 4O3A, EA5BYP, I2DMI, JA8BMK, KCØW, KE3Q, PA3A, SM6CVX, W4VQ and *The Daily DX*. Keep sending your DX news, DX Club news letters, photos and tidbits to **w3ur@arrl.org**. Until next month, see you in the pileups! — *Bernie, W3UR* QST

Feedback

◊ *Clarification:* Two clubs actually sponsored the special event Field Day operation at which Delaware Governor Ruth Ann Minner made a few contacts ["This Just In," Sep 2007, p 13], but only one was mentioned. The W3D FD special event was cosponsored by the Sussex ARA, KB3BHL, and the Nanticoke ARC, W3TBG. — *tnx Joe Stormer, W3TL*

◊ In Figure 2 of "The Doctor is IN" [May 2007, p 52], K1 and K2 upper contacts should be shown as NC.

◊ Table 3 of "Construct a Rugged, Easy to Build, 2 Element Yagi" [Aug 2007, p 33] has an incorrect dimension for the (half) driven element of the 15 meter wire Yagi. The correct dimension is 131.5 inches.

◊ In "The Doctor is IN" [Sep 2007, p 51, top of second column], "likely draw 50 to 60 W," should be "likely draw 50 to 70 A," corresponding to Figure 1.

◊ In "Hands-On Radio" [Sep 2007, p 57], the marking "103" actually means 10×10^3 pF, not 1×10^3 pF. The value is 10,000 pF = 10 nF = 0.01 µF. — *tnx Louis Carrier, VE2EZD*

K2TQN

OLD RADIO

Sputnik Launched October 4, 1957

And the world listened 50 years ago to the *beep-beep* on 20,005 kHz.

ARRL broadcasts asked hams to listen and log, then forward the information to the US Naval Research Laboratory. But by Monday, October 7 the NRL had things in hand and said, "Due to increasing number of Minitrack fixes on USSR satellite readings by amateur and volunteer observers are no longer required. The U.S. Naval Research Laboratory expresses its thanks for the splendid cooperation provided by these amateur and volunteer observers."

According to information at **www.csir.co.za/**, "...NRL designed and manufactured a precision radio interferometer tracking system, code named 'Minitrack.' The Minitrack system was capable of determining the origin of a radio source in space accurately, to one thousands [*sic*] of a degree."

This was big news in the Atlantic City High School Ham Radio Club. Wanting our own bragging rights, my friends Bob Daughenbaugh, Leroy Rankin (SK) and I made plans to monitor 20,005 and tape record *Sputnik*. Since I had a ham-band-only receiver, we decided to set up at Bob's home and use his Hallicrafters S-40B and his 160 meter long wire antenna. Leroy brought his father's tape recorder and so the adventure began. Using Bob's 40 meter transmitter with a Novice band crystal, we determined where his third harmonic was on the S-40B's band-spread dial, then back tuned to where we thought we would hear *Sputnik*. We had a rough idea what time it would fly over from Mr Anderson, the teacher in charge of the ham club, and we listened and tuned back and forth.

NASA

I'll never forget the thrill when we heard the *beep-beep*, weak at first, then gaining signal strength it got louder. We placed the tape recorder microphone in front of the speaker and recorded the episode.

The next day in school we impressed all our friends when we told them we had heard *Sputnik* on our ham radio that evening.

Time passed and I almost forgot about *Sputnik*. Then one day I purchased a box of radio papers from an estate, which reminded me. Within the box was a reprint of the story about the US Army's efforts to hear and track *Sputnik* the very evening it was launched.

The paper was titled: *From an Early Sputnik Diary* by Harold A. Zahl. (Dr Zahl was the chief Scientist at Camp Evans.) I made reference to this paper in my February 2004 Old Radio column.

His story reads in part:

> Then, one pleasant evening in 1957, October 4, to be precise, I retired very early, having had only two hours sleep the night before, when with the suddenness of a small rubber carnival balloon bursting, Ivan the Necromancer rudely set off an alarm clock which both literally and figuratively was heard around the world. Electrified by this news, Hans Ziegler called my number but the household slept on. Hans then called Bill Stroud, who tried my number again, this time with success, and having wakened me, he picked me up and the two of us drove rapidly 20 miles to the home of Edward Rich in Farmingdale, N. J. There at 2148 hours, I heard the first of the BEEPS. Ed Rich was all set for this drama, for he had a Collins R-390 warmed up as part of a communications net which kept contact with a Laboratory team firing IGY rockets at Fort Churchill, Canada. We made tape recordings (and downed a bottle of medicinal Bourbon, too) as we listened through most of the night in sleepy dismay and amazement. Long after midnight, with many rudely-awakening phone calls, I set up an emergency meeting in my office at 0800 hours, Saturday, October 5, calling in 20 top Signal Corps communications people for consultation.
>
> Together, we pondered what should be done with these stray 20- and 40-mc signals coming in at us from above and from every direction.
>
> Our decision was simple...we would ourselves declare a state of National Emergency due to an "invasion." This also served to "legalize" our many subsequent actions which the more upright among us (like Major General Earle F. Cook and Colonel Paul W. Albert) were concerned about. After all, we had no legal project set up for tracking Russian satellites. We knew the IGY net, then at 108 mc, would take days for conversion to the Soviet frequencies, but within our own Laboratory, we had an immediate potential, and Duty called desperately.
>
> By Saturday noon, October 5, our small select group of Signal Corps R & D personnel at Fort Monmouth knew their jobs. They also knew that no overtime was authorized, and knew, furthermore, that they were to arrange, within their own resources, ways and means for keeping their respective parts of our new research program running at 24 hours a day, seven days a week, until we knew all there was to be learned from the mysterious electronic invader carrying the hammer and the sickle.

This rare paper is 2500 words long, too long for this column. To read this significant story of American Space and Radio history, to hear *Sputnik* and to see some other related information, please visit my Web page, **www.k2tqn.com**.

John Dilks, K2TQN ♦ 125 Wharf Rd, Egg Harbor Township, NJ 08234-8501 ♦ k2tqn@arrl.org

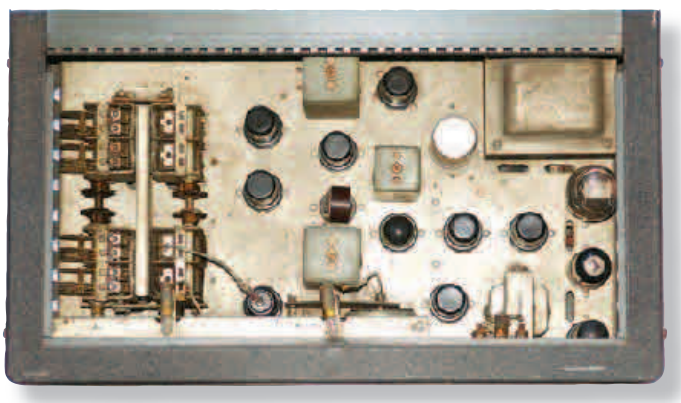
My Hallicrafters SX25

The SX-25 Super Defiant receiver was a popular post-war receiver that was, no doubt, used to listen to *Sputnik*s by hams everywhere during October 1957. I picked this one up from an old friend's family after he became an SK. It had been one of his favorites, but was stored in his cellar in later years as he graduated to SSB and modern transceivers. First licensed as W3EXB in the very early 1930s, Francis Fekel later became W2EXB when the call districts changed after WW II. Francis was a broadcast station engineer for most of his adult life.

I decided to donate his receiver to the ARRL for its Auction fund-raiser this fall. According to ARRL Business Services Manager Deb Jahnke, K1DAJ, the second On-Line Auction will get under way shortly [October 24, to be exact.— *Ed.*]. Auction proceeds will benefit ARRL educational programs and services. I'm hoping you will participate in this fund-raiser, and whoever is the winner of my SX-25 will contact me after its restoration.

I will say the overall condition of this receiver is cosmetically good, but it needs electronic restoration, recapping, power cord, etc. (I never plugged it in or tried it.) The front panel is very good and will probably not need any restoration. The cabinet is fair to good with a few scratches and rubs. The Art Deco metal fins need a good cleaning, as there is some very light rust on them. The matching speaker is also fair to good needing a touch-up and a good cleaning.

Last year's auction produced some very nice Boat Anchors and some were sold at exceptional prices, such as the Utah Jr described in the March 2007 Old Radio column. — *K2TQN* QST



Strays

OHIO-BASED FREQUENCY MEASURING TEST OCTOBER 13

◊The first annual Midwest VHF/UHF Society (located in Southwest Ohio) Frequency Measuring Test will be held Saturday, October 13, 2007. There will be two transmission periods: the first at 14:30 EDT (1830 UTC) and the second at 21:30 EDT (0130 UTC Sunday). Transmissions will be on the 80, 40 and 30 meter amateur bands from Dayton under the call sign W8KSE.

Our goal is to transmit a signal known in frequency to parts in 10e-12 (that is, less than 0.0001 Hz error at 10 MHz) and stable to at least that level during the course of the transmission. The transmitted signals will also have very low phase noise. Frequencies will be measured at the transmitter site with a system capable of microhertz resolution referenced to a GPS disciplined oscillator, and will also be monitored by another station in ground wave range that can measure the frequencies with similar accuracy.

The MVUS Frequency Measuring Test is intended to supplement, not replace, the ARRL FMT. Our transmission format is still under development, but we plan to offer significantly longer key-down times to allow not only accurate frequency measurements, but also propagation studies (for example, measuring Doppler effects as the ionosphere changes during the course of the test).

Further information, including approximate transmission frequencies, will be posted at **www.febo.com/time-freq/FMT**. You can also send e-mail with questions or comments (or, after the test, your results!) to **fmt@mvus.org**.

For discussion about off-air frequency measurement, we suggest you check out the FMT-nuts mailing list, sponsored by Connie Marshall, K5CM. For details, go to **tech.groups.yahoo.com/group/FMT-nuts/**. — *Tom Holmes, N8ZM*

Ruth Rice, K8ARA, and her daughter, Judy Talago, K8AVP, have the (more than likely) unique honor of both having been licensed for 50 years.

WB8IMY

ECLECTIC TECHNOLOGY

Emergency Power from a Hybrid Car?

A number of amateurs have gasoline-fueled generators that they use to supply emergency power to their homes. The problem with this approach is that you have to maintain the generator diligently, which includes firing it up on a regular basis to make sure it is working. ARRL Headquarters station W1AW has a large diesel generator that we test every week.

If a weekly test run is helpful, why not a daily test? How about several times a day? Impractical, you say? Not if your generator is also your car!

Richard Factor, WA2IKL, explains…

Emergency power generator, personal transportation, or both?

"Emergency power" usually means a cheap generator purchased at a home supply store. These generate a few kilowatts, enough to power essential appliances along with the ham station. At least they do when they work! Often they don't — stale fuel and lack of maintenance take their toll. But with the advent and impressive initial sales history of hybrid vehicles such as the Toyota Prius, there is a better alternative. These hybrids have high voltage "traction batteries" that are used to move the car, not just to power the accessories. They can provide 25 kW or more peak power at 200-300 V dc depending on the vehicle model. The hybrid auto automatically keeps them charged by intermittently running its efficient, non-polluting gasoline engine to maintain their voltage. The Prius can supply about 3 kW continuously and much more on peaks.

The key to using Prius (or other hybrid vehicle) power is what I call the *PriUPS* system. Ideal for hams and others with electrical skills, it involves getting a UPS (Uninterruptible Power Supply) and connecting it to the hybrid's high voltage battery. Ordinary computer UPS units that you see in the stores normally run on 12 V batteries and, in fact, can supply a few hundred watts using any auto's 12 V power system. But as you start going to higher power, the UPS battery voltage increases commensurately. There are a number of high-power, computer room UPS units that will run on the battery voltage available from a hybrid and supply anywhere from 5 to 25 kW at 115 V ac, 230 V ac, or both. Although these cost serious money when bought new, they can often be found on eBay for a few hundred dollars, or even less as the seller is sometimes just eager to get rid of them. Finding the correct one requires some patience and research, but there is rarely a week when appropriate ones aren't listed. By installing a PriUPS system in your house or garage, you can be sure of emergency power when needed to communicate, or just to be sure that your critical ice cream supply doesn't melt. Since you drive your car almost every day, you know that your "generator" will have fresh gas and be in good condition when needed.

The "home side" of WA2IKL's PriUPS power system. To get the full story, see Richard's Web site at www.priups.com/.

An additional boon: The great electrical capacity of the hybrid system has benefits for mobile operation. Running a kW mobile, at least in terms of dc power, is no challenge. Instead of tapping the small 12 V dc battery, you can use the traction battery and local dc-dc converters (eBay again) to obtain 12 V for the rig and higher voltage for a serious solid-state amplifier. See my Web page at **www.priups.com/** for complete details.

Digital Skeds on the Web

Thanks to the work of Joe, N8FQ, we now have a new method of interacting and arranging skeds for digital QSOs. It is modeled after the successful interactive pages run by Chris, NØUK, for *WSJT* digital meteor scatter modes. This is a great way to set up schedules to test various HF digital modes. You'll find the schedule page on the Web at **www.electroblog.com:8090/drsked/drsked.php**.

Blade Antennas

My July column stirred up some interest in the unusual HF/VHF "blade" antennas planned for use by the new Long Wavelength Array radio telescope. I contacted Dr Namir Kassim, radio astronomer and LWA Project Scientist at the Naval Research Laboratory and he pointed me to a series of online project "memos." You'll find the archive at **www.ece.vt.edu/swe/lwa**.

According to Dr Kassim, the antenna design is still evolving. Memo 36 describes tests on the blade antennas and gives their dimensions and geometry. A new lower-cost design is described in Memo 88. Note that Memo 36 refers to a "big blade" antenna, which is considerably larger than the small blade antenna that appeared in my June column.

Since the dipoles are electrically short over much of their operating range, a key component to their broad-band performance is an "active" balun. It is effectively a transformer incorporating an amplifier. Memos 19 and 81 take up this discussion.

If anyone tries one of these antennas in a ham application, write up an article and send it to *QST*! QST

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

SILENT KEYS

It is with deep regret that we record the passing of these amateurs:

K1AZH **Peabody**, Edwin C., Warwick, RI
W1DDK **Salloom**, Fred, South Hadley, MA
W1ENE **Roehrig**, Jonathan R., Ponte Vedra, FL
♦ WA1GEP **Donovan**, Andrew E., Lincoln, MA
WG1I **Cooney**, Michael S., Medford, MA
W1JEC **Leland**, Stuart, Hendersonville, NC
♦ K1KSY **Biro**, John R. N., Chelmsford, MA
K1LSV **Taylor**, Ernest T., Weymouth, MA
W1MB **Budlong**, Merrill P., Cranston, RI
WA1NVP **Martin**, Donald E. Jr, Saint Johnsbury, VT
♦ KA1RN **Schedler**, Spencer J., Greenwich, CT
WB2BAU **Veraldo**, George A., Norwood, NY
K2BXS **Pettit**, Ora J. "Buzz," Wilson, NY
KA2CMQ **Constantine**, James D., Russell, NY
WB2CRY **Veraldo**, Patricia R., Islip, NY
K2DZS **Yates**, Frank V. C., Seminole, FL
K2JIQ **Bennedum**, Donald E., Binghamton, NY
W2KYD **Finlayson**, James W., Lauderhill, FL
♦ AK2L **Monroe**, George R., Poughkeepsie, NY
WA2LAQ **Driscoll**, Richard J. Jr, Rochester, NY
K2LOD **Kreie**, Philip D., Roselle Park, NJ
WB2MBO **Buzzell**, John M. Jr, Sodus, NY
♦ K2NJ **Inkrote**, Bill, Flemington, NJ
WB2NTT **Ahrens**, Edith C., Nutley, NJ
♦ W2RKB **Braun**, Harry V., Dennis, MA
♦ WA2RXO **Ierlan**, Lois G., Ogdensburg, NY
KA2VCR **Dunstone**, Thomas E., Potsdam, NY
♦ WA2VSQ **Dages**, William G., Manahawkin, NJ
WB2YHP **Alley**, George, Webster, NY
KB2YUR **Stone**, Frank E., Modena, NY
W3CES **Lindsay**, James E., Tallassee, AL
N3CKJ **Randolph**, William J., Manheim, PA
KD3OF **Uzdavinys**, Sakalas V., Hatboro, PA
♦ K3UT **Moore**, George A. Jr, Annapolis, MD
KA3YCY **Wright**, Carol A., Coraopolis, PA
W3YJM **Gilbert**, Charles S. Jr, Ocean City, NJ
KC4BQC **May**, Haskell L. Jr, Fortson, GA
WA4CBK **Startup**, Paul R., Nashville, TN
♦ W4CDU **Herb**, John W., Ocala, FL
KS4DP **Barneycastle**, Andrew G., Gastonia, NC
K4EMH **Parsons**, John A., Tullahoma, TN
WB4ENI **Novi**, Marius, Mollusk, VA
♦ K4EQQ **Maples**, Dean B., Evans, GA
KD4FXK **Hutchings**, Hershell L., Trenton, GA
WA4ICF **Goss**, Van, Ohatchee, AL
KC4IYO **Rothert**, John, Orlando, FL
K4KNO **Leone**, Anthony J. Jr, Readyville, TN
W4KWR **Gilbert**, Arthur E. Jr, Louisville, KY
KA4LER **Baliles**, Maurice D., Luray, VA
♦ W4MER **Adams**, James I., Nashville, TN
WD4NAI **Murdock**, Emma J., Chattanooga, TN
WA4NBY **Ehrhardt**, Richard O., Delray Beach, FL
W4OCH **Carson**, Layton V., Atlanta, GA
KI4OQA **Hirsch**, Nicholas J., King George, VA
W4RRX **Buck**, Everett R., San Antonio, TX
K4UYC **Sligh**, Paul L. Sr, Columbus, GA
WB4VNJ **Patterson**, Thomas W., Nashville, TN
N4XTZ **Coley**, Mark L., Erwin, TN
KE4YTZ **Merony**, Don, Clarksville, TN
WA4ZRV **Booher**, David O., Jacksonville, FL
W5ADB **Randall**, Wilmer A., Dawson, GA
KC5CML **Abbott**, Carmen J., Plano, TX
KB5EKC **Chopin**, James E., Lafayette, LA
N5GAD **Dittrich**, Anita O., Edna, TX
N5GF **Griffith**, Thomas E. Sr, West Monroe, LA
W5JHJ **Elmore**, Robert E., Tulsa, OK
KB5OR **Emory**, George T., Ruston, LA
KG5OV **Gustafson**, William H., Lubbock, TX
WB5TSC **Collier**, Conrad C., Lovelady, TX
WB5UNC **Lawrence**, Jack E., Tahlequah, OK
KB5UOP **Tucker**, Thomas J., Lubbock, TX
♦ WB6AKR **Heitritter**, William E., Hemet, CA
♦ WA6HOB **Kinney**, Laurence R., Tacoma, WA
WB6KNF **Aaron**, Willie T., Carson, CA
WA6LXR **Jepson**, Arthur C., Laguna Beach, CA
WH6MZ **Richards**, Richard V., Honolulu, HI
K6ORP **West**, Veikko K., San Mateo, CA
♦ W6RCD **Goddard**, W. R. Jr, San Diego, CA
W6RPV **Hansen**, Harlan R., Boise, ID
W6VLH **Shavelson**, Melville, Studio City, CA
K6YCI **Williams**, Paul M., Phelan, CA
KK6YF **Daniel**, Robert E., Crockett, CA
W6YZV **Field**, Mable B., Fallbrook, CA
N7AAW **Rear**, Boyd M., Ellensburg, WA
W7BBR **Tondreau**, Michael A., Oregon City, OR
W7BWP **Jones**, Roger C., Tucson, AZ
W7EKM **Johnson**, John A., Custer, WA
WB7EVZ **Gates**, Jeannette F., Colville, WA
WA7GQF **Wilburn**, Claude R. Jr, Helena, MT
KD7KJM **Crosby**, Arthur M., Phoenix, AZ
KA7LHM **Bishop**, Robert K., Phoenix, AZ
KA7NBC **Le Roy**, Hubert R., Graham, WA
N7PG **Brenton**, Wallace C., Mesa, AZ
KB7QMC **Cannon**, James, Hood River, OR
W7QMY **White**, Kenneth L., Walla Walla, WA
KL7QS **Neeley**, Elizabeth M., Copperas Cove, TX
N7XGZ **Strachan**, Hortense A., Nooksack, WA
KA8GRC **Ritchie**, Dean H., Salem, OH
♦ WA8GRC **Mumma**, Arza L., New Lebanon, OH
WA8MDI **Utterback**, Robert J., Chatham, MI
K8RRN **Graber**, Russell E., New Waterford, OH
WT8S **Daley**, Paul, Canal Winchester, OH
WB8TNE **Moyer**, Peter, Muskegon, MI
WB8UAG **Karrer**, Gregg, Harper Woods, MI
WD9BGC **Colbert**, Mark E., Waunakee, WI
KE9CH **Reames**, Joseph P., Washington, IL
K9CMW **Viney**, John W., Sheboygan, WI
KA9FRQ **Misenhelter**, Oran C., Chicago, IL
WB9HVD **Hightower**, Rolla Jr, Macomb, IL
W9NFJ **Franzmann**, Donald R., Altoona, WI
KA9VAM **Mueller**, Jean A., West Allis, WI
K9VCM **Crider**, Roland W., Culver, IN
WØEKM **Nicolai**, Robert L., Saint Louis, MO
WØGAR **Amundson**, Gar L., Fairbanks, AK
NØHPK **Bainbridge**, Douglas W., Cortez, CO
WAØITU **Sorensen**, Dwight W., Kansas City, MO
KØJUZ **Gutshall**, Ronald W., Sun City West, AZ
KØOTU **Neal**, Larry E., Independence, MO
WØPWB **Valersky**, John, Aurora, CO
♦ WØQAU **Wessel**, Kenneth F., Independence, MO
KØRMR **Donlon**, Richard J. Jr, White Bear Lake, MN
NØTOH **Dennison**, Berry P., Cortez, CO
KBØYZX **Buttram**, Herbert E., Niangua, MO
VE3UAI **Hernandez**, Don, Kingsville, Ontario
G3COJ **Bower**, A. H. B., High Wycombe, Great Britain
ZL3NL **Tait**, Angus, Christchurch, New Zealand

♦ 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

Strays

MY WALKING CHAIR RADIO

◊ When I am walking a distance I use a walker as I get tired and have to sit for a bit now and then. So one year I asked my husband to help me put a 2 meter transceiver on the handlebar so we could talk to each other a flea markets and swap meets. It worked well for a while but I decided that I wanted to talk farther than a repeater reaches. I bought my husband a new transceiver so he would give me his ICOM IC-706. I tested it for the first time on Field Day 2007 and make one contact. The next day I made 11. I'm using it with a 20 meter HamStick and 12 V/12 Ah universal battery. I have reached out to Canada, Arizona, Hawaii, Southern California, Wyoming and other places on just 30 W. I use a push-to-release key holder to hang the mike up when not in use. — *Patricia Cook, WD6ECC*

Patricia Cook, WD6ECC, of La Pine, Oregon, uses an HF transceiver attached to her walker to make 20 meter contacts.

75, 50, AND 25 YEARS AGO

October 1932

- The cover photo shows a cheerily glowing and very large transmitting tube.
- The editorial discusses the Madrid radio conference, and promises news from it in next month's issue. It also notes that aliens will no longer be issued US amateur licenses.
- W. A. Lippman, W6SN, reports on ham activities at the Los Angeles Olympic Games, in "W6USA—The World Was Its Oyster."
- George Grammer, W1DF, discusses "Electron-Coupled Oscillators for the Small Transmitter."
- D. Dekker, PAØPDA, and W. Keeman, PAØZK, present information on a "Stabilized 'B' Supply for A.C. Receiver."
- True McLean discusses "Transmission-Line Feed for Short-Wave Antennas."
- Ev Battey, W1UE, reports on the "'Phone-C.W. QSO Contest Results," in which contestants transmitted on one mode and received on the other mode. Prizes were awarded to the five highest-scoring stations: 80-meter quartz crystals that were donated by "the staff at W8YA, the radio station of the Pennsylvania State College (Department of Electrical Engineering)."
- "The 56-mc. Eclipse Expedition," by Ross Hull, tells of Ross planning to do some radio experiments while flying in W1ZD's autogyro during the solar eclipse. Alas, things have a way of going wrong at the worst possible times and, despite heroic efforts by a number of hams, the autogyro didn't get off the ground in time for the eclipse.
- The "Amateur Radio Stations" column reports this month on W8DSO, in Fairmont, W. Va. The transmitter is built into *three* 63-inch Western Electric relay racks.

October 1957

- The cover photo shows W2KCR, recent recipient of the Navy's Public Service Award, at his well-equipped station.
- The editorial gives a good summary of how amateurs pioneered the use of the v.h.f. frequencies.
- Bob Tschannen, W9LUO, describes "The 'Club Saver' 2-Meter Portable," reporting that the group project put new life in an old club.
- "Combination Regulated Power Supply," by L. D. Chipman, W4PRM, tells how the supply extends the range of regulated voltage output.
- With current 6-meter conditions so terrific, Ed Tilton, W1HDQ, urges the reader to try his high-performance beam, in "Six Elements on 6."
- To help the apartment-dweller, Lew McCoy, W1ICP, describes "A Window-Sill Antenna" that is compact but effective.
- "A Universal Power Supply," by Bob Foltz, W9GBT, tells about his 300 v, 160 ma power supply that operates with either 115 vac or 12 vdc input.
- Irv Gottlieb, W6HDM, discusses "Transistor Regenerative Detectors," telling how to build a two-transistor receiver for 80 meters using 2N78 transistors.
- "An Electronic Transmitter-Receiver Antenna Switch," by Ed Arvonio, W3LYP, tells the reader how to use the device for full break-in operation.
- J. M. Shulman, W6EBY, describes "An Ultrastable Keyed V.F.O.", eliminating chirps and clicks by operating the tube barely within the threshold of oscillation.

October 1982

- The cover photo shows the large photovoltaic solar panel of W6HCS.
- The editorial reports the first 10 GHz contact to exceed a 1000 km path length, between IØSNY/EA5, near Valencia, and IØYLI and IWØBFZ, both near Rome. The editorial goes on to ask why this milestone wasn't first reached by US hams.
- Phil Chapman, W6HCS; Paul Chapman, and Alvin Lewison describe an example of "Amateur Use of Solar Electric Power."
- Don Johnson, W6AAQ, tells how to get "Mobile Antenna Matching — Automatically!"
- Doug DeMaw, W1FB, discusses "Shunt-Fed Towers: Some Practical Aspects."
- John Webb, W1ETC, tells how to build a unit for "Electrical Antenna Null Steering."
- Larry Wolfgang, WA3VIL, tells the reader how to build "The 'CHIP' (Cheap, Homemade Iambic Paddle)."
- "Product Review" takes a look at the new KWM-380 HF Transceiver, the latest in the line of equipment built by Collins, and likes what it sees.

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 transmitted on approximately 3.590 MHz by K6YR. See "Contest Corral" in this issue. Underline one minute of the highest speed you copied, certify that your copy was made without aid, and send it to ARRL for grading. Please include your name, call sign (if any) and complete mailing address. Fees: $10 for a certificate, $7.50 for endorsements.

♦ **Digital transmissions:** Frequencies are 3.5975, 7.095, 14.095, 18.1025, 21.095, 28.095 and 147.555 MHz.

Bulletins are sent 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 2007, Headquarters and W1AW are closed on New Year's Day (Jan 1), Presidents' Day (Feb 19), Good Friday (Apr 6), Memorial Day (May 28), Independence Day (Jul 4), Labor Day (Sep 3), Thanksgiving and the following Friday (Nov 22-23), and Christmas Eve Day and Christmas Day (Dec 24-25).

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				

SPECIAL EVENTS

Contact these stations and help commemorate history. Many provide a special QSL card or certificate!

Sep 15, 1600Z-2300Z, San Diego, CA. USS *Midway* CV-41 COMEDTRA, NI6IW. 62nd Commissioning Anniversary of USS Midway CV-41. 14.325 7.260. QSL. USS *Midway* CV-41 Museum, 910 North Harbor Dr, San Diego, CA 92101. **w9bq@aol.com**

Sep 15-Sep 16, 1500Z-2200Z, Bardstown, KY. Kentucky Amateur Radio Society, K4B. 16th Annual Kentucky Bourbon Festival. 28.350 21.250 14.250 7.250. QSL. Jim Brooks, KY4Z, 7099 Louisville Rd, Coxs Creek, KY 40013. **www.myoldkentuckyhome.com/kars**

Sep 22, 1300Z-2100Z, Moraine State Park, PA. Butler County Amateur Radio Public Service Group, K2BSA/3. 30th Anniversary, 1977 Moraine State Park Jamboree, at Fall Moraine Trail Council Camporee. 14.260 7.275. Certificate. K3PSG Butler ARPS, PO Box 141, Prospect, PA 16052. **cja@fyi.net**

Sep 29, 1400Z-2100Z, Rowlett, TX. US Coast Guard Auxiliary, K8K. US Coast Guard Auxiliary 68th Anniversary and ISAR 2007. 52.100 28.420. QSL. Charles Myers, 9405 Waterview Pkwy, Rowlett, TX 75089-8427. **chasmyers48@verizon.net**

Sep 29, 1700Z-2300Z, Beale Air Force Base, CA. Golden Empire BSA, K6BSA. Scout Expo 100 Year Anniversary of World Scouting. IRLP 3895 FM 147.00 SSB 14.290 7.270. QSL. Bill Ragsdale, K6KN, PO Box 1500, Woodland, CA 95776. **YoloBSA.editme.com/expo**

Sep 29, 1700Z-2100Z, St Thomas, VI. US Coast Guard Auxiliary, N2A. 68th Anniversary of the US Coast Guard Auxiliary. 14.255 21.410 28.490. QSL. Deborah Thomas, PO Box 9280, St Thomas, VI 00801. **np2dj@arrl.net**

Sep 29-Sep 30, 1400Z-2100Z, Middletown, RI. Newport County Radio Club, W1SYE. Norman Bird Sanctuary 33rd Annual Harvest Fair. 14.265 3.940 7.265. QSL. W1SYE, Box 3103, Newport, RI 02840.

Sep 29-Sep 30, 1430Z-1830Z, Signal Hill, St John's, NF, Canada. Radio Amateurs of Canada, VO1ARES. Joint Canada/USA Signal Hill ARES Event. SSB 21.235 14.235 7.235 CW 21.035 14.035 7.035 EchoLink 180234 VO1RCR IRLP 2736 VO1CGR. QSL. via bureau or direct VO1ARES via, G.L. Friars, VE9GLF, 35 Upper Quaco Rd, Baxters Corner, NB E2S 2S2, Canada. **www.rac.ca**

Sep 29-Sep 30, 1600Z-1600Z, Metropolis, IL. Midwest Amateur Radio Club, W9W. Celebrating *Metropolis*, home town of Superman. 14.280 7.220. Certificate. Gary Green, PO Box 544, Metropolis, IL 62960. **n9yws@comcast.net**

Oct 1-Oct 31, 0100Z-2359Z, Kittanning, PA. North American QRP CW Club, N3A. NAQCC Third Anniversary. 14.060 10.120 7.140 3.560. Certificate and QSL. Tom Mitchell, WY3H, 210 Garretts Run Rd, Kittanning, PA 16201. **www.arm-tek.net/~yoel**

Oct 6, 1200Z-2100Z, Coalwood, WV. Pocahontas Coalfield Amateur Radio Club, W8C. Rocket Boys Festival. 28.325 14.255 7.220 3.820. QSL. David R. Sexton, PO Box 65, Maybeury, WV 24861. **hokieham@excite.com**

Oct 6, 1300Z-2000Z, Harlem, GA. Columbia County Georgia Amateur Radio Club, W4O. Annual Oliver Hardy Birthplace Festival. 146.52 21.260 14.260 7.260. Certificate. CCARC - W4O, PO Box 800, Evans, GA 30809. **ccarc.hamradioman.com/html/ohf.html**

Oct 6, 1300Z-2000Z, Portsmouth, VA. Portsmouth Amateur Radio Club, W4POX. 40th Anniversary of the Portsmouth Lightship Museum. 28.360 21.360 14.260 7.210. Certificate. Portsmouth ARC, PO Box 7696, Portsmouth, VA 23707. **w4pox@arrl.net**

Oct 6, 1330Z-2130Z, Palmyra, VA. Fluvanna County ARES, W4F. Annual Celebration of Farming's History. 3.947 7.240 14.275 28.400. Certificate. Manny Rodriguez, 22 Fleetwood Dr, Palmyra, VA 22963. *Rain Date Sunday Oct 7, 2007.*

Oct 6, 1400Z-2000Z, Robbinsville, NC. Smoky Mountains Amateur Radio Team, N4GSM. Anniversary of the opening of the Cherahala Skyway. 14.248 7.248. Certificate. SMART, PO Box 983, Robbinsville, NC 28771. **main.nc.us/graham/smart**

Oct 6, 1500Z-2200Z, St Charles, IL. Fox River Radio League, W9CEQ. Commemorating the 22nd Annual Scarecrow Festival. 14.260. QSL. FRRL, PO Box 673, Batavia, IL 60510. **www.frrl.org**

Oct 6, 1800Z-2200Z, Olathe, KS. SATERN, KSØJC. Honoring Marshal and Loretta Ensor code teachers. 14.250 10.115. Certificate. Dan Reed, 29545 West 152nd Ter, Gardner, KS 66030. **dmreed10@earthlink.net**

Oct 6-Oct 7, 1300Z-2000Z, Torrington, CT. CQ Radio Club, K1BCI. Work All States for our 60th Anniversary! 21.273 14.273 7.273 3.973 6 m. QSL. CQ Radio Club, 33 Sunset Ln, Torrington, CT 06790. **www.cqradioclub.com**

Oct 6-Oct 14, 0100Z-2359Z, Milford, CT. Lake Effect Amateur Radio Club, W1M. National Wildlife Refuge Week 104 years. 21.310 14.265 CW 7.110. QSL. Kevin Gunther, 2 Milford Point Rd, Milford, CT 06460. **beeltee@optonline.net**

Oct 7-Oct 13, 1500Z-2000Z, Newburyport, MA. Pentucket Radio Association, K1W. Celebrate National Wildlife Refuge Week. 21.310 14.265 7.240 3.880. QSL. Larry Caruso, K1LGC, 77 Whittier Rd, Haverhill, MA 01830. **www.pra625.org**

Oct 12-Oct 14, 1600Z-1600Z, Pigeon Key, FL. Boca Raton Amateur Radio Association and Florida Atlantic University Radio Club, K4P. Activate Pigeon Key using emergency power for amateurs. 14.300. QSL. Rudolph Neuhaus, 1275 SW 21st St, Boca Raton, FL 33486. **brara.qrpradio.com**

Oct 12-Oct 14, 1700Z-0300Z, Reelfoot Lake, TN. Dyer County Amateur Radio Association, W4R. National Wildlife Refuge Week. 14.262 7.262 3.962. Certificate. Dyer County Amateur Radio Association/W4R, Howard Runions, 1355 Tatumville Rd, Newbern, TN 38059. **hireddux@yahoo.com**

Oct 13, 1300Z-2200Z, Greenville, IL. Okaw Valley Amateur Radio Club, K9K. The American Farm Heritage Museum, Outhouse Festival. 21.380 14.280 7.280 3.880. QSL. Hope H. Walker, 1322 Irongate Tr, Greenville, IL 62246. **www.americanfarmheritagemuseum.org**

Oct 13, 1500Z-1800Z, Onalaska, WI. Mississippi Valley Amateur Radio Association, W9FCC. Onalaska Fire Department Open House. 28.330 21.330 14.330. Certificate. Terry Miller, 1926 Loomis St, La Crosse, WI 54603-2061. **www.mvara.net**

Oct 13-Oct 14, 1600Z-2000Z, Seney, MI. Lake Effect Amateur Radio Club, W8W. National Wildlife Refuge Week: 104 Years of Service. 14.250 14.070 7.250 7.060. QSL. Lake Effect ARC/NWR2007, 36 Southfork St, Marquette, MI 49855. **www.pilgrimriver.com/nwr2007**

Oct 13-Oct 14, 2000Z-2000Z, Eureka, CA. Humboldt Amateur Radio Club, KA6PGN. Historic Navy ship LCI(L) 1091 on Humboldt Bay. 3.855 7.250 14.250 146.52. QSL. Michael Brennan, KA6PGN, 3671 Dolbeer St, Eureka, CA 95503. **mikeka6pgn@sbcglobal.net**

Oct 19-Oct 21, 0600Z-2200Z, Worldwide, Strange Radio Team, SRT calls. 4th Anniversary Strange Radio Team. 14.250. QSL. Direct to amateur contacted. *Certificate for contact with 5 SRT (Strange Radio Team) call signs. QSL to Marco De Carlo, IZ7DOK, Via degli Orefici 6, Lecce 73100, Italy. See Web for list of call signs and full details.* **www.strangeradioteam.com/sr_event.asp**

Oct 19-Oct 21, 1400Z-2359Z, Garland, TX. Garland Amateur Radio Club, K5QHD. GARC K5QHD celebrating 50th anniversary. 21.295 14.245 7.195 3.820. QSL. K5QHD, 1027-B West Austin St, Garland, TX 75040. **www.k5qhd.org**

Oct 20, 1300Z-1730Z, Randleman, NC. Tri-County Amateur Radio Club, NC4AR. 19th Annual NASCAR Day Festival. 14.270 7.268. Certificate. NC4AR, PO Box 747, Trinity, NC 27370.

Oct 20, 1400Z-2100Z, Cambridge, OH. Cambridge Amateur Radio Association, W8VP. Unique "S" Bridges of Old National Road. 7.240 7.235 7.230 7.225. QSL. Cambridge Amateur Radio Association, PO Box 1804, Cambridge, OH 43725. **www.w8vp.org**

Oct 20, 1600Z-2300Z, San Diego, CA. USS *Midway* CV-41 COMEDTRA, NI6IW. First launch and recovery of a/c on USS *Langley* CV-1. 14.325 7.260. QSL. USS *Midway* CV-41 Museum, 910 North Harbor Dr, San Diego, CA 92101. **w9bq@aol.com**

Oct 20-Oct 22, 0000Z-0000Z, Glen Mills, PA. Frankford Radio Club, AmQRP/NJQRP, Delco ARES, W3S. Cradle of Liberty Council, Minquas District, JOTA. SSB 18.140 14.290 7.270 CW 14.070. QSL. Nick Roscoe, N3NR, 129 Governor Markham Dr, Glen Mills, PA 19342. **www.gvpack260.org**

Oct 21-Oct 22, 1700Z-0100Z, Allerton, IL. Midwest Traffickers & Contesters, N9Q. 4 county operation during the Illinois QSO Party. 21.040 14.040 7.040 3.540. QSL. Hank Greeb, N8XX, 5727 11 Mile Rd NE, Rockford, MI 49341. **www.greeb.net/2007ilqp/2007ilqp.html**

Oct 22-Nov 2, 0000Z-2359Z, Mocksville, NC. Davie County Amateur Radio Club, KI4ORW. This special event celebrates the birth of Daniel Boone. 14.275 14.035 14.080 7.175. QSL. John Dwiggins, PO Box 970, Cooleemee, NC 27014. **www.ki4orw.org/ki4orw/danielboone.htm**

Oct 26-Nov 2, 0000Z-2359Z, Wallingford, CT. Meriden Amateur Radio Club, W1NRG/60. Meriden ARC 60th anniversary. 14.260 7.260 7.060 3.860. Certificate. Meriden ARC, PO Box 583, Meriden, CT 06450. *Specific operating times.* **www.meridenarc.org**

Oct 28, 1500Z-2100Z, Sandy Hook National Recreation Area, NJ. Roseland and Middletown Amateur Radio Clubs, K2A. Fort Hancock Establishment Day — Ham Radio at the Lighthouse. 14.270 7.270. QSL. Roseland ARC, 300 Eagle Rock Ave, Roseland, NJ 07068.

Maty Weinberg, KB1EIB ♦ Special Events ♦ events@arrl.org

CONTEST CORRAL

W1AW Qualifying Runs are 10 PM EDT Monday, October 1 (0200Z October 2), and 4 PM EDT Wednesday, October 17 (2000Z). The West Coast Qualifying Run will be at 2 PM PDT Saturday, October 13 (2100Z), originating from K6KPH. Unless otherwise indicated, code speeds are from 10-35 WPM. Check the W1AW Schedule elsewhere in this issue for details.

Abbreviations

SO — Single-Op, M2 — Multiop-2 Transmitters, MO — Multiop, MS — Multiop, Single Transmitter, MM — Multiop, Multiple Transmitters, AB — All Band, SB — Single Band, S/P/C — State/Province/DXCC Entity, HP — High Power (>100 W), LP — Low Power, QRP (5 W or less), Entity — DXCC Entity.

No contest activity on 30, 17 and 12 meters. Refer to the contest Web sites for information about awards. Unless stated otherwise, regional contests only count QSOs with stations in the region. Publication deadline for Contest Corral listings is the first of the second month prior to publication. For updates and additional contests, see the Contest Corral Web page at **www.arrl.org/contests**.

Oct 6-7

RSGB 21/28 MHz Contest — SSB/CW, sponsored by the RSGB, 0700Z-1900Z Oct 7. Frequencies: 15 and 10 meters (see Web site for band plan), work UK stations only. Categories: UK and DX SO or MS (Open, Restricted, QRP <10 W) and SWL (Open and Restricted). Exchange: serial number and UK district. QSO points: 3 pts/QSO. Score QSO points × UK districts (UK stations use DXCC entities plus JA, W, VE, VK, ZL and ZS call areas) counted once per band. For more information: **www.rsgbhfcc.org**. Logs due Oct 22 to **2128.logs@rsgb.org.uk** or to RSGB — G3UFY, 77 Bensham Manor Rd, Thornton Heath, Surrey CR7 7AF, England.

Classic Exchange — CW, from 1300Z Oct 7-0700Z Oct 8. Frequencies: 1.810, 3.545, 7.045, 14.045, 21.135, 28.050, 50.100, 144.100 Mc. Score: QSOs on all bands × equipment age multiplier. For more information: **qsl.asti.com/CX**. Logs to WQ8U, 104 W Queen St, Hillsborough, NC 27278.

EU Autumn Sprint — SSB, sponsored by the EU Sprint Gang, 1600Z-1959Z Oct 6 (CW is 1600Z-1959Z Oct 13). Frequencies: 80-20 meters, stations outside EU work EU stations only. SOAB category only. Exchange: your call, serial number, name, other station's call. Special QSY rule — see Web site. Score is number of QSOs. For more information: **www.eusprint.com**. Logs due 15 days after the contest to **eusprint@kkn.net** or Paolo Cortese, I2UIY, PO Box 14, I-27043 Broni (PV), Italy (CW logs to Karel Karmasin, OK2FD, Gen Svobody 636, CZ-674 01 Trebic, Czech Republic).

California QSO Party — CW/SSB, sponsored by the Northern California Contest Club, 1600Z Oct 6-2159Z Oct 7. Frequencies: 160-2 meters. Categories: SOAB (HP >200 W, LP, QRP), MS, MM, CA County Expedition, Mobile, Club, School. SO work 24 hours only. CW QSOs in CW subbands, except 160/6/2 meters. Stations on a county line count as a single contact for QSO points, but both counties may be claimed as multipliers. Exchange: serial number and state/province (DX send DX) or CA county. QSO points: CW — 3 pts, Phone — 2 pts. Score: QSO points × CA counties (max 58) or CA stations multiply by states and VE call areas (max 58). For more information: **www.cqp.org** or **info@cqp.org**. Logs due by Nov 15 via Web form at **logs.cqp.org** (preferred), e-mail to **logs@cqp.org**, or NCCC c/o Kevin Rowett K6TD, 21906 Monte Ct, Cupertino, CA 95014-1144.

Point those antennas out over the blue Pacific and see if you can't bag some DX from somewhere very far away!

Oceania DX Contest — primary sponsorship by Wireless Institute of Australia (WIA) and New Zealand Association of Radio Transmitters (NZART), Phone 0800Z Oct 6-0800Z Oct 7 (CW is 0800Z Oct 13-0800Z Oct 14). Frequencies: 160-10 meters, work VK/ZL/Oceania stations only. Categories: SOAB, SOSB, MS, MM, SWL. Exchange: RS(T) and serial number. QSO points: 160 — 20 pts, 80 — 10 pts, 40 — 5 pts, 20 — 1 pt, 15 — 2 pts, 10 — 3 pts. Score: QSO points × WPX prefixes counted once per band. For more information: **www.oceaniadxcontest.com**. Logs due Nov 11 in Cabrillo format (required for logs with more than 50 QSOs) to **ph@oceaniadxcontest.com** (CW to **cw@oceaniadxcontest.com**) or paper logs (if less than 50 QSOs) to Oceania DX Contest, c/o Wellington Amateur Radio Club Inc, PO Box 6464, Wellington 6030, New Zealand.

VHF Fall Sprints — CW/Phone/Digital, 432 MHz, 7-11 PM local Oct 3. (See September *QST*, p 90, or **www.svhfs.org**. Logs due four weeks from contest.)

YLRL Anniversary Party — CW, sponsored by the YLRL, 1400Z Oct 2-0200Z Oct 4. (phone Oct 9-Oct 11) Frequencies: 160-10 meters. Exchange: serial number, RS(T), and ARRL section/VE province/country. QSO points: US or VE YLs — 1 pt, DX YLs — 2 pts. Score: QSO points × S/P/C. For more information: **www.ylrl.org**. Logs due 30 days after the contest to **kc4iyd@yahoo.com** or to Nancy Rabel Hall, KC4IYD, PO Box 775, North Olmsted, OH 44070.

PSK Rumble (The Fall Classic) — sponsored by Troy ARA, 0000Z-2400Z Oct 6. Frequencies: 160-6 meters. Exchange: name and S/P/C. Categories: Normal (>100 W), Great (<20 W), Super (<5 W), Novice, SWL. Score: QSOs × (W/VE/JA/VK call areas + DXCC entities counted once per band). For more information: **www.n2ty.org/seasons/tara_rumble_rules.html**. Logs due Oct 29 via online score submission form at **www.n2ty.org/seasons/tara_rumble_score.html**.

10-10 Day Sprint — Phone/CW/Digital, 0001Z-2359Z, Oct 10. One QSO per station, regardless of mode. Logs due 25 Oct. (see August *QST*, p 96 or **www.ten-ten.org**).

Oct 10-14

For those chasing the Worked All Britain award, this is the event that brings out stations from rare WAB areas.

Worked All Britain HF Contest — Phone, from 1200Z Oct 13-1200Z Oct 14. Frequencies: 20-10 meters. Categories: SOAB, MO, QRP (≤10 W), SWL, Fixed, Mobile, Portable all categories. Exchange: RS(T), serial number, and DXCC entity or WAB area. QSO points: 5 pts/QSO. Total score: QSO points × WAB multipliers (see Web site) + DXCC entities. For more information: **www.worked-all-britain.co.uk**. Logs due Nov 4 to **g0bfj@worked-all-britain.co.uk** or Brian Stocks GØBFJ, 96 North Street, Lockwood Huddersfield, HD1 3SL, England.

VHF Fall Sprints — CW/Phone/Digital, Microwave (902 MHz and higher), 6 AM-12 PM local Oct 13. (See September *QST*, p 90, or **www.svhfs.org**. Logs due four weeks from contest.)

Straight Key Sprint — sponsored by the Straight Key Century Club from 0000Z-0200Z Oct 10 (WES Weekend Sprint, 0000Z Oct 28-0000Z Oct 29). Frequencies (MHz): 3.550, 7.055, 14.050, 21.050, 28.050. Categories: SKCC Member, Non-Member. Exchange S/P/C + SKCC number or power. QSO points: 1 pt/per QSO. Score: QSO points × S/P/C (see Web site for bonus points). For more information: **www.usatek.net/~yoel/contests.html** and **nt9k.com/skcc/wes**.

Pennsylvania QSO Party — CW, Phone, PSK31, RTTY. sponsored by the Nittany ARC from 1600Z Oct 13-0500Z Oct 14 and 1300Z-2200Z Oct 14. Frequencies (MHz): CW — 1.810 and 40 kHz above band edge; Phone — 1.850, 3.980, 7.280, 14.280, 21.380, 28.480; mobiles 5 kHz below the listed frequencies; PSK31 on 28.120, 24.920, 21.070, 14.070, 7.080, 3.580. Categories: SO (HP >150 W, LP, QRP), MS, MM, SO or MS Portable, Novice/Tech/TechPlus, Mobile, Rover. Exchange: serial number and ARRL/RAC section (PA stations send PA county). QSO points: CW — 2 pts on 160 and 80, 1.5 pts on other bands; Phone — 1 pt., PSK31 and RTTY — 2 points. Score: QSO points × PA counties (PA stations use PA counties + ARRL/RAC sections + 1 DX) ×2 if QRP or ×3 if Novice/Tech. Add 200 points for each QSO with the bonus station (see Web site). PA mobiles and rovers add 500 points for each county with 10 or more QSOs. For more information: **www.nittany-arc.net/paqso.html**. Logs due Nov 14 to **paqsolog@nittany-arc.net** or PA QSO Party, c/o NARC, PO Box 614, State College, PA 16804-0614.

North American RTTY Sprint — sponsored by the *National Contest Journal*, 0000Z-0400Z Oct 14. Frequencies 80-20 meters. North American stations work everyone; others work NA stations only. Exchange both call signs, serial number, name, and S/P/C. The same station can be worked multiple times provided 3 contacts separate the contact in both logs, regardless of band. QSY rule: Stations calling CQ, QRZ, etc, may only work one station in response to that call; they must then move at least 1 kHz before working another station or 5 kHz before soliciting another call. Once you are required to QSY, you may not make a new QSO on the previous frequency until you have made a contact at least 1 or 5 kHz (as required) away. For more information: **www.ncjweb.com**. Logs due 7 days after the contest via Web form at **www.ncjweb.com/sprintlogsubmit.php**, **rttysprint@ncjweb.com** or Ed Muns, WØYK, PO Box 1877, Los Gatos, CA 95031-1877.

YLRL Anniversary Party — SSB, 1400Z Oct 9-0200Z Oct 11 (see Oct 6-7).

EU Autumn Sprint — CW, 1500Z-1859Z Oct 13 (see Oct 6-7).

Oceania DX Contest — CW, 0800Z Oct 13-0800Z Oct 14 (see Oct 6-7).

FISTS Fall Sprint — CW, sponsored by FISTS CW Club from 1700Z-2100Z Oct 13. Frequencies: 80-10 meters. Categories: SOAB (QRP and QRO), Club. Exchange: RST, QTH (S/P/C), Name, FISTS number if member, non-

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

members send power output. QSO points: members — 5 pts, nonmembers — 2 pts. Score: QSO points × S/P/C (count S/P only once, count DXCC each time). For more information: **www.fists.org**. Logs due 30 days after the contest to **w8pig@yahoo.com** or Dan Shepherd, N8IE, 1900 Pittsfield St, Kettering, OH 45420.

Bill Windle QSO Party — CW, sponsored by First Class Operator's Club (FOC), from 0000Z-2359Z Oct 13. Frequencies: 160-10 meters, 6 and 2 meters. Call CQ BW from 15 to 45 kHz above band edge, open to all hams, not just FOC members. Exchange: RST and name or FOC number, if member. Report total QSOs with FOC members, counted once per band, FOC members report total QSOs and total FOC QSOs. For more information: **www.firstclasscw.org.uk**. QSO totals due 7 days after the contest to **kz5d@aol.com**.

PRO CW Contest, from 1600Z-1800Z Oct 6 and 0600Z-0800Z Oct 7. Frequencies: 7 MHz. Categories: SO (YO and non-YO), QRP, MO, PRO CW member. Exchange: RST and serial number or PRO CW member number. QSO points: 4 pts/QSO outside EU, double for PRO CW member. QTC may also be exchanged (see Web site). Score: QSO points × DXCC and WAE entities + YO call districts. For more information: **www.procwclub.yo6ex.ro**. Logs due 20 days after the contest to **yo2rr@clicknet.ro** or Ioan Brange YO2RR, Str Imparatul Traian nr 2, RO-30550 Lugoj, Romania.

Oct 20-21

Illinois QSO Party — CW/Phone, sponsored by the Western Illinois ARC from 1700Z Oct 21-0100Z Oct 22. Frequencies (MHz): 160-2 meters, CW — 50 kHz above band edge, Phone — 3.890, 7.290, 14.290, 21.390, 28.390. Categories: IL-Fixed, IL-Portable, IL-Mobile, IL-Rover, Non-IL. Work stations in each county, county line contacts count for 1 QSO from each county. Exchange: RS(T) and S/P/C (IL stations send county). QSO points: Phone — 1 pt/QSO, CW — 2 pts. Score: QSO points × IL counties (IL stations use states + IL counties + VE provinces + up to 5 DXCC entities). Count additional DX for points, but not multipliers. For more information and new Rover/Mobile rules: **www.w9awe.org/ILQP%202007%20Rules.pdf**. Logs due Nov 21 to **n9jf@arrl.net** (Cabrillo format) or WIARC, PO Box 3132, Quincy, IL 62306.

If you enjoyed the IOTA contest in July, this is the North American equivalent, counting both salt and freshwater islands.

W/VE Islands QSO Party — CW/SSB/Digital from 1600Z Oct 20-2359Z Oct 21. Frequencies: 160-6 meters. Categories: Island Fixed, Expedition, Rover, non-island W/VE, DX, SWL. Non-island stations contact W/VE Island stations. Modes are combined in new rules. QSO points: Island — 5 pts/QSO, non-island — 1 pt. Score: QSO points × states/provinces counted once per mode. For more information: **www.usislands.org**. Logs due Nov 30 to **wa4ja@arrl.net** or John Almon, WA4JA, 1411 Oak Leaf Dr, Columbia, TN 38401.

VHF Fall Sprints — CW/Phone/Digital, 50 MHz, 2300Z Oct 20-0300Z Oct 21. (See September *QST*, p 90, or **www.svhfs.org**. Logs due four weeks from contest.)

QRP ARCI Fall QSO Party — CW, sponsored by QRP ARC International from 1200Z Oct 20-2400Z Oct 21, operate 24 hrs max. Frequencies (MHz): 1.810, 3.560, 3.710, 7.040, 14.060, 21.060, 28.060. Categories: SOAB, SO-High Band (20-6), SO-Low Band (160-40). QSO points: member QSOs — 5 pts, non-members on same cont — 2 pts, non-members on diff cont — 4 pts. Score: QSO points × S/P/C × Power Multiplier (< 55 mW ×20, <250 mW ×15, <1 W ×10, <5 W output ×7, >5 W ×1). For more information: **www.qrparci.org**. Submit entry via contest Web site. Logs due Nov 21 to **contest@qrparci.org** or ARCI Fall QSO Party, c/o Jeff Hetherington VA3JFF, 139 Elizabeth St W, Welland, ON L3C 4M3, Canada.

Worked All Germany — CW/SSB, sponsored by The Deutscher Amateur Radio Club from 1500Z Oct 20-1459Z Oct 21. Frequencies: 80-10 meters, work German stations only. Categories: SOAB (HP >100 W , LP, QRP <5 W in Mixed only) CW or Mixed Mode, MS, SWL, packet spotting allowed for all classes. Exchange: RS(T) and serial number or DOK code. QSO points: 3 pts/QSO. Germans count DXCC/WAE countries per band. Score: QSO points × first letters of DOK codes (Germans use DXCC entities or WAE countries) counted once per band and mode. For more information: **www.darc.de/referate/dx/fedcg.htm**. Logs due Nov 20 (Cabrillo or DARC-STF) to **wag@dxhf.darc.de**.

Asia-Pacific Sprint — CW, sponsored by the Asia-Pacific Sprint Contest Committee, 0000Z-0200Z Oct 21. Frequencies (MHz): 14.030-14.050 and 21.030-21.050. Categories: SO <150 W only. Work Asia-Pacific stations only. Exchange: RST and serial number. Special QSY rule. Score: QSOs × WPX prefixes counted once only. For more information and AP country list: **jsfc.org/apsprint**. Logs due 7 days after contest to **apsprint@jsfc.org** (Cabrillo format encouraged, no paper logs accepted).

JARTS WW RTTY Contest, sponsored by the Japanese Amateur Radio Teleprinter Society from 0000Z Oct 20-2400Z Oct 21. Frequencies: 80-10 meters. Categories: SOAB (HP >100 W, LP), MO, SWL. Exchange: RST and age (Multiop sends 99, YL may send 00). QSO points: own continent — 2 pts, diff cont — 3 pts per QSO. Score: QSO points × DXCC entities + JA, W, VE and VK call areas counted once per band. For more information: **www.edsoftz.com/JARTS**. Logs in Cabrillo format due Nov 30 via Web form at **www.kiznax.com/p/jarts/submit_form.html**.

070 Club 160m Great Pumpkin Sprint — PSK31, sponsored by the Penn-Ohio DX Society (PODXS) from 2000 Oct 20-0200 Oct 21, local time. Frequencies: 160 meters. Categories: QRP, LP (<50 W), MP (<100 W). Exchange: RST and S/P/C. QSO points: 1 pt/QSO. Score: QSO points × S/P/C. For more information: **www.podxs.com/html/160_meter_sprint.html**. Logs due Nov 23 to **sprints@podxs.com** or Steve Dominguez, N6YIH, 11700 Fairlawn Ct, Boise, ID 83709.

Oct 27-28

ARRL International EME Contest, 0000Z Oct 27-2400Z Oct 28, 50-1296 MHz (see August *QST*, p 104, or **www.arrl.org/contests**).

Ham radio's equivalent of a sold-out stadium, the CQ WW SSB contest is the biggest in the world with DX aplenty to fill your log.

CQ World Wide DX Contest — SSB, sponsored by *CQ Magazine*, 0000Z Oct 27-2400Z Oct 28 (CW is 0000Z Nov 24-2400Z Nov 25). Frequencies: 160-10 meters. Categories: SOAB and SOSB (HP, LP, QRP), MS, M2 (new), MM. MS has 10 minute rule. Exchange RS(T) and CQ zone. QSO points: same cont — 1 pts (NA stations count 2 pts), diff cont — 3 pts. Stations in the same country may be worked for zone credit only. Score: QSO points × CQ Zones + DXCC entities and WAE countries counted once per band. For more information: **www.cqww.com**. Logs due Dec 1 (Jan 15 for CW) to **ssb@cqww.com** (CW logs to **cw@cqww.com**) or to CQ Magazine, 25 Newbridge Rd, Hicksville, NY 11801.

10-10 International CW/Digital Contest, 0001Z Oct 27-2359Z Oct 28. Logs due Nov 12 (see August *QST*, p 96, or **www.ten-ten.org**).

Straight Key Weekend Sprint — 0000Z Oct 28-0000Z Oct 29, see Oct 10-14.

Interested in finding out more about contesting and "how they do it"? Try the free, biweekly e-mail newsletter *Contester's Rate Sheet* (**www.arrl.org/contests**) or the bimonthly magazine *National Contest Journal* (**www.ncjweb.com**). QST

New Products

AMERITRON MOBILE ANTENNA CONTROLLER FOR ICOM RADIOS

◊ The Ameritron SDC-103 is a control head for use with mobile HF screwdriver antennas and ICOM transceivers. The SDC-103 receives frequency information from the transceiver's CI-V interface and tunes the antenna accordingly. The controller also allows you to manually tune the antenna up or down and save 10 antenna positions in memory. A 4-digit turns counter indicates antenna position. Other features automatically lower the antenna to the bottom position for parking in low garages, recalibrate the counter for repeatable settings, and shut off the motor in case of a stall. The controller is compatible with antennas that use single or dual magnetic sensors. Accessory magnetic sensor kits allow use with Hi-Q and High Sierra antennas. Price: $139.95. To order or for your nearest dealer, call 800-713-3550 or see **www.ameritron.com**.

COMING CONVENTIONS

FLORIDA STATE CONVENTION

October 13-14, Melbourne

F D V S

The Florida State Convention, sponsored by the Platinum Coast ARS, will be held at the Melbourne City Auditorium, 625 E Hibiscus Blvd. Doors are open for setup Friday 6-9 PM; public Saturday 9 AM-5 PM, Sunday 9 AM-4 PM. Features include 42nd Annual Event, large indoor swap area, large outdoor tailgate area ($10 per space; first-come, first-serve basis), commercial vendors, excellent forums and meetings, hidden transmitter hunt, VE sessions (FCC Radio and ARECC EMCOMM Exams), ARES Badging (all day Saturday), ARRL Awards Checking. Talk-in on 146.85. Admission is $6 in advance (before Sep 30), $7 at the door or after Sep 30. Swap tables are $20, commercial tables are $80. Contact Jan Heise, K4QD, c/o PCARS Hamfest, Box 1004, Melbourne, FL 32902-1004; 321-956-2482; **hamfest2007@pcars.org**; **www.pcars.org**.

WESTERN NEW YORK SECTION CONVENTION

October 14, Buffalo

F D V S

The Western New York Section Convention, sponsored by the Lancaster ARC, will be held at the Ismailia Shrine Center, 1600 Southwestern Blvd. Doors are open 7:30 AM-3 PM. Features include large indoor flea market, ARRL talks/forum, vendors, demos and talks, VE sessions (9 AM, walk-ins accepted; John Maxwell, W2JM, 716-741-2317), breakfast and lunch. Talk-in on 147.255 (107.2 Hz). Admission is $7, under 10 free. Tables are $15 (Chuck Lawson, KC2BLH, 716-825-7097; **kc2blh@aol.com**). Contact Luke Calianno, N2GDU, 1105 Ransom Rd, Lancaster, NY 14086; 716-481-5747; **luke48@gmail.com**; **gbhamfest.hamgate.net/**.

MICROWAVE UPDATE CONVENTION

October 18-20, King of Prussia, Pennsylvania

F S

The Microwave Update Convention, sponsored by the Mt Airy VHF RC (Packrats), will be held at the Dolce Valley Forge (formerly The Inn at Valley Forge), 251 W DeKalb Pike. Doors are open Thursday 6-10 PM, Friday and Saturday 8 AM-10 PM. Features include technical and practical presentations, tech measurement, nightly hosted hospitality, flea market (Friday eve), banquet with guest speaker (Saturday eve). Admission is $79 through Sep 1, $89 through October 1, $99 thereafter (fees include banquet; additional banquet tickets are $39). Contact Rick Rosen, K1DS, 206 Kimberton Dr, Blue Bell, PA 19422; 610-270-8884; **rick1ds@hotmail.com**; **www.microwaveupdate.org**.

PACIFIC DIVISION CONVENTION

October 19-21, San Ramon, California

F D V S

The Pacific Division Convention (Pacificon 2007), sponsored by the Mt Diablo ARC, will be held at the San Ramon Marriott Hotel, 2600 Bishop Dr. Doors are open Friday 7 AM-9 PM, Saturday 6 AM-7 PM, Sunday 6 AM-1 PM. Features include antenna seminar (Friday, 8 AM-5 PM, $10); Legal Seminar (Friday, 1-4 PM); QRP and HFpack Dinner and Meeting (Friday, 6:30 PM) and other activities; opening breakfast buffet with keynote speaker Chris Imlay, W3KD, General Counsel of the ARRL (Saturday, 6:45 AM, $14); electronics swapmeet (Sunday, 6 AM-noon in hotel parking lot; admission is free to buyers, sellers $20 for double car slot); vendors; latest ham radio gear on exhibit; manufacturers; outstanding technical forums; T-hunts (Sunday 8 AM beginners; 9 AM advanced); banquet with special guest speaker Kay Craigie, N3KN, First Vice President of the ARRL (Saturday, 7 PM, $39); Wouff-Hong ceremony (Saturday at midnight); one-day technician license class (Saturday, 8 AM-5 PM; test at 5 PM); VE test sessions (Saturday and Sunday, 9 AM-noon; Technician through Extra Class, nominal fee); ARRL forum (Sunday, 1 PM). Talk-in on 147.06 (100 Hz). Admission is $10 in advance, $15 at the door. Exhibit tables are $150 and exhibit booths are $320. Contact John Schulze, KR6CR, 2006 Fir St, Concord, CA 94519; or c/o PACIFICON, Box 272613, Concord, CA 94527; 925-288-1730; fax 925-935-0120; **kr6cr@arrl.net** or **pacificoninfo@astound.net**; **www.pacificon.org**.

September 14-15
W9DXCC, Elk Grove Village, IL*

September 15-16
Roanoke Division, Virginia Beach, VA*

September 21-22
Great Lakes Division, Independence (Cleveland), OH*

September 22
Washington State, Spokane Valley*

September 28-30
ARRL/TAPR Digital Communications, Hartford (Windsor Locks), CT*

September 28-30
Pacific Northwest VHF, Bend, OR*

October 6
Northern New York Section, Lake Placid*

October 7
Connecticut State, Wallingford*

November 17-18
Indiana State, Fort Wayne

December 1-2
West Central Florida Section, Palmetto

*See September *QST* for details.

GEORGIA SECTION CONVENTION

November 3-4, Lawrenceville

F D V S

The Georgia Section Convention (Stone Mountain Hamfest and Computer Expo), sponsored by the Alford Memorial RC, will be held at the Gwinnett County Fairgrounds, 2405 Sugarloaf Parkway. Doors are open Saturday 8 AM-4 PM, Sunday 8 AM-2 PM. Features include indoor flea market, tailgating ($8 per space, good both days, plus admission), commercial tailgating ($25 per space with electric hookup; includes 1 admission), huge boneyard, vendors, dealers, forums, contests, VE sessions, on-site camping, free parking, refreshments. Talk-in on 146.76 (107.2 Hz). Admission is $6 in advance (until Oct 22), $8 at the door; under 16 free (students with ID, $6). Tables are $20 ($25 with electrical hookup; includes 1 admission). Contact Randy Bassett, KR4NQ, Box 1282, Stone Mountain, GA 30086-1282; 770-978-9181; **hamfest@totr-radio.org**; **www.totr-radio.org**.

ALABAMA SECTION CONVENTION

November 10, Montgomery

F D V S

The Alabama Section Convention, sponsored by the Montgomery ARC, will be held at the Garrett Coliseum, 1555 Federal Dr. Doors are open for setup Friday 3-9 PM, Saturday 7-8:50 AM; public 9 AM-3 PM. Features include 31st Annual Hamfest/Computer Show, flea market, tailgating ($5 per space), new equipment vendors, forums, VE sessions (8 AM; bring CSCEs and/or copy of your current AR license), RV and camper hookups (334-242-5598), free parking. Talk-in on 146.84. Admission is $6, under 16 free. Tables are $15 in advance for the 1st table, $10 for each additional table; $15 each at the door. Contact Rik Doll, KU4PY, 142 Oldfield Dr, Montgomery, AL 36117; 334-277-0864; **ku4py@arrl.net**; or Phil Salley, K4PO, 334-272-7980 (after 5 PM); **hamfest@w4ap.org**; **www.w4ap.org**.

MIDWEST DIVISION CONVENTION

November 10, Lebanon, Missouri

F V

The Midwest Division Convention, sponsored by the Lebanon ARC, will be held at the Cowan Civic Center, 500 E Elm. Doors are open 8 AM-2 PM. Features include flea market; DXpeditions and DX insight; Emergency Communications; operating W1AW/0 from the Cowan Civic Center (bring your license and receive a certificate); on-site VE sessions (register at 10 AM, exams follow promptly, walk-ins accepted; Bob Sharp, KØYS, 417-345-8299; **bflobob@positech.net**); special guest speaker ARRL President Joel Harrison, W5ZN. Talk-in on 146.7. Admission is $5. First table is free to all licensed hams (additional tables are $10 each; must register your table in advance). Contact Mike Edwards, WB9M, 201 Hillside Ct, Lebanon, MO 65536; 417-588-1535; **wb9m@earthlink.net** or **wb9m@embarqmail.com**; **www.lebanonarc.com**.

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 obtained by writing to or calling the ARRL convention program manager, tel 860-594-0262.

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.

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 **October 1** to be listed in the **December** issue. Hamfest information is accurate as of our deadline; contact sponsor for possible late changes. 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, *Tl* = Talk-in frequency, *Adm* = Admission.

Alabama (Montgomery) — Nov 10, Alabama Section Convention. See "Coming Conventions."

Arizona (Tucson) — Oct 20 F D V
Set up 6 AM; public 7 AM-noon. *Sprs:* Old Pueblo RC and Radio Society of Tucson. Kino Sports Park, 2500 E Ajo Rd. Swapmeet, vendors ($5), VE sessions, ARCA meeting, free parking, refreshments. *Tl:* 147.3 (110.9 Hz). *Adm:* Free. John Clor, N7SQQ, 1934 S Avenida Planeta, Tucson, AZ 85710; 520-400-6446; **w7gv@aol.com**.

California (San Ramon) — Oct 19-21, Pacific Division Convention. See "Coming Conventions."

Florida (Eustis) — Nov 3 V
8 AM-3 PM. *Spr:* Lake ARA. Eustis Senior Center, 301 W Ward Ave. VE sessions. *Tl:* 147.255 (103.5 Hz). *Adm:* advance $4.50, door $5. Tables: $10. David Nachbaur, KR4OW, 26722 Pelican St, Eustis, FL 32736; 352-551-4043; **kr4ow@arrl.net**; **www.k4fc.org**.

Florida (Melbourne) — Oct 13-14, Florida State Convention. See "Coming Conventions."

Florida (New Port Richey) — Sep 22 F
8 AM-2 PM. *Spr:* Suncoast ARC. First Lutheran Church, 6416 Delaware Ave. Free tailgating. *Tl:* 146.64. *Adm:* $5. Tables: $10. Ron Wright, N9EE, 8849 Gum Tree Ave, New Port Richey, FL 34653; 727-376-6575; **mccrpt@verizon.net**; **groups.yahoo.com/group/sarcmail**.

Florida (Oakland Park) — Nov 3 F V
Set up 6 AM; public 7 AM-noon. *Spr:* Broward ARC. Collins Center, 3900 NE 3rd Ave. "Cy Harris W4MAQ Memorial Free Flea," VE sessions, breakfast. *Tl:* 146.79. *Adm:* Free. Jeffrey Depew, KI4FFG, 221 SW 53rd Ave, Plantation, FL 33317; 954-562-5391; fax 954-791-8118; **j4244@aol.com**; **www.eagle3.net/barc**.

Georgia (Augusta/Evans) — Oct 13 F V S
9 AM. *Spr:* ARC of Augusta. Evans Middle School, 4781 Hereford Farm Rd. Tailgating, VE sessions, forums (ARRL, ARES, MARS). *Tl:* 145.49. *Adm:* $5. Tables: $10. Doug Pugh, KE4JSJ, 1806 Birch Dr, N Augusta, SC 29860; 803-279-6725; **doug9945@yahoo.com**; **www.w4dv.org/**.

Georgia (Lawrenceville) — Nov 3-4, Georgia Section Convention. See "Coming Conventions."

Georgia (Rome) — Oct 20 F V
8 AM-2:30 PM. *Spr:* Northwest Georgia ARC. American Legion Post #5, 5 Shorter Ave. Al Brock Memorial Hamfest/Computer Show, VE sessions. *Tl:* 146.94 (88.5 Hz). *Adm:* $5. Tables: $10. Grover Keith, KA5QFI, Box 5002, Rome, GA 30162; 706-766-1118; fax 706-292-0516 (call prior); **gfkeith@comcast.net**; **www.w4vo.org**.

Hawaii (Waimea/Kamuela) — Oct 20 F V
10 AM-3 PM. *Sprs:* Big Island ARC, Kohala-Hamakua RC and Kona ARS. Waimea Community Senior Center, Kawaihae Rd (near Mamalahoa Hwy). Big Island International Hamfest/Swapmeet, VE sessions, All Islands meeting. *Tl:* 146.52. *Adm:* Free. John Buck, KH7T, 808-885-9718; **kh7t@arrl.net**; **www.biarc.net/swapmeet.asp**.

Illinois (Decatur) — Oct 20 F V
8 AM-1 PM. *Spr:* Cenois ARC. Richland Community College, Rea's Bridge and Brush College Rd. Old-fashioned hamfest, outdoor flea market, VE sessions. *Tl:* 146.73 (123 Hz), 442.25 (103.5 Hz). *Adm:* $5. Tables: $5. Jerry Sebok, N9RBQ, 2397 S Franklin Street Rd, Decatur, IL 62521; 217-423-2095; fax 217-422-1356; **n9rbq@sbcglobal.net**; **www.cenois.com**.

Illinois (Logan) — Oct 13 F
7 AM-1 PM. *Spr:* Little Egypt ARS. Old Logan School, Logan Rd. Free outdoor tailgating. *Tl:* 146.805. *Adm:* $5. Tables: $10. Jason Sample, KF9CZ, 7551 Grammer Rd, Sesser, IL 62884; 618-525-6871; **kf9cz@arrl.net**; **www.learsradio.com**.

Indiana (Crown Point) — Oct 14 V
8 AM-1 PM. *Spr:* Lake County ARC. Lake County Fairgrounds, Industrial Arts Building, 889 S Court St. All indoors, VE sessions. *Tl:* 147.0 (131.8 Hz), 146.52. *Adm:* $5. Tables: Free. Rich Gilles, KA9SVS, 156 S Ridge St, Crown Point, IN 46307; 219-662-0594; fax 219-987-3247 (call first); **paris156@yahoo.com**; **www.qsl.net/w9lj/index.html**.

Kentucky (Richmond) — Nov 10 V
8 AM-4 PM. *Spr:* Central Kentucky ARS. Madison County FOP Lodge #47, 5095 Atwood Dr. VE sessions. *Tl:* 145.37 (192.8 Hz). *Adm:* $5. Tables: $10. Michael Rogers, KE4ISW, 144 Allen Douglas Dr, Richmond, KY 40475; 859-624-9156; **ke4isw@arrl.net**; **www.qsl.net/ckars/hamfest/**.

Louisiana (Monroe) — Nov 10 F V S
Set up Friday 2-7 PM (Hamburger Social 5-7 PM); public Saturday 8 AM-mid afternoon. *Spr:* Twin City Ham Club. Barak Shrine Temple, 6620 Frontage Rd. Monroe Regional Hamfest, forums (ARRL, ARES), VE sessions (9 AM). *Tl:* 146.85. *Adm:* $5. Tables: $10. Scott Dickson, W5WZ, 267 Jim Finley Rd, Calhoun, LA 71225; 318-644-2215; fax 318-644-0977; **w5wz@arrl.net**; **www.ares-nela.org/hamfest/**.

Louisiana (Pineville) — Oct 13 V
8 AM-2 PM. *Spr:* Central Louisiana ARC. Kees Park, Hwy 28E. VE sessions. *Tl:* 147.33 (173.8 Hz). *Adm:* Free. Tables: $10. Charles Standlee, AC5PW, Box 56, Ruby, LA 71365; 318-473-0359; **ac5pw@arrl.net**; **www.clarc.us**.

Maryland (Westminster) — Oct 28 F D V
8 AM-1 PM. *Spr:* Carroll County ARC. Carroll County Agricultural Center, 700 Agriculture Center Dr. 18th Annual Mason-Dixon Hamfest, indoor and outdoor vendors, VE sessions. *Tl:* 145.41. *Adm:* $5. Tables: $12. Bill Neeriemer, W3STG, Box 2211, Westminster, MD 21158; 240-285-4548; fax 301-402-0341; **w3stg@arrl.net**; **www.qis.net/~k3pzn/mdhfest.htm**.

Massachusetts (Cambridge) — Oct 21. Nick Altenbernd, KA1MQX, 617-253-3776; **w1gsl@mit.edu**; **www.swapfest.us**.

Michigan (Holland) — Oct 20 F V S
8 AM-1 PM. *Spr:* Holland ARC. West Ottawa South Campus, 3600 152nd Ave. 5th Annual Great Lakeshore Super Swap, outside displays, test table, forums, VE sessions. *Tl:* 147.06 (94.8 Hz). *Adm:* $6. Tables: $10. Sue Seidelman, KC8RQS, c/o HARC, 46 W 21st St, Holland, MI 49423; 616-394-9821; **swap@hollandarc.org**; **www.hollandarc.org**.

Michigan (Kalamazoo) — Oct 14 F V S
Set up 6 AM; public 8 AM-1 PM. *Sprs:* Kalamazoo ARC and SW Michigan AR Team. Exhibition Hall "E" at Kalamazoo County Fairgrounds, 2900 Lake St. 25th Annual Hamfest, trunk sales ($5 per space), DXCC card checking, forums, VE sessions (noon), campsites with electricity and water (fee charged), free parking, refreshments. *Tl:* 147.04 (94.8 Hz). *Adm:* $5. Tables: 8-ft $12 (plus admission; electrical hookup $20). Jim Simons, N8IJH, Box 33, Richland, MI 49083-0033; 269-388-4865; **info@kalamazoohamfest.com**; **www.kalamazoohamfest.com/**.

Michigan (Sterling Heights) — Oct 28 F V
8 AM-1 PM. *Spr:* Utica Shelby Emergency Communications Assn. Polish-American Century Club, 33204 Maple Ln Dr. 22nd Annual Swap, radio equipment test bench, VE sessions. *Tl:* 147.18 (100 Hz). *Adm:* $5. Tables: $15 (first), $10 (for each additional). Bob Hollingsworth, KZ8N, Box 46331, Mt Clemens, MI 48046; 586-716-9114; **kz8n@arrl.net**; **useca.rfc791.org**.

Missouri (Grandview) — Oct 20 F V
8 AM-2 PM. *Spr:* South-Side ARC. Grandview Middle School (East Jr High), 12650 Manchester Ave. Octoberfest 2007, American Red Cross, VE sessions. *Tl:* 147.12. *Adm:* advance 4 for $5 or $3 each; door 3 for $5 or $3 each. Tables: $15. Donna Quick, KBØYJN, Box 1670, Lee's Summit, MO 64063; 816-537-7464; **kb0yjn@juno.com**; **www.southsidearc.org**.

Missouri (Kirkwood/St. Louis) — Oct 27 F V
7:30 AM-1:30 PM. *Spr:* St Louis ARC. Kirkwood Community Center, 111 S Geyer Rd. 16th Halloween Hamfest, VE sessions, made-to-order breakfast. *Tl:* 147.15 (141.3 Hz). *Adm:* advance $3, door $5. Tables: $15. Bob Sluder, NØIS, 47 Wells Rd, Fenton, MO 63026; 636-349-6584; **bcsluder@msn.com**; **www.halloweenhamfest.org**.

Missouri (Lebanon) — Nov 10, Midwest Division Convention. See "Coming Conventions."

Missouri (Springfield) — Oct 12-13 F V S
Friday 5-9 PM; Saturday 8 AM-3 PM. *Spr:* Southwest Missouri ARC. Remington's Entertainment Complex, 1655 West Republic Rd. Ozarks Regional Hamfest, forums, VE sessions, guest speakers from SEMA and FEMA. *Tl:* 146.91 (100 Hz). *Adm:* advance $7.50, door $10. Tables: $20. Lee Brown, NAØLB, 2550 W Chestnut St, Springfield, MO 65802; 417-831-3016; **na0lb@na0lb.net**; **www.smarc.org** or **hamfest.smarc.org**.

New Hampshire (Deerfield) — Oct 12-13. Mike Raisbeck, K1TWF, 978-250-1235; **k1twf@arrl.org**; **www.near-fest.com**.

New Hampshire (Londonderry) — Nov 3 F
9 AM-1 PM. *Spr:* Interstate Repeater Society. Londonderry Lion's Club, Mammoth Rd. Flea market, breakfast. *Tl:* 146.85 (85.4 Hz). *Adm:* $3. Tables: $15. Gayle Willman, KB1LHA, Box 693, Derry, NH 03038; 781-598-1442; fax 603-421-0940; **kb1lha@verizon.net**; **www.irs.nhradio.org**.

New Mexico (Socorro) — Oct 27 F V S
8 AM-3 PM. *Sprs:* Socorro ARA and the City of

Gail Iannone ♦ Convention and Hamfest Program Manager ♦ giannone@arrl.org

Socorro. NM State Fire Training Academy, Academy Rd. Tailgating ($10 per space), forums (ARRL, Emergency Communications, Incident Command System), Emergency Communications Trailer, HF Station, VHF Station, VE sessions. *Tl:* 146.68 (100 Hz). *Adm:* Free. Tables: $10. Al Braun, AC5BX, 722 N California St, Socorro, NM 87801; 505-835-3370; **ac5bx@juno.com**; **www.socorroara.org**.

New York (Buffalo) — Oct 14, Western New York Section Convention. See "Coming Conventions."

New York (Hicksville) — Oct 28 F V
Sellers 8 AM; buyers 9 AM-1 PM. *Spr:* Long Island Mobile ARC. Levittown Hall, 201 Levittown Parkway. Long Island Indoor Hamfair and Electronics Show, VE sessions, tune-up clinic, refreshments. *Tl:* 146.85 (136.5 Hz). *Adm:* $6. Tables: $20. Richie Cetron, K2KNB, 198 Haypath Rd, Old Bethpage, NY 11804; 516-694-4937 (phone and fax); **hamfest@limarc.org**; **www.limarc.org**.

New York (Lindenhurst) — Oct 21 V
8 AM-noon. *Spr:* Town of Babylon AR Emergency Services. Fireman's Memorial Park, Hartford St. VE sessions. *Tl:* 146.685 (110.9 Hz). *Adm:* $6. Tables: $20. Walter Wenzel, KA2RGI, Box 1222, W Babylon, NY 11704; 631-957-0218; **tobares@optonline.net**; **www.tobares.org**.

North Carolina (Maysville) — Oct 14
8 AM-3 PM. *Spr:* Maysville Hamfest Club. Community Center, 201 8th St. *Adm:* Free. Byron Highland, K4BMH, 3753 Thorne Dr, Farmville, NC 27828; 252-753-2895.

North Carolina (Pfafftown) — Oct 20 F V
8 AM-noon. *Spr:* Forsyth ARC. West Central Community Center, 6130 Yadkinville Rd. Good old-fashioned swapfest, VE sessions. *Tl:* 145.47 (100 Hz), 146.64 (100 Hz). *Adm:* $5. Tables: $10. John Kippe, NØKTY, Box 11361, Winston-Salem, NC 27116-1361; 336-723-7388; **oct-hamfest@w4nc.org; www.w4nc.com**.

Ohio (Georgetown) — Nov 10 V
8 AM-3 PM. *Spr:* Grant ARC. ABCAP Building (Old Alverda Reed School), 406 W Plum St. Auction, VE sessions, great food. *Tl:* 146.73. *Adm:* $2. Tables: Free. Rodney Crawford, WD8CTX, Box 76, Buford, OH 45110; 937-446-2338; **wd8ctx@juno.com**; **www.garcohio.net**.

Ohio (Massillon) — Oct 28 F H V
Set up 6 AM; public 8 AM-2 PM. *Spr:* Massillon ARC. Massillon Boys and Girls Club Complex, 730 Duncan St SW. 47th Annual Hamfest, all indoors and heated, auction (10 AM, 15% commission charged on all items sold; no computer equipment), VE sessions (9 AM; Gary Kline, WC8W, 330-837-2927), handicapped accessible, acres of free parking, lunch available on site. *Tl:* 147.18 (110.9 Hz). *Adm:* $5, under 12 free. Tables: $12 (8-ft, with limited electricity). Terry Russ, N8ATZ, 3420 Briardale Circle NW, Massillon, OH 44646; 330-837-3091; **truss@sssnet.com** or **info@marcradio.org**; **www.marcradio.org**.

Oklahoma (Ardmore) — Oct 26-27 F D V S
Friday 6-9 PM; Saturday 8 AM-2 PM. *Spr:* Texoma Hamarama Assn. Ardmore Convention Center, 2401 N Rockford. Flea market, dealers, forums (ARRL and others), VE sessions. *Tl:* 146.97. *Adm:* advance $7, door $8. Tables: $7 (flea market); $15 (dealers, with electricity). Henry Allen, K5BUG, 2802 County Road 2226, Caddo Mills, TX 75135; 800-588-2841; fax 214-388-2706; **k5bug@arrl.net**; **www.angelfire.com/tx5/TexomaHamarama/**.

Oklahoma (Enid) — Nov 3.
enidhamfest@yahoo.com; **www.enidhamfest.com**.

Pennsylvania (King of Prussia) — Oct 18-20, Microwave Update Convention. See "Coming Conventions."

Pennsylvania (Sellersville) — Oct 21 D H V
Set up 6 AM; public 7 AM-1 PM. *Spr:* RF Hill ARC. Sellersville Firehouse, 2 N Main St (Bethlehem Pike). Vendors, VE sessions (10 AM-noon, all elements; walk-ins welcomed, bring necessary documents), free parking and transportation from remote lot (6:30 AM-12:30 PM), handicapped parking, refreshments. *Tl:* 145.31 (131.8 Hz). *Adm:* $6, non-ham spouses and children free. Tables: $12 (indoor); $8 (outdoor spaces; bring your own table), plus admission. Charles Schmell, KS3Z, 215-257-6368 (work, 8 AM-4:30 PM) or 215-538-7458 (home); fax 215-257-0724; **kb3cez@yahoo.com**; **www.rfhill.ampr.org**.

Pennsylvania (Washington) — Nov 4 V
8 AM-1 PM. *Spr:* Washington Amateur Communications. Washington County Fairgrounds, 2151 N Main St. VE sessions (10 AM). *Tl:* 145.49. *Adm:* $5. Tables: $10. Jacqueline Gosselin, N3ZEL, 60 Carl Ave, B-2, Eighty Four, PA 15330; 724-746-9235; **n3zel@arrl.net**; **www.wacomarc.org**.

South Carolina (Conway) — Nov 10 F D V
8 AM-2 PM. *Spr:* Grand Strand ARC. Conway National Guard Armory, 1621 16th Ave. Beachfest 2007, outside tailgating, inside vendors, VE sessions, refreshments. *Tl:* 145.11. *Adm:* advance $5, door $6. Tables: $10. Bob Gagliardi, N4XML, Box 2135, Myrtle Beach, SC 29578; 843-907-7770, fax 843-236-7889; **n4xml@w4gs.org**; **www.w4gs.org/beachfest/**.

South Carolina (Sumter) — Oct 27
8 AM-4 PM. *Spr:* Sumter ARA. Sumter Jaycee Hut, 314 Pine St. Great buys, fellowship, refreshments. *Tl:* 147.015 (156.7 Hz). *Adm:* $5. Tables: $10. Carl Ecabert, AA1MD, 6105 Dubose Siding Rd, Sumter, SC 29153; 803-469-0113; fax 803-499-3590; **aa1md@ftc-i.net**; **www.geocities.com/CapeCanaveral/2695/sara.htm**.

Tennessee (Chattanooga) — Oct 27 V S
8 AM-4 PM. *Spr:* Chattanooga ARC. Chattanooga Convention Center, 1100 Carter St. Forums, VE sessions. *Tl:* 146.79. *Adm:* $7. Tables: $20. Tom Cash, K4ZQX, Box 23121, Chattanooga, TN 37422; 423-875-8269; fax 423-877-7817; **k4zqx@arrl.net**; **www.w4am.org**.

Tennessee (Clarksville) — Oct 20 F
Set up Friday; public Saturday 8 AM-2 PM. *Spr:* Clarksville Amateur Transmitting Society. Clarksville Jaycees Building, 1190 Cumberland Dr. 5th Annual Old-fashioned Hamfest. *Tl:* 147.39. *Adm:* $5. Tables: $10. Jimmie Shelton, KT4FQ, 2329 Pendleton Dr, Clarksville, TN 37042; 931-431-4081; fax 931-378-7194; **kt4fq@charter.net**; **www.kf4l.org**.

Tennessee (Gray) — Oct 20 F V S
8 AM-2 PM. *Spr:* GrayHamfest Assn. Appalachian Fairgrounds, 100 Lakeview Dr. Tailgating, forums, special interest group meetings, VE sessions. *Tl:* 145.11, 146.7. *Adm:* $6. Tables: $10. Ken Fleenor, KI4BZK, 215 Arch St, Bristol, TN 37620; 423-341-1552; fax 423-764-1922; **fleenorkii@aol.com**; **www.grayhamfest.com/**.

Tennessee (Oak Ridge) — Oct 13 F D V
8 AM-3 PM. *Spr:* Oak Ridge ARC. Fraternal Order of the Eagles Bldg, 1650 Oak Ridge Turnpike. New dealers, tailgating, VE sessions, refreshments. *Tl:* 146.88, 146.97. *Adm:* $5. Tables: $10. Tom Muncy, AG4SF, 142 Manhattan Ave, Oak Ridge, TN 37830; 865-482-4123; **ag4sf@arrl.net**; **www.discoveret.org/orarc/main_page.html**.

Tennessee (Pigeon Forge) — Sep 29.
George Dominick, W4UWC; 865-577-8137; **w4uwc@comcast.net**; **www.sedco.homestead.com**.

Texas (Azle) — Nov 10 V S
8 AM-noon. *Spr:* Tri-County ARC of North Texas. Azle Lighthouse Conference Facility, 404 W Main St. VE sessions, ARRL NTX Section Forum, presentations (AMSAT, Tarrant Co, RACES, and more). *Tl:* 147.16 (110.9 Hz). *Adm:* $5. Tables: $10. David Johnson, KB5YLG, 820 Wood Ln, Azle, TX 76020; 817-507-9258; **kb5ylg@arrl.net**; **www.wc5c.org**.

Texas (Brenham) — Oct 27 F
7 AM-noon. *Spr:* Brenham ARC. Washington County Fairgrounds, 1303 E Blue Bell Rd. Swapmeet. *Tl:* 147.26 (103.5 Hz). *Adm:* Free. Tables: $10. James Nabors, KD5HRE, 902 College Ave, Brenham, TX 77833; 832-630-3912; **kd5hre@yahoo.com**; **www.alpha1.net/~w5aum**.

Texas (Corpus Christi) — Nov 10 F V S
8 AM-2 PM. *Spr:* South Texas ARC. Hilltop Community Center, 11423 Leopard St. 9th Annual Coastal Bend Hamfest, forums, VE sessions, BBQ lunch. *Tl:* 146.82 (107.2 Hz). *Adm:* $5. Tables: Free. Steven Pituch, W2MY, 14118 Bounty Ave, Corpus Christi, TX 78418; 361-949-7632; fax 361-949-1632; **hamfest@pituch.net**; **www.n5crp.org**.

Texas (Paris) — Oct 13 F D V S
Set up 6 AM; public 8 AM. *Spr:* Ham Assn of Paris. Red River Valley Fairgrounds Coliseum, 570 E Center St. 3rd Annual Hamfest, indoor flea market, outdoor tailgating ($10 per space), commercial vendors, forums, VE sessions, refreshments. *Tl:* 147.04 (100 Hz). *Adm:* $2. Tables: $15. Richard Lenoir, KI5DX, 2150 Plum St, Paris, TX 75460; 903-783-0968; **ki5dx@yahoo.com**; **www.paristexasradio.com/hamfest/**.

Washington (Lynden) — Oct 27 V S
9 AM-2 PM. *Spr:* Mount Baker ARC. Northwest Washington Fairgrounds, 1775 Front St (Hwy 539). Seminars, VE sessions. *Tl:* 146.74 (103.5 Hz). *Adm:* $5 (US). Tables: $15 each; 4 or more $12 each. Al Norton, K7IEY, 1008 Liberty St, Lynden, WA 98264; 360-354-4622; **k7iey@netscape.net**; **www.qsl.net/k7skw/**.

Wisconsin (Appleton) — Nov 4 F V
Set up 6 AM; public 8 AM. *Spr:* Fox Cities ARC. The Wave Ballroom, 2350 N Casaloma Dr. Swapfest, VE sessions. *Tl:* 146.76 (100 Hz). *Adm:* advance $5, door $6. Tables: advance $10, door $14 (if available). Anthony Mach, AB9IO, 312 Second St, Menasha, WI 54952; 920-722-0482; **ab9io@yahoo.com**; **www.fcarc.us/hamfest.php**.

F = FLEA MARKET
D = DEALERS / VENDORS
H = HANDICAP ACCESS
V = VE SESSIONS
S = SEMINARS / PRESENTATIONS

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2007 ARRL International DX Phone Contest Results

H. Ward Silver, NØAX
n0ax@arrl.org

"By trying we can easily learn to endure adversity — another man's I mean." — Mark Twain (official quotist of this write-up)

We were all standing around by the side of Solar Highway 1 with our thumbs out, hoping to catch a lift from Cycle 24. Some of us were sure the new cycle would be the biggest, fastest ride we'd ever seen. Others were of the opinion that no, it was going to be a rickety flat-bed with one headlight out. As it turns out, we're *still* waiting with Cycle 23 conked out on the shoulder, hood up and battery dead. Will we ever catch a ride of fresh sunspots and a tank full of ultraviolet?

Patience may be a virtue, but it's hard to put DX contests on top priority with not much encouragement from WWV. This year's solar and geomagnetic conditions were nearly a repeat of last year's as you can see from Table 1. So how many intrepid DXing souls went the distance and sent in a log? Almost exactly the same number of US and VE contesters — 1283 this year and 1284 in 2006. Outside the US and Canada, log submissions did take a bit of a hit, falling from 937 to 880, a drop of 6%.

That's only the number of submitted logs, however. The maximum number of QSOs tells a better story. K3LR's multi-multi crew squeegee-ed 20 meters bone dry with a QSO total of 2689, the highest of any domestic station on any band and a slight rise over last year's pinnacle of 2663 QSOs. Going the other way, PJ2T managed to attract quite a crowd, working 3724 Ws and VEs — a stunning increase of 23% over the 2006 count! How many of those were new General class licensees, I wonder?

After log checking, US/VE stations were credited with 354,702 QSOs, down from 416,857 last year. DX stations, even though there were slightly fewer of them, almost kept their total QSOs steady, working 438,798 QSOs, a drop of about 20,000 (4%) from 2006. Those are still pretty powerful rates — 7389 and 9141 QSOs per hour on average! That should answer any questions about whether hams can fill up the bands on any given weekend. I'd say interest in DX and DX contesting remains high, despite the lack of high-band propagation.

(Solar and ionospheric data can be obtained from NOAA's "Solar Data and Products Online" Web site, **www.sec.noaa.gov/Data/index.html#indices**.)

Web Write-up Notes and Features

"When we remember we are all mad, the mysteries disappear and life stands explained."

The *QST* write-up really has no choice but to focus on the overall leaders — as it should since they have made the big effort to make those huge scores. That shouldn't diminish the achievement of any operator moving up in the standings, making the most of a modest station, or taking advantage of smart strategy. That's why we have the Divisional Write-ups in the ARRLWeb version at **www.arrl.org/contest/results**. This year, not only do we have analysis of the results from every continent and the Caribbean, but from a resident contester manning the keyboard for every one! And for the third year running, every US and VE ARRL/RAC Division benefits from regional analysis. Please be sure to say "Thanks!" to the folks who put operating aside for an evening or two to spend time writing at the computer. You can help them in future contests by uploading your contest stories to the ARRL Soapbox pages at **www.arrl.org/contests/soapbox**. In the sidebar department, you'll find contesting's favorite propagation poobah, Carl Luetzelschwab, K9LA, trying to answer everybody's hottest question, "When Will the Higher Bands Be Back?"

I'd also like to remind everyone that sortable contest scoring data is available from the ARRL Contest Results Web page at **www.arrl.org/contests/results**. While you're there, download a copy of the printable line scores, too!

Steve, GW4BLE, is a well-known contester from Wales, entering in the SOAB-HP category with 555 kpts.

Table 1
Propagation Indices for ARRL DX Phone

	Flux		Planetary A_p		Estimated K	
Year	Sat	Sun	Sat	Sun	Sat	Sun
2002	191	183	5	10	1.6	2.5
2003	138	147	14.5	11	2.8	2.6
2004	105	106	5	6	1.8	1.8
2005	81	84	10	36	2.5	4.3
2006	75	74	2	1	0.9	0.5
2007	73	73	2	3	0.5	0.8

Records

"How little a thing can make us happy when we feel that we have earned it!"

Few records changed hands this year. In keeping with the general level of solar activity, both of the single-band records set this year were on 80 meters. Alex, KU1CW, set a new 80 meter record for the 10th district, eclipsing the old mark set last year. 80 meters was good across the pond, too, because F6CTT took over the top spot from ON4UN, whose record was also set last year!

Multi-Two was the hot category with four records being set in 2007. 6Y1V broke the oldest record this year, convincingly claiming a new North American record last set in 1993.

Table 2A
New US/VE Records for 2007

Category	Call District	Call	New Record	Old Record	Year Set
SO-80	0	KU1CW	51,948	34,996	2006
Multi-Two	1	KC1XX	5,590,086	1,435,802	2000

Table 2B
New DX Records for 2007

Category	Continent	Call	New Record	Old Record	Year Set
SO-80	EU	F6CTT	204,156	189,840	2006
Multi-Two	NA	6Y1V	9,633,852	4,466,708	1993
Multi-Two	OC	KH7X	6,162,156	5,865,941	1998
Multi-Two	SA	PJ2T	10,704,960	3,061,412	2003

Top Ten US/VE

Single Operator High Power

VY2ZM	4,455,600
VO1MP	2,835,864
VC3O	2,565,912
K1TO	2,344,650
AA1K	2,334,780
K3CR	2,080,152
K1RU	1,816,014
W9RE	1,627,716
WB9Z	1,486,032
K7RL	1,466,652

Single Operator Low Power

N1UR	1,009,866
W3LL	684,294
N5AW	628,236
N4KG	509,217
VE3AD	502,944
VE3XN	425,739
W4TAA	390,429
N3DG	344,088
KD9MS	332,442
W1CTN	315,948

Single Operator QRP

N1TM	109,344
KA1LMR	94,563
VA3DF	63,879
WA8WV	39,192
KA1C	35,235
N4AU	25,875
K3TW	20,400
N4ZAK	15,498
KT8K	14,022
KO1H	13,728

Single Operator 160 Meters

W4SVO	8,370
AA4MM	7,308
W8LRL	6,765
W3GH	6,084
KK4SI	5,358
K5RX	4,554
K4MHZ	3,813
K1HAP	3,510
WJ9B	1,449
WC4H	1,134

Single Operator 80 Meters

AA1BU	128,304
KT1V	120,600
KU1CW	51,948
N3YD	28,512
K9MUG	21,411
NØNI	19,080
K4JLD	14,742
N2GC	6,765
K9IDQ	6,765
N4NM	6,360

Single Operator 40 Meters

KY5R	52,371
W1XX	42,966
WDØBGZ	38,880
K8DJC	26,838
K5MQ	25,254
K4KZZ	23,625
KI6LZ	22,428
K4LTA	21,120
W8FR	18,975
W9OP	17,325

Single Operator 20 Meters

W7WA	479,094
NA3D	393,900
N4PN	321,816
VA3YP	310,365
W6AAN	297,024
W7BJN	147,456
K6HNZ	139,740
W8TWA	121,716
W7TTE	112,437
W6AEA	95,586

Single Operator 15 Meters

K2SS	119,922
K6XX	96,957
K9BGL	87,975
KC7V	57,792
K8IA	53,460
NØVD	40,500
K5FP	40,068
NØRB	24,804
W2AW	23,352
KC6R	21,147

Single Operator 10 Meters

K4WI	3,591
KE5CCN	3,534
KI4ETD	1,044
WAØFQK	456
AD5ZA	432
K4DLD	264
KN4JN	234
KI4EVA	210
KE3WM	210
W6GMT	24

Single Operator Assisted

N2NT	2,145,480
N3KS	2,109,336
K2XA	1,821,330
K3WW	1,763,148
NN3W	1,469,952
N8TR	1,420,965
K2PS	1,303,344
N3AD	1,257,138
AA3B	1,249,020
W3PP	1,122,384

Multioperator Single Transmitter

W3BGN	2,514,912
VE3RM	2,116,884
W1QA	1,837,140
N1MM	1,685,718
K3MD	1,084,500
N1FD	1,083,576
W3MF	1,017,360
W3GQ	969,387
K1KI	872,640
NT4D	806,796

Multioperator Two Transmitters

KC1XX	5,590,086
N3RS	4,964,262
WE3C	4,326,996
W4RM	3,318,456
KØTV	2,142,174
NE3F	1,840,626
NK7U	1,570,008
W4MYA	1,371,846
WX3B	1,282,953
N3MX	1,276,695

Multioperator Multi Transmitter

K3LR	7,701,825
W3LPL	6,823,500
K1TTT	4,138,209
K1RX	3,924,180
KB1H	3,074,688
WØAIH	1,467,684
K7ZSD	1,169,460
K1IR	772,431
KBØHH	99,120
KB5TX	96,570

Top Ten DX

Single Operator High Power

8P1A	7,611,492
FY5KE	5,673,438
TO5A	3,640,896
CN3A	2,840,445
OK5R	2,561,835
EA4KR	1,803,984
SN7Q	1,431,936
YW5NN	676,260
IZ3ALF	655,728
SO6X	632,835

Single Operator Low Power

P4ØA	5,595,456
HI3T	3,824,532
VP9/W6PH	2,461,179
P4ØLE	1,727,250
8P6EX	867,432
XE1XOE	543,552
OM5CD	467,550
3G1K	318,171
IZ2FOS	318,135
YV5EAH	317,898

Single Operator QRP

4M2L	233,916
PY2HL	114,228
AH7ZA	67,200
F5BEG	65,025
LU1VK	54,264
F5NOD	37,053
OK7CM	19,812
UA3BL	14,175
JR4DAH	10,185
EA3FF	9,477

Single Operator 160 Meters

KV4FZ	116,109
YW5T	29,232
CU2AF	21,696
PT7AG	14,280
SN3R	5,244
EA1DVY	2,760
PP5FMM	297
LU2DVI	99
DJ8ES	27

Single Operator 80 Meters

XE2K	205,146
F6CTT	204,156
KP4KE	203,928
CM6RCR	161,994
GM3PPG	148,512
CO6LP	116,964
SN3A	85,446
DL1AUZ	83,049
HG3DX	68,310
KL7RA	66,444

Single Operator 40 Meters

YW4D	314,418
TM9R	208,449
ZL3WW	152,712
YT5T	115,650
SO8A	105,300
KH6FKG	104,463
OL9R	104,370
JAØJHA	61,017
EA5BRE	57,684
DF3GY	51,600

Single Operator 20 Meters

ZF2AH	600,480
4M5IR	430,287
SO2R	397,542
MIØLLL	397,542
OH8X	390,462
YV1RDX	372,600
TM1W	360,876
6H1L	352,602
9A1A	349,914
DP4K	341,040

Single Operator 15 Meters

ZX5J	644,457
ZX2B	362,496
WP3C	350,262
ZPØR	309,396
L44DX	264,084
PP5JD	224,286
YV1CTE	198,912
LU7HF	141,417
IR4M	137,694
9A5E	132,741

Single Operator 10 Meters

LU1HF	131,760
TI5N	103,329
PP5AMP	74,562
LU9DAG	58,254
LU8EOT	43,575
PP5TR	30,432
CX4DX	17,298
LU3JVO	12,225
PY2CX	11,340
PP5BZ	9,216

Single Operator Assisted

PJ4G	5,326,200
PT7CB	3,029,598
LU4DX	2,220,936
EA7RU	1,138,626
DLØWW	994,080
HR2DMR	899,775
YR9P	466,044
F8CMF	318,714
IK3SCB	299,847
G3YYD	294,591

Multioperator Single Transmitter

V26H	4,958,832
VP2E	4,944,654
XE7S	4,322,268
HI3C	4,218,480
CU2A	3,560,214
VP5H	3,348,099
LP1H	3,165,645
LT1F	2,972,976
TO6T	2,895,018
NH6P	2,676,993

Multioperator Two Transmitters

PJ2T	10,704,960
6Y1V	9,633,852
KH7X	6,162,156
V47KP	4,907,100
TM6M	3,157,680
HG6N	1,946,973
JA3YBK	753,219
JA1YPA	429,570
OZ/DKØG	13,965
J42WT	10,332

Multioperator Multi Transmitter

OE4A	2,324,316
9A7A	2,125,242
RK2FWA	1,355,310

KH7X added to their Oceania trophy case, raising by 5% the bar last moved in 1998. In the Caribbean, PJ2T destroyed the old South American record with a score more than 3 times the old record set in 2003! And here in the states, KC1XX made the switch from Multi-Multi (MM) to Multi-Two (M2) and pounded the 1st district record into submission.

Exceptional Performances

"Facts are stubborn things, but statistics are more pliable."

First, anybody that goes all out during the bottom of the solar cycle in a DX phone contest deserves the accolades! Even though conditions aren't their best, though, it's still fun to bust those pileups and put calls in the log. Every QSO is just that little bit sweeter, is it not?

- K7RL managed to crack the SOAB-HP (Single Operator All Bands — High Power) Top Ten from WA state, more than 1500 miles west of any other Top Ten inhabitant.
- V47KP's Multi-Two effort would have been a North American record but for the higher score of the 6Y1V team.
- K4KZZ on SOSB-40 (Single Op Single Band) and W8LRL on SOSB-160 made the domestic Top Ten with low-power entries — nice work!
- TI5N was the only North American station to make the SOSB-10 Top Ten. With the band so long, that's a testament to a great effort from a great station.
- K6XX placed second in the US/VE SOSB-15 Top Ten, besting K2SS's QSO total, but losing the top place in multipliers, the downfall of many a West Coast score.

US and VE Overview

"Get your facts first, and then you can distort them as much as you please."

For the third straight year, 20 meters has been the band with the highest fraction of DX QSOs. The only noticeable change is a few more 15 meter QSOs in the SOAB-LP (Low Power) category. In fact, the relative amounts of QSOs across the bands looks very much this year like last year, as the solar indices suggest. It will take a significant change in conditions to change this state of affairs. If you are building a station to compete in DX contests, be sure to focus on the 20 meter hardware.

Figure 1 shows the percent by which QSOs or multipliers have changed since the solar peak year of 2002. These graphs show the relative contribution of each band compared to 2002. Over a long period of time, the bars should track the solar cycle, although with different phases on the high and low bands. Keep reading!

Close Finishes

As on any day at the races, there will be some close finishes. These are always fun to look for in the results and this year is no exception:

- K1TO and AA1K were separated by only 0.4% for 3rd and 4th place in SOAB-HP, respectively.

- The entire SO-Assisted Top Ten is filled with competitors only a few percent apart.
- 80 meters finds K9IDQ and N2GC tied for 8th and 9th place in 80-meter single-band.
- The tightest non-tied race in any domestic Top Ten was found in the Multi-Single category where K3MD squeaked by N1FD with only 0.08% to spare!

Remember these photo finishes when you are tempted to log that weak station even though you aren't really sure if your information was acknowledged or if you really got the call correct.

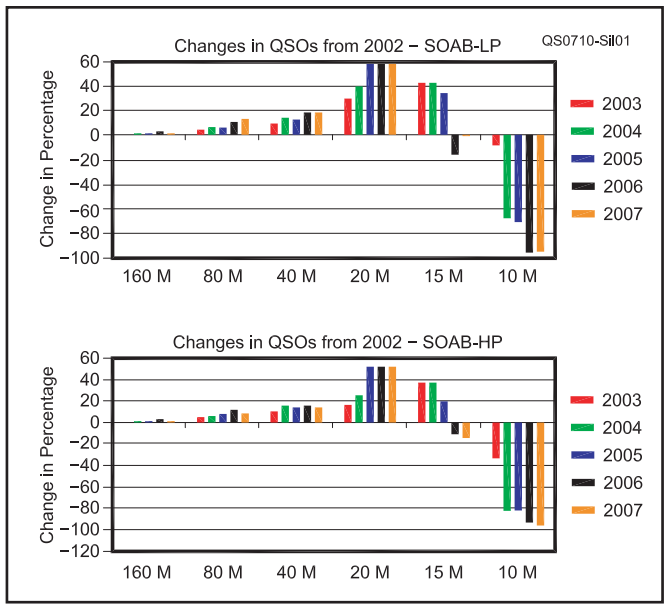


Figure 1 — Trends in QSOs since 2002.

Single Operator

You had to be considerably east of the Mississippi to make the Top Ten in the QRP category this year. Michigan and Alabama were as far west as the list went. N1TM moved up from 4th place last year to take the plaque this time out with a convincing 109k and 13% win over second place challenger KA1LMR. VA3DF made a run from 8th to 3rd this year, nearly cracking 200 QSOs. KA1C and K3TW both moved up in the standings as the persistent operators showed they could deal with the bands, even limited to QRP power.

N1UR made a lot of stations happy with his VT multiplier, repeating as the SOAB-LP (Low Power) winner this year. His category leading score of 1.009 Mpts (1,009,00 points) was only slightly down from last year's 1.063 Mpts, but the competition was down even more. W3LL was not in the Top Ten last year, but leaped to second place just ahead of N5AW in STX who held on to third place for a second year. There was more geographic diversity than in the QRP Top Ten with stations farther west and south (N4KG in AL in 4th place and W4TAA in WCF in 7th). VE3AD moved up three places to finish 5th from Ontario, chased by VE3XN in 6th.

With the path to Europe so important and so compromised by low solar flux, there's really only one thing to do — make it shorter! And that's what K1ZM has done by moving to Prince Edward Island and setting up shop as VY2ZM. Leading the SOAB-HP category for another year by an impressive 36%, it's hard to see what will push 'ZM out of first place except for perhaps the return of strong 10 and 15 meter openings. Until then, look for VY2ZM atop the standings.

Once again this year, the Canadian northeast was very well represented in the SOAB-HP category as VO1MP and VC3O (operated by shape-shifting VE3AT) completed the 1-2-3 sweep of the Top Ten's top places. In a squeaker mentioned before, AA1K made a strong move up to 5th place from ever-popular DE, but couldn't get by K1TO who placed 4th from the WCF section.

As usual, US/VE Single-Op-Assisted is very hotly contested. All this competitiveness is crammed into the Atlantic and Hudson Divisions, too, with those stations claiming all but one of the positions. With Internet connections becoming the norm for spotting network feeds, density of VHF-based networks is less important, but there is clearly some benefit to being located in a region packed with hams, even if the QRM is likely murderous at times.

Andy, N2NT, made a rather successful entry into the category in first place, besting N3KS in 2nd who moved up from 6th last year. Another big move was made by K2XA from 9th in 2006 to 3rd in 2007. Mr SOA, K3WW, appears in 4th place and southern neighbor NN3W right behind. The stranglehold of East Coast stations is broken at 6th place by N8TR from OH.

Single Band

This year's trends in single-band logs continue those seen over the past couple of years. The growth in entries slowed, but 20 meters remains by far the most popular single-band category, picking up a few percent from 15 meter's free fall from 2003-2004 prominence. 160, 80 and 40 meters all showed slight increases. Unless there are lots of sunspots to play with, expect 2008 to show about the same levels of interest in the different bands.

Just how wan and tenuous was 10 meters? Let's put it this way — the sum of all the scores in the 10 meter Top Ten would not be enough to crack 10th place in the 15 meter Top Ten! Nevertheless, specialists still manage to eke out contacts on this very-VHF-like band.

K4WI repeats in the top spot this year, just a pair of multipliers overcoming the 5 additional QSOs of 2nd-place KE5CCN.

Even without thundering masses of signals on 15 meters, there was enough interesting propagation and activity that everybody had a shot at the Top Ten. New England's K2SS out-multipliered K6XX from the West Coast to bring home the 1st place walnut this year. This could be a real horse race when Europe is once again available across the North American continent. Single-band stalwart K9BGL put IL on the map in 3rd before the list swings back to a pair of AZ stations — KC7V and K8IA — in 4th and 5th, respectively.

Last year I opined that the 20 meter band might overload and burn out — it apparently took a step or two in that direction. Scores were down significantly with W7WA holding on to the top spot, but at only 53% of last year's score. The secret? Only a handful more QSOs than 2nd place finisher NA3D. Band knowledge is definitely at a premium for single-band competitors.

Watch the bouncing ball as it tracks the locations of the 40 meter Top Ten stations; AL, RI, CO, OH, LA, NC, SB, TN, MS, WI. Or as districts; 4, 1, 0, 8, 5, 4, 6, 4, 5, 9. That's a pretty wide distribution and indicative of fairly good conditions on 40 phone. We are getting closer to the day when broadcasters start vacating the upper reaches of the band and hams worldwide can make better use of this important allocation. When that happens, look for 40 meter scores to jump dramatically. In the meantime, congratulations to KY5R for overcoming the distance-to-Europe challenge and prevailing in this tough category. W1XX made RI available near and far from 2nd place, followed by WDØBGZ in 3rd from the Great Plains of CO.

From the numbers, one wouldn't have been faulted for expecting a record-setting year for 80 and 160 meters, yet scores and multipliers were down on both bands. Pushing the envelope from the Midwest, KU1CW made a big dent in the old tenth district record from MO and now owns that to match the 160 meter record he posted last year as KØLW.

The big battle on 80 between 1st-place AA1BU and 2nd-place KT1V was a hot one. In a pattern we've seen elsewhere in the results, KT1V managed 8 more QSOs, but AA1BU managed to dig out 6 more multipliers on his way to the top. This is great for the competitive spirit and strategic skullduggery.

The night owls were busy on Top Band, as well, with W4SVO crashing the Top Ten party this year in the #1 spot. AA4MM was third last year, but moved up one notch to

Continental Leaders

	Call	Score
Africa		
Single Operator High Power	CN3A	2,840,445
Single Operator Low Power	EA8OM	37,740
Single Operator 20 Meters	EC8ADW	30,879
Single Operator 15 Meters	VQ9LA	29,502
Single Operator Assisted	EA8BZH	55,680
Asia		
Single Operator High Power	JA0QNJ	516,375
Single Operator Low Power	JH4UYB	247,776
Single Operator QRP	JR4DAH	10,185
Single Operator 80 Meters	JE1SPY	108
Single Operator 40 Meters	JA0JHA	61,017
Single Operator 20 Meters	JA7BJS	66,693
Single Operator 15 Meters	JH7XMO	22,950
Single Operator Assisted	JM2RUV	198,465
Multioperator Single Transmitter	JA8RWU	450,882
Multioperator Two Transmitters	JA3YBK	753,219
Europe		
Single Operator High Power	OK5R	2,561,835
Single Operator Low Power	OM5CD	467,550
Single Operator QRP	F5BEG	65,025
Single Operator 160 Meters	CU2AF	21,696
Single Operator 80 Meters	F6CTT	204,156
Single Operator 40 Meters	TM9R	208,449
Single Operator 20 Meters	MI0LLL	397,542
Single Operator 15 Meters	IR4M	137,694
Single Operator Assisted	EA7RU	1,138,626
Multioperator Single Transmitter	CU2A	3,560,214
Multioperator Two Transmitters	TM6M	3,157,680
Multioperator Multi Transmitter	OE4A	2,324,316
North America		
Single Operator High Power	8P1A	7,611,492
Single Operator Low Power	HI3T	3,824,532
Single Operator QRP	HI8/NM6E	3,750
Single Operator 160 Meters	KV4FZ	116,109
Single Operator 80 Meters	XE2K	205,146
Single Operator 40 Meters	TE2M	43,050
Single Operator 20 Meters	ZF2AH	600,480
Single Operator 15 Meters	WP3C	350,262
Single Operator 10 Meters	TI5N	103,329
Single Operator Assisted	HR2DMR	899,775
Multioperator Single Transmitter	V26H	4,958,832
Multioperator Two Transmitters	6Y1V	9,633,852
Oceania		
Single Operator High Power	KH6GMP	185,640
Single Operator Low Power	KH6SH	238,395
Single Operator QRP	AH7ZA	67,200
Single Operator 80 Meters	ZL1KMN	1,248
Single Operator 40 Meters	ZL3WW	152,712
Single Operator 20 Meters	AH6RR	23,835
Single Operator 15 Meters	DV1EG	300
Single Operator Assisted	KH6/AA4V	26,271
Multioperator Single Transmitter	NH6P	2,676,993
Multioperator Two Transmitters	KH7X	6,162,156
South America		
Single Operator High Power	FY5KE	5,673,438
Single Operator Low Power	P40A	5,595,456
Single Operator QRP	4M2L	233,916
Single Operator 160 Meters	YW5T	29,232
Single Operator 80 Meters	YY5OHV	39,072
Single Operator 40 Meters	YW4D	314,418
Single Operator 20 Meters	4M5IR	430,287
Single Operator 15 Meters	ZX5J	644,457
Single Operator 10 Meters	LU1HF	131,760
Single Operator Assisted	PJ4G	5,326,200
Multioperator Single Transmitter	LP1H	3,165,645
Multioperator Two Transmitters	PJ2T	10,704,960

second, passing W8LRL in third with a nice LP score. W3GH and KK4SI placed 3rd and 4th before the spotlight swept west to K5RX in NTX, this year's most western Top Ten inhabitant.

Multioperator

With all the new Technician and General class operators that are due to hit the airwaves this year, what better way to teach contesting and HF operating than a multioperator "contest college"? Everybody comes out a winner, especially the new hams who get valuable instruction and make a whole bunch of new friends at the same time.

Lest one think the top teams have a lot of operators, the average in multi-single is only 2.6 operators and most were just two-person teams. That's a lot of QSOs and a lot of time in the chair. W3BGN leapt into the Top Ten, landing in the top spot courtesy of a substantial multiplier advantage over 2nd place score and sole Canadian representative VE3RM. W1QA and N1MM (wonder what software they used?) duked it out for 3rd and 4th, respectively, from the New England Division.

Hey, guys — there's a really big dude at the door and he wants to come in! Please welcome KC1XX to the Multi-Two party (also known as Mini-Multi-Multi) as Matt's Marauders take first in their initial foray in the category. The next four places went to finishers in the same order as in 2006; N3RS (2nd), WE3C (3rd), W4RM (4th), and KØTV (5th).

It will happen sooner or later, but this was not the year for the K3LR string of wins to come to a close, now held over to a fourth big year. Who can dethrone the Mighty Tim? W3LPL's crew certainly gave it a great shot again this year, giving the Pride of Way-West Pennsylvania a waxing on 160, 80 and 40, but they couldn't overcome the Lima Radio magic on 20 and 15 meters. The Multi-Multi heavyweights do some serious heavy lifting on contest weekend.

Sponsored Plaque Winners

Plaque Category	*Winner*	*Plaque Sponsor*
W/VE Single Operator High Power Phone	VY2ZM (K1ZM, op)	Frankford Radio Club
W/VE 1.8 MHz Phone	K8V (W8LRL, op)	Butch Greve, W9EWC Memorial
W/VE 3.5 MHz Phone	K1LZ	K1ZM Communications, Inc
W/VE 14 MHz Phone	VE6WQ (@VE6JY)	William F. Beyer Jr., N2WB
W/VE 21 MHz Phone	N4PN	Dayton Amateur Radio Association
W/VE 28 MHz Phone	K4WI	Ralph Fontaine
W/VE Single Operator Low Power Phone	N1UR	Dauberville DX Association
W/VE Single Operator QRP Phone	K4CIA	Jeffrey Briggs
W/VE Single Operator Assisted Phone	K1AR	Pete Carter, K3VW Memorial
W/VE Multioperator Single Transmitter Phone	VE3RM	Steve Adams
W/VE Multioperator Unlimited Transmitter Phone	K3LR	Western New York DX Association
World Single Operator Phone High Power	TI1C (W5AJ, op)	North Jersey DX Association
Asia Single Operator Phone High Power	JA1ELY	Tim Coad
Oceania Single Operator High Power Phone	KH6WT (K1YR, op)	W7EW / W7AT
World 1.8 MHz Phone	KV4FZ	Fred Race, W8FR, In Memory of ZL2BT
World 3.5 MHz Phone	EA8AH (OH1RY, op)	Northern Illinois DX Association
World 7 MHz Phone	4M5DX (YV5SSB, op)	Dayton Amateur Radio Association
World 14 MHz Phone	OH8X (OH8NC, op)	Don Wallace, W6AM, Memorial Award
World 21 MHz Phone	PS2T (PY5EG, op)	Long Island DX Association
World 28 MHz Phone	LU1HF	North Shenandoah DX Association NS4DX
World Single Operator Phone QRP	YV5YMA	Southern Arizona DX Association
World Single Operator Assisted Phone	P40W (W2GD, op)	Willamette Valley DX Club
World Multioperator Single Transmitter Phone	FY5KE	Carl Cook, AI6V/P49V
Asia Multioperator Single Transmitter Phone	JA8RWU	Yankee Clipper Contest Club
North America Multioperator Single Transmitter Phone	XE7T	Nick Lash
World Multioperator Two Transmitters Phone	PJ2T	W6NL and K6BL
Europe Multioperator Unlimited Phone	9A15DX	Operators at K1TTT
South America Multioperator Two Transmitter Phone	PJ2T	Operators at K1TTT
W/VE Single Operator High Power Combined Score	K3CR (LZ4AX, op)	National Contest Journal
W/VE Single Operator Low Power Combined Score	N1UR	Rochester DX Association K2FR Memorial Plaque
Japan Single Operator Low Power Phone	JH4UYB	Western Washington DX Club
Seventh Call Area Single Operator High Power Phone	K7RL	Willamette Valley DX Club
World Multioperator Unlimited Combined	9A15DX	W2PV Memorial - Schenectady ARA
World Multioperator Unlimited Phone	KH7X (@ KH6YY)	Stanley Cohen
Central Division Single Operator High Power Phone	W9RE	Society of Midwest Contesters
Central Division Single Operator Low Power Phone	AJ9C	Society of Midwest Contesters
Central Division Multioperator Single Transmitter Phone	WN9O	Society of Midwest Contesters
World Single Operator Low Power Combined Score	VP9/W6PH	C. Sharp, K5DX Memorial by the Texas DX Society
World Single Operator Phone Low Power	P40A (KK9A, op)	Dayton Amateur Radio Association
Canada Single Operator Low Power Phone	VO1MX	Contest Club Ontario
Rocky Mountain Division Single Operator Combined	N6ZZ	Albuquerque DX Association
Oceania 28 MHz Phone	AH6RF	Ralph Fontaine

DX Overview

"When I was younger, I could remember anything, whether it had happened or not."

Let's start by saying thanks to the DX stations that aimed the aluminum stateside for the weekend. It wouldn't be much of a DX contest if you didn't! Tell your friends and encourage them to spend a few hours or 48 being welcomed by the US and VE crowd. It's a great way to work on WAS-type awards, too!

Before proceeding, let's have a collective tip of the cap to three great wins by a trio of traveling troubadours from the US making another trip to log thousands of QSOs from the Caribbean. W2SC as 8P1A in SOAB-HP, KK9A as P4ØA in SOAB-LP, and K2NG as PJ4G in SO-Assisted all put on quite a display as they took the top score back home. Not only did they lead their categories in scoring, but in logging accuracy, too! Strong work!

The most competitive Top Ten is in the popular SOAB-20 category. Behind the category leading score, the ratio of 2nd to 10th place is only 1.26:1. That's almost as crowded as the 20 meter band sounded!

Single Operator

With the ARRL DX exchange of signal

W/VE Region Leaders

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

Northeast Region (New England, Hudson and Atlantic Divisions; Maritime and Quebec Sections)			Southeast Region (Delta, Roanoke and Southeastern Divisions)			Central Region (Central and Great Lakes Divisions; Ontario)			Midwest Region (Dakota, Midwest, Rocky Mountain and West Gulf Divisions; Manitoba and Saskatchewan Sections)			West Coast Region (Pacific, Northwestern and Southwestern Divisions; Alberta, British Columbia and NWT Sections)		
VY2ZM	4,455,600	C	K1TO	2,344,650	C	VC3O	2,565,912	C	KØRH	427,050	C	K7RL	1,466,652	C
VO1MP	2,835,864	C	N8II	1,031,079	C	W9RE	1,627,716	C	KØOU	289,872	C	N6BV	1,032,750	C
AA1K	2,334,780	C	K5RQ	755,550	C	WB9Z	1,486,032	C	NØKE	267,840	C	K6NA	833,448	C
K3CR	2,080,152	C	AD4TR	597,045	C	W8KEN	207,015	C	WD5K	261,702	C	VE5UA	553,896	C
K1RU	1,816,014	C	AC8Y	560,142	C	VE3UZ	199,479	C	W6PU	236,964	C	K5RR	529,920	C
N1UR	1,009,866	B	N4KG	509,217	B	VE3AD	502,944	B	N5AW	628,236	B	K7ACZ	173,988	B
W3LL	684,294	B	W4TAA	390,429	B	VE3XN	425,739	B	KE5LQ	191,079	B	K7JE	151,815	B
N3DG	344,088	B	NA4K	249,480	B	KD9MS	332,442	B	VE5ZX	171,384	B	W7RV	139,416	B
W1CTN	315,948	B	WJ2D	247,665	B	N4TZ	192,648	B	WØETT	122,478	B	KM6Z	101,556	B
W1JQ	286,638	B	W4EEH	240,366	B	WB8JUI	144,000	B	W5GZ	93,375	B	NW7E	92,820	B
			KP4KOE	44,541	B									
N1TM	109,344	A	WA8WV	39,192	A	VA3DF	63,879	A	WF4U	7,560	A	N6WG	12,000	A
KA1LMR	94,563	A	N4AU	25,875	A	KT8K	14,022	A	N4CYV	2,418	A	K6UIZ	1,824	A
KA1C	35,235	A	N4ZAK	15,498	A	WD9FTZ	10,725	A	K2HT	330	A	K6MI	972	A
K3TW	20,400	A	KK4PQ	7,095	A	N8XA	8,379	A				K6RM	72	A
KO1H	13,728	A	WN4DX	2,262	A	KC9ECI	3,552	A						

report and power, there's no doubt when a Single Op QRP station calls in, sometimes breaking through a pileup to do so. The scores are often surprisingly large, such as category-leading 4M2L operated by YV5YMA — that would be a good score in the low-power results. PY2HL claimed the 2nd spot from a little farther south before the only Oceania entry in QRP by AH7ZA. Mahalo! Europe makes an appearance with F5BEG in 4th place. Asia is represented in the Top Ten by another good effort from JR4DAH in the 9th position. The lone NA entry in the QRP category was by HI8/NM6E taking a contest holiday, we presume. There were no African QRP entries.

Low Power is intensely competitive and is the most popular single category on either side of the pileups. KK9A at P4ØA decided to make it a three-peat and placed first in convincing fashion. HI3T (op-HI3TEJ) was a strong second, possibly a little too far north to catch the 15 and 10 meter waves of domestic stations. VP9/W6PH made his annual trip to Bermuda (What kind of shorts does Kurt wear while operating, I wonder?) to pick up a bronze. P4ØLE, 8P6EX, and XE1XOE filled out the next three positions before Europe appears with OM5CD and IZ2FOS in 7th and 9th place on either side of 3G1K from Chile. YV5EAH, a neighbor to leader P4ØA, closes out the Top Ten.

Maybe we should add airline miles used up to the SOAB-HP scores in some way. Our traveling expeditioners mixed it up with resident operators this year, with four roving operators in the Top Ten as opposed to eight last year. The competition between Home and Visitors leads to a very vigorous category!

W2SC powered 8P1A to outdistance F5MZN who traveled to FY5KE in pursuit of DX contest gold. Both were followed by NH7A, who moved up from fifth to place third this year from TO5A. Leaving the Caribbean/South American shores, IK2SGC operated CN3A to make Africa's only showing in any Top Ten box of 2007 in 4th place. Europe claims the next three positions in the guise of OK5R (op OK1RI), EA4KR, and SN7Q. YW5NN and SO6X slugged it out to claim 8th and 9th place, respectively, while GW4BLE completes the Top Ten listing. Just out of the Top Ten, JAØQNJ is the top Asian entry in SOAB-HP.

This year is quite a change from not too many years ago when the DX SO-Assisted category was dominated by Europeans! This year, the three top spots go to South America, demonstrating that the spotting networks really are worldwide. SO-Assisted was won this year by K2NG traveling to operate at PJ4G, managing to stay on a run frequency to the tune of 5918 QSOs while amassing some 300 multipliers. South America's sweep of Win-Place-and-Show was completed by 2nd place finisher PT7CB and in 3rd, LU4DX. EA7RU moved to 4th place this year, followed by DLØWW as Europe's top scores. HR2DMR put Honduras on the SOA map with a 6th place showing. Europe ran the rest of the table in the form of YR9P, F8CMF, IK3SKB and G3YYD. JM2RUV is the top Asian score at #14, EA8BZH repeats as the top African score, and KH6/AA4V did, in fact, bring the Internet to Hawaii this year!

Single-Band

The north-south railroad is running on schedule and on time. The Single Band 10 meter Top Ten is populated almost entirely in call signs from South American countries below the equator — PY, LU, and CX. LU1HF repeated as the winner this year, this time by a bigger margin. Right behind is an amazing performance from W5AJ at TI5N who must have worked a whole lot of back-scatter and sporadic-E to place second from Central America. The list promptly returned to South America and PP5AMP repeating last year's 3rd-place finish.

As far as geography goes, Single Band 15 meters wasn't that different from SB-10. The variety of last year's continental representation has vanished with seven of the top scores from South America, a lone North American score, and two Europeans. First place was decisively claimed by ZX5J. Brazilian call signs are well-represented in both 10 meter and 15 meter listings and the PY multiplier is more common in logs around the world, perhaps encouraged by last year's very successful WRTC 2006 in Florianopolis. Taking 2nd place is ZX2B and the NA representative, WP3C from Puerto Rico. Paraguay's ZPØR held down 4th place and moving a bit farther south, L44DX appears in 5th. PP5JD, YV1CTE, and LU7HF complete the South American group before IR4M and 9A5E fill out 9th and 10th positions, respectively. The top Asian score from VQ9LA was a delightful surprise from the middle of the Indian Ocean. EA8CCB was the lone African entry in SOAB-15, surprisingly, and DV1EG the top Oceania score.

There is a good mix of continents in the SOSB-20 category. ZF2AH was not at all troubled by long skip and easily outdistanced the competition to take the top spot. 4M5IR hailed from across the Caribbean in Venezuela for a 2nd place finish. Tied for third, yes, tied, were co-continental leaders MIØLLL and SO2R (that's a call, not an operating technique). Right behind them was OH8X, so northern Europe turned out to be once again a good place for 20 meter operating. The 6th spot flew back across the Atlantic to YV1RDX, only to return to Europe and TM1W in 7th. The exotic call 6H1L attracted enough attention to claim the 8th position. Two powerhouses in Europe, 9A1A and DP4K rounded out the Top Ten. The top Asian score was turned in by JA7BJS and EC8ADW was on hand to pick up the African title.

The 40 meter aficionados are impatiently drumming their fingers on the desktop, waiting for the day when working split isn't the only way to operate in this contest. Well, it's not here yet, so YW4D did it the old fashioned way

to place first in this tough category. The finalists bounced all over the map, with 2nd going to TM9R in EU and 3rd to ZL3WW putting up a nice score from the South Pacific. YT5T puts Europe back in the hunt at 4th place followed by SO8A in 5th. KH6FKG and OL9R put the squeeze on North America, nearly fighting to a draw, with the Oceania station prevailing by a slim 0.09%! At 8th place, JAØJHA puts an Asian station in the Top Ten for the only time this year. EA5BRE and DF3GY complete the SOAB-40 Top Ten.

SOAB-80 seems to be quite popular in Europe and with some success; half of the Top Ten spots go to the Continent, dividing the slots with North America and shutting out South America completely! XE2K stayed in run mode and used the distance advantage to out-talk F6CTT who set a new European record along with the 2nd place finish. They finished just barely ahead of KP4KE, all three stations separated by less than 0.5%! Another Caribbean, CM6RCR, took 4th before GM3PPG pinned down the 5th spot for Europe and CO6LP grabbed 6th. SN3A, DL1AUX, and HG3DX are found in 7th through 9th, respectively. KL7RA returned to the airwaves after moving his station with the final Top Ten spot. ZL1KMN braved his summer QRN to land the top Oceania score while JE1SPY turned in the best Asian score.

As with other low-band scores, the dramatic improvement expected on SOSB-160 at the solar minimum failed to materialize, but the Top Ten reflects good efforts. KV4FZ walked away with the top prize, using his capable station at an advantageous distance from US and VE callers. Just on the north shore of South America, YW5T took 2nd. CU2AF, almost halfway across the Atlantic came in 3rd. PT7AG's 4th place score is a good one from Brazil and the following pair of scores from SN3R and EA1DVY certainly reflect the high degree of difficulty in being heard in North America.

Multioperator

The big story was the photo finish between V26H and VP2E from the Caribbean. After log checking (it was that close) the V26H crew hung on their advantage to win, even though VP2E lost a bit less of their score. On the other side of the Caribbean, XE7S came in third, just ahead of the two-operator team at HI3C. CU2A in 5th was the top European score from their mid-Atlantic QTH. In 6th place, VP5H finished just ahead of a pair of teams from Argentina, LP1H and LT1F, that finished very close together in both QSOs and multipliers. TO6T in 9th put Guadeloupe in a lot of logs and NH6P was the top Oceania score this year. Once again, JA8RWU was the top Asian score — a beacon from Japan.

Multi-Two was *the* place to be in 2007! The Top Ten begins with four record-level scores in a row, led by PJ2T with a new South American record, 6Y1V with a new North American record, KH7X with a new Oceania record, and V47KP with a score that also beat the old NA record. Wow! Not many stations got through the contest without working most of these calls. TM6M was 5th with the top EU score and HG6N right behind. Two familiar JA call signs, JA3YBK and JA1YPA made sure we all had JA in the log.

In Multi-Multi, OE4A tried this unlimited category and took home 1st place from Austria and for Europe, just nosing out 9A7A. RK2FWA put out a big signal from Kaliningradsk again this year. When conditions get better on the high bands, we'll see more Multi-Multi entries from outside the US and Canada.

Affiliated Club Competition

Unlimited Category	Score	Entries
Yankee Clipper Contest Club	139,404,426	198
Frankford Radio Club	134,311,530	124
Potomac Valley Radio Club	93,655,371	190
Society of Midwest Contesters	30,875,724	77
Northern California Contest Club	23,352,162	77
Florida Contest Group	22,318,782	76
Minnesota Wireless Assn	20,297,799	71
Contest Club Ontario	18,633,665	63
Medium Category		
North Coast Contesters	20,414,244	23
South East Contest Club	15,756,765	23
North Texas Contest Club	15,013,548	17
Order of Boiled Owls of New York	12,165,531	18
Hudson Valley Contesters and DXers	11,703,576	37
Tennessee Contest Group	9,844,989	47
Mad River Radio Club	9,358,038	18
Maritime Contest Club	8,067,564	9
Carolina DX Assn	7,970,718	30
Western Washington DX Club	7,118,514	27
East Coast Canada Contest Club	7,106,277	9
Central Texas DX and Contest	7,079,703	14
Southern California Contest Club	7,007,127	31
Alabama Contest Group	5,237,307	20
Mother Lode DX/Contest Club	3,824,730	16
Central Arizona DX Assn	3,575,046	29
Rochester (NY) DX Assn	3,267,462	12
Willamette Valley DX Club	2,703,456	14
Grand Mesa Contesters of Colorado	1,694,571	17
Oklahoma DX Assn	1,561,014	5
Utah DX Assn	1,461,300	11
Metro DX Club	855,984	11
West Park Radiops	431,256	12
Local Category		
Albuquerque DX Assn	2,022,342	7
BC DX Club	1,578,399	5
Bay Area Wireless Assn	1,515,726	4
Northern Arizona DX Assn	1,032,318	10
Northern Illinois DX Assn	649,350	7
Florida Contest Group	646,500	3
Southern California DX Club	620,253	4
Western New York DX Assn	583,071	5
Kansas City DX Club	530,340	6
Bergen ARA	440,055	7
Spokane DX Association	423,321	6
CTRI Contest Group	398,037	5
Texas DX Society	348,240	7
Western Illinois ARC	338,652	4
Alberta Clippers	314,361	3
South Jersey DX Assn	281,487	5
Sterling Park ARC	273,933	4
Low Country Contest Club	267,069	3
Dauberville DX Assn	260,562	3
Wireless Association of South Hills	232,437	5
Magnolia DX Assn	197,892	3
Northern Rockies DX Association	190,650	3
Pikes Peak DX Group	114,231	5
Northeast Wisconsin DX Assn	103,842	3
South Jersey Radio Assn	28,755	3
Redmond Top Key Contest Club	20,763	3

Affiliated Club Competition

"The universal brotherhood of man is our most precious possession, what there is of it."

A total of 57 club entries were received this year — off from 2006's high of 60 submissions. While the number of clubs was slightly down, the number of logs was definitely up! This year's club scores represent 1451 total logs, up from 1411 last year. This is a terrific way for clubs to get new members on the air and for less-experienced contesters to feel like they are making a contribution. Check the rules for club categories at **www.arrl.org/contests/cc.html** and see if your club can muster an entry.

The number of logs makes a huge difference as the Unlimited category shows. The Yankee Clipper Contest Club (YCCC) mustered 198 individual logs for 139.4 Mpts. This was just enough to nose out a strong challenge from the Frankford Radio Club's (FRC) 134.9 Mpts from 126 members. Time for a recruitment drive? Potomac Valley Radio Club appeared in 3rd place with 93 Mpts.

In the Medium category, the North Coast Contesters held on to their gavel in the face of perennial challenger South East Contest Club. The North Texas Contest Club added one more log and raised the average score substantially to move into 3rd place. In the newly populated Local category, the Albuquerque (spell that phonetically, please) DX Association withstood the onslaught from the Medium camp and added four more scores to take the top spot this year. The BC DX Club and Bay Area Wireless Club jumped from Medium to Local and swapped places, finishing 2nd and 3rd, respectively.

Concluding Remarks

"Let us so live that when we come to die even the undertaker will be sorry."

I'm sure everyone is tired of listening to flat bands and tired clichés about the solar minimum. Even the low-banders were dragging their tails a bit this year. But you know what? This won't last and pretty soon, those high bands will start to come alive with signals from the far corners of the globe on contest weekend. And there will be joy in Mudville. Take heart because I have heard the Big Bass Bongo drumming up on the hill and seen the Palos Verde Sundancers conducting their Propagation Exhortation dances.

Once the clock turned over to 0000Z on Saturday, every station forgot about the dismal numbers and made contacts as fast as they could go, for as long as they felt like operating! The bands that were open were crowded with signals from near and far. It has been that way since 1927 when the ARRL DX Contest made its appearance in ham radio history. Eighty years and 7 solar cycles later, we're still at it.

Keep it ever so — see you next year! QST

School Club Roundup 2007

Two SCR events during this past school year brought the wonders of communication via the airwaves to hundreds of schoolchildren.

Lew Malchick, N2RQ
n2rq@arrl.net

The 2006-2007 school year marked the first time we attempted a School Club Roundup in October. It was an apparent success with 31 entries received and many positive comments. The usual February session of the SCR produced 54 entries, a significant drop-off from last year. It was marked by many schools shutting down or curtailing operation because of widespread winter storms. The combined total of 85 entries was still better than the February 2006 SCR level of participation, however.

W3NCS, a perennial high scorer that placed 2nd last year moved up to 1st place in February 2007. N6KKS not only topped the October elementary school list, but also counted 109 as operators.

K3EE made the February SCR an ARES (Amateur Radio Emergency Service) group project. They made a proposal to a local middle school principal and got themselves featured as the lesson of the day in six science classes (about 150 students). They gave a 10 minute briefing on Amateur Radio and HF propagation — how it differs from cell phones and Internet, and so on, while HF contacts were readied. Visit the School Club Roundup Web page at **www.arrl.org/SCR** for a complete listing of scores.

As we have seen, Amateur Radio provides many modes and kinds of experience for operators new and old. Some prefer voice, others digital and CW. In the SCR, it is not always about getting a high score; it is about getting new, prospective hams interested and excited about our wonderfully diverse hobby.

The 2007-2008 school year SCR will run October 15-19, 2007 and February 11-15, 2008. Operation starts on Monday at 1300 UTC and ends on Friday at 2400 UTC. See January 2007 *QST* or the School Club Roundup Web page at **www.arrl.org/SCR** for rules. Check the ARRL Web site and **scr-L@yahoogroups.com** discussion group for more information.

Students at Wyomissing Area High School, Wyomissing, Pennsylvania, enjoyed operating K3ATO during SCR 2007.

Soapbox

What a wonderful idea to hold a second SCR during October! It gave me a chance to demonstrate ham radio to my physics students early in the year, early enough that they can be in radio club for most of the year. The students, as always, really enjoyed talking on the air. The hams with whom we spoke were all very friendly, and helped the students quickly get over their mic-shyness. We are eagerly looking forward to the next SCR! — KA3WSQ for KB3BSW

"a great way for students to gain confidence in their on-the-air skills...."

SCR is a great way to introduce students to the world of amateur radio and live, on the air, operation. Being a totally hands-on experience, it is a great way for students to gain confidence in their on-the-air skills…. And thanks to all the great hams who took the time to QSO with the future hams of this great hobby. — KØMHP, trustee for KØKID

Another fantastic experience for our elementary students. They had a great time calling CQs, visiting, logging, and locating. Thanks to all the hams who took time to visit with the radio club members. — K3LTM, advisor CVSARC KB3BRT

The best part of the week was introducing our hobby to more than 200 students at Barnhart School, in Arcadia, California. In groups of 10, our 4th through 8th grade students visited the radio room. As two students operated the radio we projected a PSK contact on our digital white board. Students used a map and ruler to create ratios and proportions to calculate the distance between the two stations. — W6OQK, N6BMS, Barnhart Middle School ARC

It was fun to see these savvy 3rd graders have fun and talk for the first time over HF radio. They did quite well with this terrific easygoing environment. Lots of schools and lots of very encouraging individual ops calling. — W5AP

2007 ARRL November Sweepstakes Contest Announcement

Morse code: 2100 UTC November 3 – 0300 UTC November 5

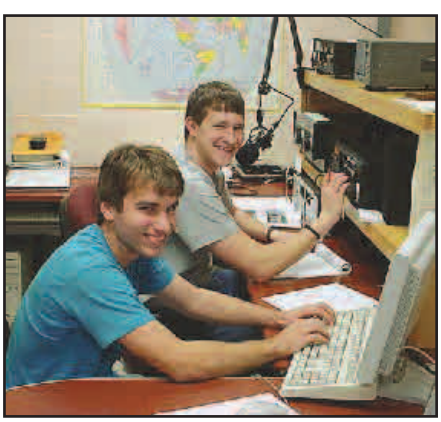
Voice: 2100 UTC November 17 – 0300 UTC November 19

How to participate: W/VE amateurs work as many amateurs in as many US/Canadian (ARRL/RAC) sections (**www.arrl.org/sections**) as possible on 160, 80, 40, 20, 15 and 10 meters. Single Operators may participate as all-band High power, Low power, QRP (5 W or less) or Unlimited entries (packet assisted at any power level). Multioperator stations are multi-single only. A school club category is available for schools operating without alumni participation.

What to say: Sweepstakes has a more complicated exchange than in other contests. It closely resembles the header of a formal radiogram. A station sends a consecutive serial number, a letter indicating its operating category (known as precedence), their call sign, the last two digits of the year first licensed and their ARRL/RAC section. The precedence abbreviations are Q = Single Operator QRP, A = Single Operator Low Power, B = Single Operator High Power, U = Single Operator Unlimited, M = Multioperator and S = School Club. (Example: If W1AW was a Single Operator High Power Station, the operator would send Number 188 B W1AW 37 CT.)

Special interest: This is perhaps the most competitive of contests for US and Canadian stations. Because of the more demanding exchange, it really challenges an operator's award abilities. Completing a Worked All States award (**www.arrl.org/awards/was/**) in a weekend is common.

Quirks: You may operate a total of 24 hours of the 30 hour contest period. Off-times must be a minimum of 30 minutes in length. A School Club entry must be comprised of current students and faculty members of the institution. You also may work a station only once, regardless of the band. There is no limit on the number of band changes for a multioperator station in Sweepstakes.



David, KD8BXT, and Andrew work the pileups at the Michigan State University ARC station, W8SH, in the 2006 SS Phone contest.

Rule changes this year: None for 2007.

Best reason to participate: Make 100 contacts during the weekend and you are eligible to purchase the collectible 2007 Sweepstakes CW or Phone Pin ($6 each) — an easy achievement to attain. Work all 80 sections (71 US and 9 Canadian) for a "clean sweep" and you are eligible to purchase the collectible 2007 Sweepstakes Clean Sweep Mug. Section winners in each operating category earn an attractive certificate.

Relative challenge: Sweepstakes offers you one of the best challenges to improve your operating skills, earn awards — and have fun! Accuracy is the key to a successful Sweepstakes. And as we move to the end of the sunspot cycle, the lower bands should prove to be more valuable in making contacts, so strategy becomes more important as well.

Scoring: Each QSO counts 2 points each. Each section counts as a separate multiplier. Count a multiplier only once, not once per band. The final score is QSO points times the number of sections worked (200 QSOs times 2 points = 400 QSO points times 80 Sections worked = 32,000 points).

How to report your score: For Morse code, you must send in your entry by *December 5, 2007*. For Voice, you must submit your entry *by December 19, 2007*. E-mail Cabrillo-format logs (**www.arrl.org/contests/fileform.html**) for CW to **sscw@arrl.org** and Phone to **ssphone@arrl.org**. Send paper logs and complete summary sheet to SS CW Contest (or SS Phone Contest), ARRL, 225 Main St, Newington, CT 06111. You may also submit your entry using the Web application available at **www.b4h.net/cabforms**.

Complete rules: The complete rules may be found at **www.arrl.org/contests/forms** where you will also find links to the General Rules for all ARRL Contests, General Rules for ARRL Contests on bands below 30 MHz (HF) and other forms and operating aids, log sheets for submitting your entry. If you don't have Web access, you can obtain the complete rules and forms by sending a self-addressed, stamped envelope with 2 units of postage to November SS Rules, ARRL, 225 Main St, Newington, CT 06111.

For more information: E-mail **contests@arrl.org** or phone 860-594-0295.

November Sweepstakes Participation Pins

The ARRL is again pleased to continue its PINS (Participation In November Sweepstakes) program for 2007. Anyone who completes 100 contacts on CW or Phone during Sweepstakes is eligible to purchase one of these attractive Participation Pins. Pins are based on claimed scores. Each pin includes the year and mode and has become a popular tradition in the November Sweepstakes event. *Pins cost $6,* including postage and handling and will be shipped after all entries have been processed and logs verified.

To order your pins, attach a note to the front of your summary sheet indicating the number of pins ordered along with your check. If you enter electronically, send a copy of your summary sheet with a note and your check attached to Sweepstakes PINS, ARRL Contest Branch, 225 Main St, Newington, CT 06111.

Clean Sweep Mugs

Commemorate working your "clean sweep" by purchasing your ARRL 2007 November Sweepstakes mug. To earn your mug, work all 80 ARRL/RAC sections during the CW or Phone November Sweepstakes. Mug awards are based on claimed scores. *The price for the keepsake mug is $12 each* (including postage and handling). If you submit electronically, send a paper copy of the first page of your Cabrillo file and indicate how many mugs you are ordering along with your check. If you log by paper, attach a note to the top of your summary sheet indicating how many mugs you are ordering and your check. All orders should be sent to Clean Sweep Mugs, ARRL Contest Branch, 225 Main St, Newington, CT 06111. Your mug will be shipped after all entries and mug orders have been processed and verified. Supplies are limited. *We can only guarantee filling orders received by the Phone Submission deadline of December 19, 2007.*

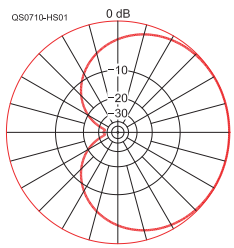
HAMSPEAK

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**.

An All-Band Attic Antenna

ADSL — Asymmetric digital subscriber line. Method of sharing a copper twisted pair telephone line between analog voice service and digital data in which the upstream direction has a lower capacity than the downstream — hence the *asymmetric* in the name. See **www.iec.org/online/tutorials/adsl/**.

Cardioid — Unidirectional pattern associated with some antenna and microphone systems that is characterized by a sharp null in the rear response.



Inverted-L antenna — A modification of the usual quarter-wave (λ/4) vertical antenna fed against ground. In the inverted-L case, the top portion is bent over so that it is horizontal to allow construction using a lower support member.

J-pole — Half-wave (λ/2) vertical antenna fed through a λ/4 transmission line matching section. The combination has the appearance of the letter J.

Are You Using The Right Sized Fuse?

American wire gauge — Measure of the diameter of wire, especially electrical wire (other types often use a different standard). See **www.powerstream.com/Wire_Size.htm** for more information.

Anderson Powerpole connectors — Trade name for a kind of electrical plug-in connector designed for low power loss and ease of interconnection. By their design they are "genderless"; that is, any connector can plug into any other. The 30 A size are very popular for dc circuits. For more information, see **www.andersonpower.com**.

Circular mils per ampere — A measure of the cross-sectional area of wire per ampere of current. The larger the area (lower number wire size) the lower the resistance. The lower resistance results in less heating.

[1] *The ARRL Handbook for Radio Communications,* 2007 Edition. Available from your ARRL dealer or the ARRL Bookstore, ARRL order no. 9760. Telephone 860-594-0355, or toll-free in the US 888-277-5289; **www.arrl.org/shop/**; **pubsales@arrl.org**.

Fuse blocks — Physical connection point for electrical power wiring. Usually a power source supplies the block and multiple circuits connect there, each with their own fuse.

Splatter — Generation and transmission of spurious signals outside of your operating bandwidth. These signals can be produced by misadjustment of SSB transmitters and interfere with other users of the band.

Voltage regulator — Electrical circuit, often constructed as a single integrated circuit, that accepts a variable voltage input and provides a constant, but lower, voltage output. This allows equipment to operate in a stable manner, in spite of power source variation. See **www.national.com/appinfo/power/files/f4.pdf** for more information.

The Doctor is IN

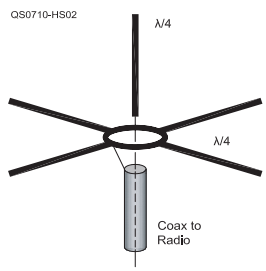
Broadside array — Multielement antenna array in which the maximum radiation is perpendicular to the plane of the elements.

End-fire array — Multielement antenna array in which the maximum radiation is parallel to the plane of the elements. Note that this is not the same as from the end of the elements, which makes the name confusing. [I would call it an "edge-fire" array if I got to name things. — *Ed.*]

EZNEC — Computer antenna analysis software with an easy (EZ) to use interface using the *Numerical Electromagnetics Code (NEC).*

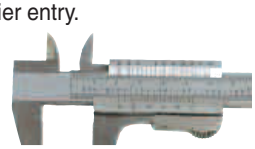
Ferrite beads — Powdered iron formed in a small donut shape designed to slide over a wire to increase the wire inductance. Generally used to remove interfering high frequency signals from wires or cables.

Ground plane — Elevated quarter-wave (λ/4) vertical monopole antenna fed against an artificial ground composed of three or four λ/4 horizontal (sometimes "drooping") rods.



J-pole — See earlier entry.

Vernier — A scale on measuring instruments, such as on the vernier calipers shown, that allows a direct readout to an additional order of magnitude of precision by mechanical interpolation. [Note that *precision*, the ability to specify additional significant digits, does not necessarily imply additional *accuracy*, a specification of the correctness of the data. — *Ed.*]



Keeping Safe with Generators and Starting Batteries

Electrolyte — Solution generally of acid or salt that acts like a conductive medium in batteries or for electroplating purposes. The conduction is via free ions within the solution. For more information, see **en.wikipedia.org/wiki/Electrolyte**.

A Low Cost Frequency Synthesizer

Drake R4B — Member of a family of popular vacuum tube amateur SSB receivers made by the R. L. Drake company of Miamisburg, Ohio from the late '50s to the early '80s. The R4 series was designed to operate with the T4X series of transmitters. See **www.dproducts.be/DRAKE_MUSEUM/**.

Solderless breadboard — Predrilled circuit board designed to allow easy fabrication of prototype circuits using mechanical spring connectors in place of solder.

VCO — Voltage controlled oscillator. Circuit that generates a signal with a frequency that is varied by changing an applied voltage.

Motorola VHF Micor Radio Modifications — *Part 1*

Audio deviation — Frequency shift associated with the audio input or modulation of an FM transmitter. See **www.satturkey.com/yayincilikstandardlari/fmdeviation.htm**.

Crystals — Slices of quartz designed to take advantage of the piezoelectric property |that converts electrical signals to mechanical vibration at a precise frequency. Used as the frequency control element in some radio equipment. Also used for frequency filtering in many types of radios. See **en.wikipedia.org/wiki/Piezoelectric**.

Front end — Portion of radio receiver circuitry nearest to the antenna terminals. Usually the first place that off-frequency signals start to be rejected.

Hamfest — Gathering of Amateur Radio operators generally sponsored by a club or other amateur organization. See **www.arrl.org/hamfests.html**.

Packet radio — Amateur data encoding, transmission and relay system designed to allow communication of computer to computer information between amateur stations. See **www.arrl.org/tis/info/digital.html**.

Terminal node controller (TNC) — Device that interconnects a radio transceiver and a data terminal, or usually a PC in terminal emulation mode, to convert data to audio signals in packet radio (AX.25) format. See **www.tapr.org/pr_intro.html**.

Tuning slugs — Movable core designed to screw in or out of inductors to change the inductance and hence the resonant frequency of associated tuning circuits. QST

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ID-800H Digital Dual Band Mobile

• 55 watt VHF/50 watt UHF • Wide RX: 118-173, 230-549, 810-999 MHz (cellular blocked on US versions) • Analog/Digital Voice & Data • Callsign Squelch • CTCSS & DTCS Encode/Decode w/tone scan

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- DX Packet Cluster Monitor
- 200 Mems., CTCSS
- VC-H1 Messaging Control

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- 50w 2M & UHF
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- 1000 memories • Dual receive
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- Built-in TNC • Sky Command II+
- GPS I/O Port
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- 60 Watt, 200 Mems, CTCSS/DCS
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- Dual Chanel Receive
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- 5w 2M/220/440 TX, FM
- 435 Memories
- Li-Ion Battery

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TS-480AT/HX HF+6M Transceiver

- 480SAT 100w HF & 6M w/AT
- 480HX 200w HF & 100w 6M (no Tuner)
- DSP built in
- Remotable w/front panel/speaker

$180. Kenwood Coupon

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TS-2000 HF/VHF/UHF TCVR

TS-2000 $80. Kenwood Coupon

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- 100W HF, 6M, 2M • 50W 70CM
- 10W 1.2 GHz w/opt UT-20 module
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- IF Stage DSP • Backlit Front Key Panel

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TM-V71A 2m/440 Dual Band

- High RF output (50w) • Multiple Scan
- Dual Receive on same band (VxV, UxU)
- EchoLink® memory (auto dialer)
- EchoLink® Sysop mode for node terminal ops
- Invertible front panel
- Choice of Amber/Green for LCD panel
- 104 code digital code squelch
- "Five in One" programmable memory
- 1,000 multifunction memory

Call Now For Your Low Price!

TS-570SG DSP Enhanced

- 100W HF and 6M
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- DSP • Large LCD Display • Elec. Keyer
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NEW!

- Fully Solid-state 1 KW HF 650W 6m
- Built-in Power supply (110 or 220v)
- 2 Ant ports selectable
- auto band switched w/ most ICOM/Kenwood/Yaesu tcvrs

Watch for new THP Products coming soon!

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KAM XL

- DSP modem offers great performance on Packet 300/1200,G-tor,Pactor, Amtor,PSK-31
- RTTY, Navtex, ASCII, Wefax, CW, GPS NMEA-0183 and more!

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KPC-3 Plus/KPC-9612 Plus

High-performance, low power TNC.
Great for packet, and APRS compatible.

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ICOM

IC-R20 Wide Band Receiver

- Wide RX .150–3304 mHz*
- SSB, CW, AM, FM, WFM
- 32mb digital recorder
- 1,000 memories
- VSC • 100 ch/sec. scanning

$20. mail-in rebate* *good thru 9/30/07

NEW!

IC-R5 Wide Band Receiver

- Wide RX .150–3309 mHz*
- 1250 memories
- Alphanumeric labels
- DMS scan
- AM, FM, WFM

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IC-R3 Wide Band Receiver

- 500 kHz - 2.45 GHz*
- 450 Alphanumeric Memories
- CTCSS w/Tone Scan
- 4 Level Attenuator
- Telescoping Antenna w/BNC Connector
- Lithium Ion Battery
- 2" Color TFT Display
- Audio/Video Output
- Four Way Action Joystick
- PC Programmable w/Optional Cable & Software

$10. mail-in rebate* *good thru 9/30/07

*cell bands blocked
*816-901.995 MHz blocked; unblocked versions available to FCC approved users. FM video range for the IC-R3 is 900-1300 MHz & 2250-2450 MHz

GEOCHRON

Detailed illuminated map shows time, time zone, sun position and day of the week at a glance for any place in the world.Continuously moving – areas of day and night change as you watch.
• Mounts easily on wall. Size: 34 1/2" x 22 1/2".

Reg $1595. SALE $1099.95

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Shown with Optional Rotor Base

MA-40

40' Tubular Tower

Call For Latest Pricing!

MA-550

55' Tubular Tower

Handles 10 sq.ft. at 50mph
Pleases neighbors with tubular streamlined look

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TX-455

55' Freestanding Crank-Up
Handles 18 sq. ft. @ 50 mph
No guying required
Extra-strength const.
Can add raising and motor drive acces.

Towers Rated to EIA Specifications
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Power supplies with battery backup

$129.95

JTPS35BCM

Just add a battery, the power supply will trickle charge the battery and automatically switch to the battery when your electricity goes off! 27 amps continuous, 35 amp surge. Battery terminals are on the back. Low current, High current and cigarette lighter plug on the front. Voltage adjustable 9-15 volts.

$59.95

JTPS14BCM

Just add a battery, the power supply will trickle charge the battery and automatically switch to the battery when your electricity goes off! 12 amps continuous, 14 amp surge. Battery and output terminals are on the back. Voltage adjustable 9-15 volts.

YAESU
Choice of the World's top DXers

VX3R

The new ultra-compact VX-3R 2m/70cm FM HT Transceiver is loaded with convenience features. In addition to top quality performance on 2m and 70cm, you will also be able to enjoy stereo FM and improved AM broadcast band reception with our new Internal Bar Antenna. And *"When All Else Fails"* and local power service is not available to power your charger, you can now operate using "AA" batteries with our optional battery case. 1.9" X 3.2" X .9" 4.6 ounces. Tough where it counts - Aluminum Die-Cast Chassis. Supplied with Tiny Super-thin, Lithium-ion High-Capacity Battery and Charger. Internal Bar Antenna for AM Broadcast Band Reception. Listen to AM or FM Broadcast while Monitoring an Amateur Frequency.

FTM10R

WORLD'S FIRST DUAL-BAND MOBILE DESIGNED TO SUPPORT ALL-WEATHER OUTDOOR MOTORSPORT ACTIVITIES COMPLETE NEW STYLING EASY-TO-OPERATE PACKAGE The exciting newly designed FTM-10R/E* Mobile 2m/70cm Transceiver is packed with innovative features that operators have been dreaming of for years. Great new appearance with keys and indicators that are illuminated with very bright LEDs. The bright ocean blue negative type LCD display is easy on your eyes. Super compact detachable front panel is ready to go with your motor vehicle! The unique Waterproof/ Dustproof Front Operation Panel is designed to support All-Weather Outdoor Activity in a manner never before possible. Detach the front panel with one-touch release when transmitting! The detachable front panel may be separated from the main chassis, and attached to a flat metal surface with the magnetic mounting bracket. The microphone and PTT button are built into the front panel.

FT450

The FT-450 is compact 9"W x 3.3"H x 8.5"D, lightweight 7.9 pounds. 100 watts on 160 through 6 meters. The FT-450 can be powered by any convenient 13.8 VDC 22 amp external power source. You will love the FT-450 9-segment Black-Nega type LCD frequency display with larger-than-normal easy to read characters. 400 MHz built-in IF DSP. IF Roofing Filter. IF SHIFT & WIDTH. CONTOUR. IF NOTCH. DNR - Digital Noise Reduction. Manual Notch Filter. IPO/ 20 dB ATT built-in. CLARIFIER adjustment. QUICK SPLIT automatically set higher than the Main Frequency. TXW feature to monitor the xmit frequency when split. Digital Microphone Equalizer. Built-In Electronic Keyer. Memory Keyer. Spotting (Zero-Beating) CW Training Feature. Beacon Function (up to 118 characters). Rugged die-cast aluminum chassis. Dedicated Data Jack for FSK-RTTY operation. CAT System (D-sub 9 pin): Computer programming. Versatile Memory System. 500 memory channels with 13 Memory Groups. My Band / My Mode function to recall personal favorites.

TOKYO HY-POWER

Complies with New FCC Rules.

Available Now with 12m and 10m Built-in!

HL-1.5KFX

HF/50MHz Linear Power Amplifier

This compact and lightweight 1kW desktop HF/50MHz linear power amplifier has a maximum input power of 1.75kW. Our solid-state broadband power amp technology makes it **the smallest and lightest self-contained amplifier in the industry**.

Typical output power is 1kW PEP/SSB on HF and 650W on 6m band with the drive power of 85-90W. Bands set automatically with the **built-in band decoder**. You can forget about the band setting when the amplifier is connected to your modern radio through **supplied band data cables for ICOM CI-V, DC voltage (ICOM, Yaesu), and RS-232C (Kenwood)**. Manual band setting selectable as well.

All these data cables are included with the amplifier.

More Fine Products from TOKYO HY-POWER

HL-1.2KFX
HF amp 750W out

HC-1.5KAT
HF 1.5KW Auto Tuner

HL-350VDX
VHF 330W Amplifier

Watch for Our NEWEST and MOST POWERFUL full legal Limit. HL-2.5Kfx available early Fall!

*All of these devices have been authorized as required by the rules of the FCC.

Features

- Lightest and most compact 1kW HF amplifier in the industry.
- The amplifier's decoder changes bands automatically with most ICOM, Kenwood, Yaesu.
- The amp utilizes an advanced 16 bit MPU (microprocessor) to run the various high speed protection circuits such as overdrive, high antenna SWR, DC overvoltage, band miss-set etc.
- Built in power supply.
- AC (200/220/235/240V) and (100/110/115/120V) selectable.
- Equipped with a control cable connection socket, for the HC-1.5KAT, auto antenna tuner by Tokyo Hy-Power Labs.
- Two antenna ports selectable from front panel.
- Great for desktop or DXpedition!

Specifications

Frequency:
1.8 ~ 28MHz all amateur bands including WARC bands and 50MHz

Mode:
SSB, CW, RTTY

RF Drive:
85W typ. (100W max.)

Output Power:
HF 1kW PEP max.
50MHz 650W PEP max.

Matching Transceivers for Auto Band Decoder:
Most modern ICOM, Yaesu, Kenwood

Drain Voltage:
53V (when no RF drive)

Drain Current:
40A max.

Input Impedance:
50 OHM (unbalanced)

Output Impedance:
50 OHM (unbalanced)

Final Transistor:
SD2933 x 4 (MOS FET by ST micro)

Circuit:
Class AB parallel push-pull

Cooling Method:
Forced Air Cooling

MPU:
PIC 18F452 x 2

Multi-Meter:
Output Power – Pf 1Kw
Drain Voltage – Vd 60V
Drain Current – Id 50A

Input/Output Connectors:
UHF SO-239

AC Power:
AC 240V default (200/220/235) – 10 A max.
AC 120V (100/110/115) – 20 A max.

AC Consumption:
1.9kVA max. when TX

Dimension:
10.7 x 5.6 x 14.3 inches (Wx-HxD)/272 x 142 x 363 mm

Weight:
Approx. 20kgs. or 45.5lbs.

Accessories Included:
AC Power Cord
Band Decoder Cables included for Kenwood, ICOM and Yaesu
Spare Fuses and Plugs
User Manual

Optional Items:
Auto Antenna Tuner (HC-1.5KAT)
External Cooling Fan (HXT-1.5KF for high duty cycle RTTY)

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TWO-IN-ONE CONTROLLER

1 Noise Canceling Controller

- Reduce overload or interference by nulling a strong local signal or noise before it gets to your receiver
- Better and more stable nulling than any other noise canceller on the market
- Peak weak signals hidden under a strong signal on the same frequency
- Null out local AM broadcast stations
- Null out noise from power line arcing, lamp dimmers, motors and consumer electronics

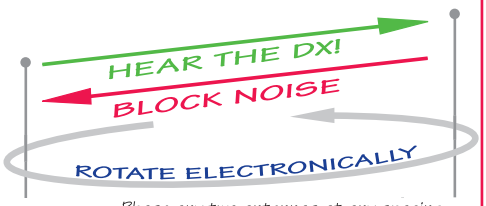
2 Antenna Phasing Controller

- 2 antenna alternative to DX Engineering's Receive Four-Square antenna
- Combine two antennas to create a directional pattern
- The NCC-1 enables you to adjust the antenna array pattern as if you were moving the antennas
- Use for direction finding

Special Features

- Exceptional dynamic range, nearly 1000 times better than nearest competitor
- Phasing is voltage controlled allowing precise resetting of phase
- Phasing rotates more than 360 degrees with smooth control
- Built-in two channel, voltage controlled attenuator system
- Low noise, high dynamic range amplifiers
- Vastly superior dual channel complementary phasing system
- Very low noise floor
- Separate controls for reversing channel and phase
- Works on all modes, 300 kHz to 30 MHz
- Provides power for external active antennas
- Input for mute on transmit

DXE-NCC-1 Noise Canceling/Phasing Controller **$495.00**



Phase any two antennas at any spacing. For optimal results, use identical antennas.

HAM-SWL

Active Receive Antenna

- Now available with relay protection from transmitter overload when used with TVSU-1
- Weak signal sensitivity rivals full size antenna
- Operates from 100 kHz to 30 MHz
- Excellent strong signal handling with +30 dBm output third order intercept
- Easy installation
- Available in vertical or dipole configuration

DXE-ARAH-1P	Horizontal Configuration	**$259.00**
DXE-ARAV-1P	Vertical Configuration	**$229.00**
DXE-ARAH2-1P	Horizontal Configuration with relay	**$289.00**
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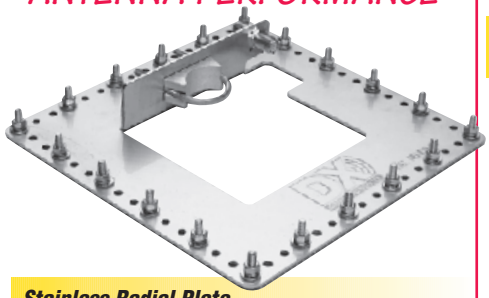
MAXIMIZE VERTICAL ANTENNA PERFORMANCE



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

Shown with optional DXE-363-SST and DXE-SAD-200A

DXE-RADP-1P	Complete with 20 stainless bolt sets	**$49.95**
DXE-RADP-1HWK	20 sets of 1/4" stainless hardware	**$5.95**
DXE-CAVS-1P	Stainless Saddle Clamp for attachment to round tube 0.5" to 1.75" O.D.	**$8.90**
DXE-363-SST	Silver/Teflon® bulkhead connector	**$6.95**
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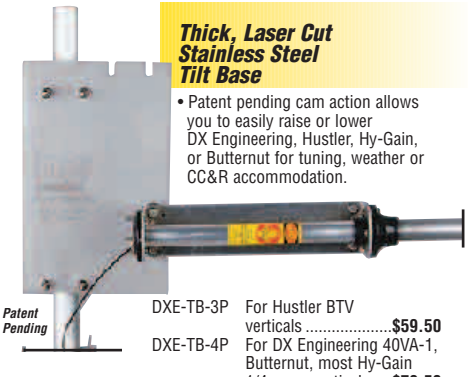

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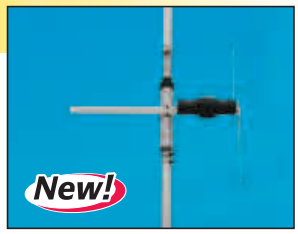

- Full band under 1.5:1 SWR
- Minor adjustments for other bands
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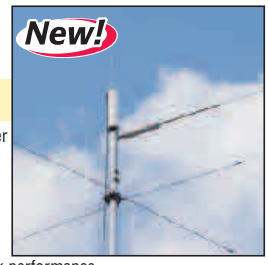

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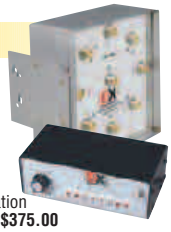

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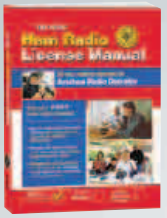

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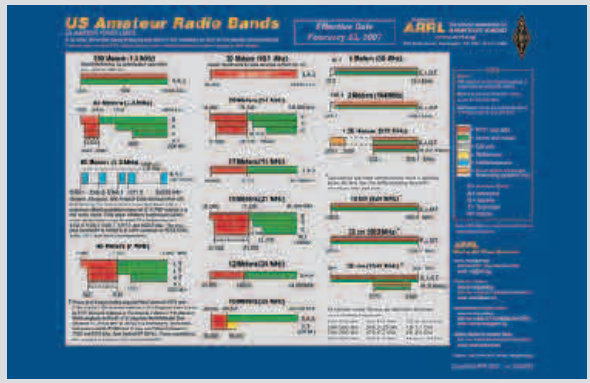

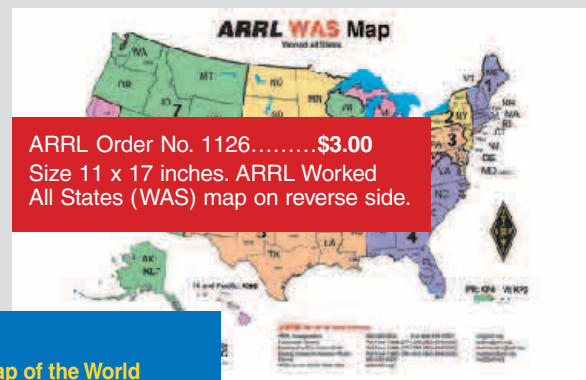

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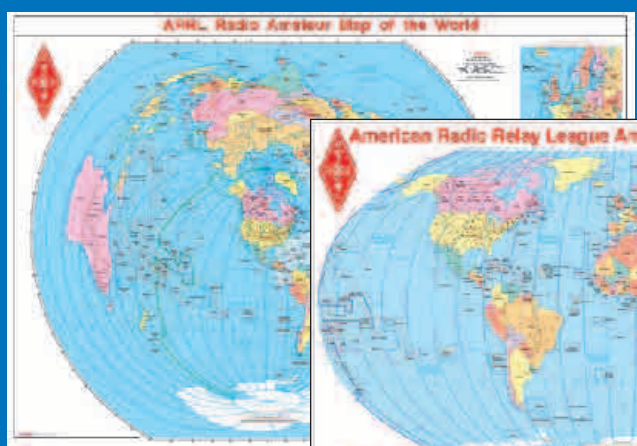

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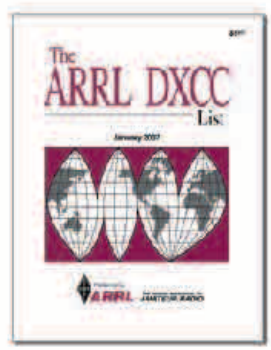

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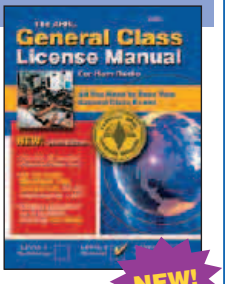

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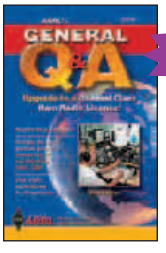

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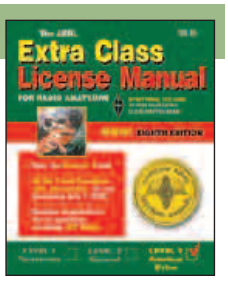

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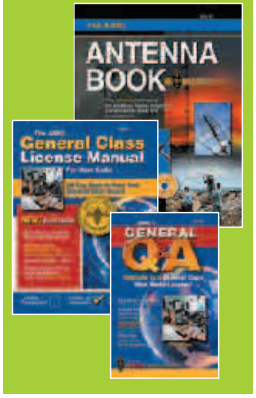

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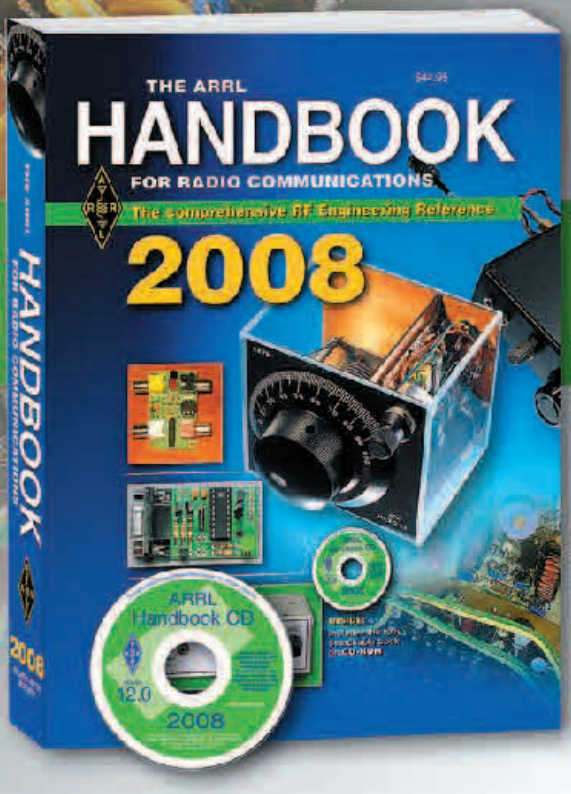

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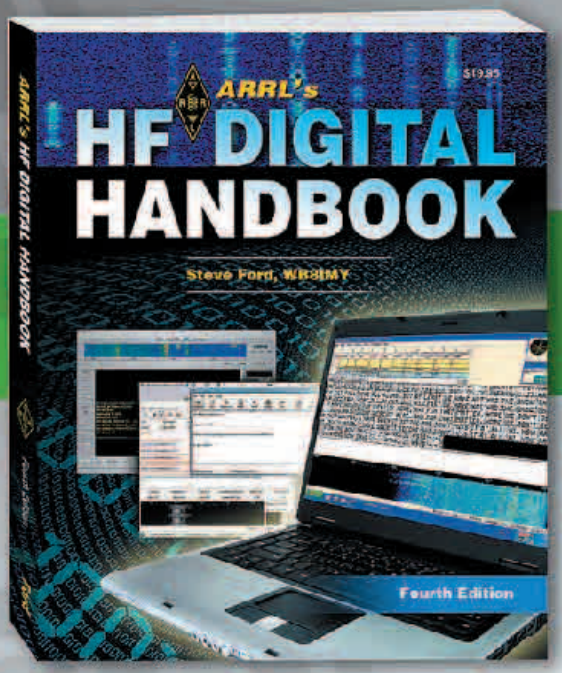

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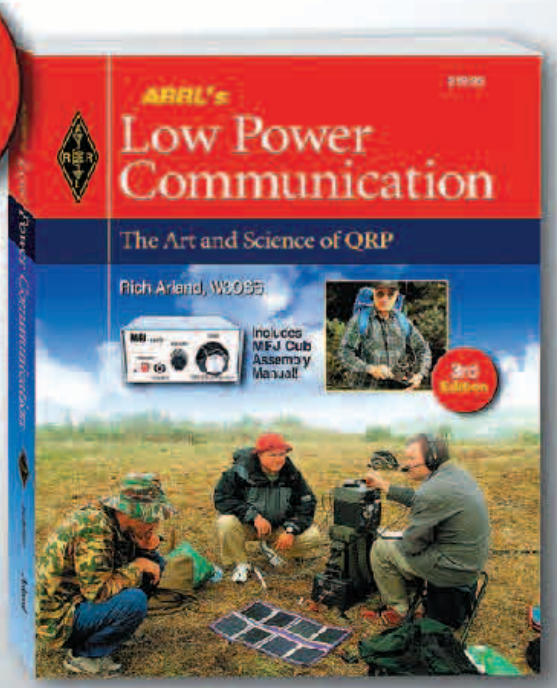

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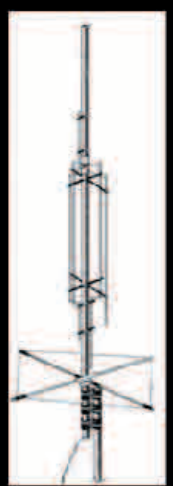
The GAP Technology eliminates traps, electromechanical devices and coils, which can increase loss and decrease reliability. Simplicity in design, results in a very user friendly assembly process. Slide one tube over another until the big hole lines up with the little and insert a screw. A GAP is pretuned, will handle 1500 watts PEP and provides instantaneous coverage with a VSWR under 2:1 across the entire band.*

CATCH THE WAVE



TITAN DX

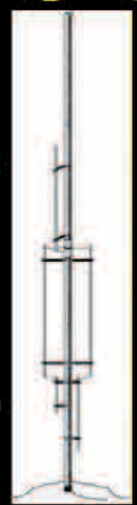
10m, 12m, 15m, 17m, 20m, 30m, 40m, & 80m

25' tall 25 lbs

Mounts on 1-1/4" OD mast

No radials required.

*VSWR under 2:1 on 80m 100 KHz



CHALLENGER DX

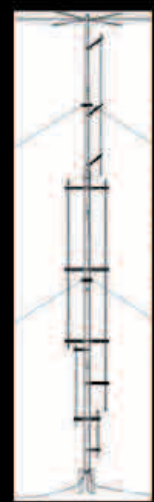
2m, 6m, 10m, 12m, 15m, 20m, 40m, & 80m

31.5' tall 21 lbs

Drop in ground mount supplied.

3 counterpoises required 25' long.

*VSWR under 2:1 on 80m 130 KHz



VOYAGER DX

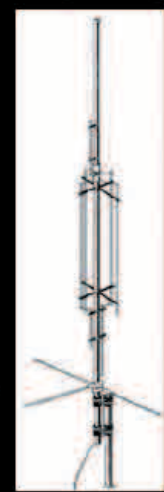
20m, 40m, 80m, & 160m

45' tall 39 lbs

Supllied with hinged ground mount.

3 counterpoises required 57' long.

*VSWR under 2:1 on 160m 90 KHz



EAGLE DX

10m, 12m, 15m, 17m, 20m & 40m

21' tall 19 lbs

Mounts on 1-1/4" OD mast

No radials required.

*40m limited to 300 watts

QUICK TILT

The easy way to raise and lower your antenna, support mast or flagpole. Works with most antennas.

GROUND MOUNT

Accomdates 1 1/4" 2" OD Mast

LADDER MOUNT

STAINLESS STEEL & ALUMINUM CONSTRUCTION

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gapantenna.com

GUY KITS

Insure your antenna or support mast against the elements with a Guy Kit.

STAINLESS STEEL & ALUMINUM CLAMP

3/32" UV Protected Black Double Braided Polyester Rope

The #1 Line of Autotuners

LDG Electronics makes the #1 line of autotuners in the industry based on total number of autotuner reviews on eham.net in July 2007. Here's a sample of what some of those people are saying - "Love it, works great on my G5RV, I would say this is the best tuner for the money for the 706 (AT-7000)", "Faster tuning, plenty of options, and excellent matches make this one a great buy! (Z-11Pro)", "The quickness and precision of the unit is a dream." (AT-200Pro).

Our customers have known we were #1 all along. LDG was the first company with the "no questions asked" two-year warranty on our autotuners and all other products, the first company to include all of the cables with our autotuners, and the first company with 3-D memory in our autotuners. LDG autotuners also have the highest resale value of any autotuner on the market today.

To thank you for making us the #1 autotuner we are now offering you a FREE balun with the purchase of any LDG Electronics autotuner through January 31st, 2008. What are you waiting for? We have worked hard to offer you the best products in the industry and with a FREE balun you can't go wrong. Call or visit your favorite distributor today!

Z-11Pro

A Legend in it's Own Time

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.

Ready to go right out of the box!
No extra cable to buy.

List Price $179

NEW! AT-1000Pro

Just Key and It Tunes!

Building on the success of the AT-1000, LDG Electronics has refined and expanded its 1KW tuner. The AT-1000Pro has an Auto mode 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 RFRelay protection software prevents tuning at greater than 125 watts
- 2 Antenna connections
- Tunes from 1.8 to 54.0 MHz (including 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-200Pro

The first auto tuner designed for high-powered transceivers

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 MH **(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

AT-100Pro

Automatic Antenna Tuner

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

The Perfect Autotuner for the Hottest Radio in the Industry

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 in a flash.

Requires just 0.1 W for operation, but will handle up to 125 W (100 W on 6 m), making it suitable for everything from QRP (IC- 703Plus) to a typical 100 W ICOM transceiver.

All cables included.

Suggested Price $169

Z-100

The definitive low cost automatic antenna tuner!

Designed from the ground up to provide the 100 watt power handling you asked for, 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 the tuner is not tuning, it draws nearly zero amps.

Suggested Price $149

LDG ELECTRONICS Two-Year Warranty

Visit your favorite dealer to purchase LDG products.
Visit www.ldgelectronics.com for a list of distributors.

LDG Electronics, Inc.
1445 Parran Road,
St. Leonard, MD 20685
Phone: 410-586-2177
Fax: 410-586-8475

FREE Balun with Any Autotuner Purchase

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 are 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 if you are using another CAT device, hooking it up couldn't be easier.

Suggested Price $199

AT-200PC

The First Automatic Tuner Designed Specifically for PC Rig Control

Now you can have a state-of-the-art, high performance automatic tuner and still run your whole station right from your keyboard and mouse.

LDG's AT-200PC is a special version of the popular AT-200Pro, designed for PC control. All of its functions are controlled entirely by a program running on your PC. The tuner itself can be installed out of the way, on the floor or even in another room, interfacing to your PC via a serial or USB cable. All cables included.

Suggested Price $259

We Took a Great Meter and Made it Better

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 on the back of the unit; no need to take apart to calibrate
- Backlight brightness adjustment on the back so you can set the backlight to your desired level

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

LDG ELECTRONICS Two-Year Warranty

The "Talking" Watt Meter

The TW-1 Talking Wattmeter provides an aural spoken indication of power and SWR using a digitally recorded voice. It is ideal for the vision-impaired, for those of us in the "bi-focal set", or just for those times when you need to be looking somewhere else. At the press of a button, the TW-1 speaks the forward power, reverse power or SWR. Three languages are available: English, Spanish and German. It includes its own internal speaker; no external audio hookups are needed. Also available TW-2 UHF/VHF.

Suggested Price $149

The DTS Series Antenna Switches

Tired of that tangled mess of coax and pigtails in your shack? Always worrying about whether you set the ground switch on your antenna before you left your snack? LDG's new DTS Series antenna switches are for you. Instantly switch your rig between 4 or 6 antennas with the press of a button. Auto-grounding when you shut your rig down. Purchase the additional remote control and put the DTS Series switch anywhere indoors and operate it from your desk. They handle up to 1500 watts of RF power on HF

(250W on 6M), and can be used with any coax-fed antenna.

Suggested Price DTS-4 $79, remote $39, DTS-6 $99. remote, $49

Your Cable Problems—Solved!

RCA-14 is a breakout box for the accessory jacks on most popular transceivers. It comes with cables with the right DIN plugs, and all the outputs are RCA jacks. You simply plug the RCA-14 into your radio's accessory jacks, and all your ports are right there at your fingertips; just plug and play, one function or all of them, makes no difference.

The RCA-14 is compatible with: Icom 703, 706, 718, 746, 756, 7000 and 7800, Yaesu 817, 857, 897 and 840, Kenwood 480, 570, 2000 Ten Tec Orion and many more.

Suggested Price $59

Your Power Problems—Solved!

The Multi-DC 12 Volt DC Distribution Box

The Multi-DC can source up to three amps; each of the six outputs can provide up to .5 amps to your LDG accessories. The Multi-DC comes with an input cable, and six output cables, each 3 feet long.

Suggested Price $49

Baluns

RBA-4:1 Remote 4:1 Balun **$30**
RBA-1:1 Remote 1:1 Balun **$30**

FREE BALUN WITH ANY AUTOTUNER PURCHASE

Purchase any LDG Electronics autotuner between September 1st, 2007 and January 31st, 2008 and you will receive a free LDG Balun ($30 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.

VECTRONICS RF Accessories

300 Watt Antenna Tuner

VC-300DLP
$169.95

VECTRONICS uses the finest components available to build the highest quality 300 Watt antenna tuner ever made.

You can tune any *real* antenna 1.8-30 MHz. Custom 48 position switched inductor and 1000 Volt variable capacitors provide arc-free operation. Handles 300 Watts PEP SSB, (150 Watts on 1.8 MHz).

8 position antenna switch, 50 Ohm dummy load, peak reading backlit Cross-Needle SWR Power meter, 4:1 balun for balanced lines. Scratch-proof Lexan front panel. 10.2x9.4x3.5 inches. 3.4 pounds.

300 Watt Mobile Tuner

VC-300M
$119.95

The VC-300M *Mobile* Antenna Tuner is compact, lightweight, easy-to-operate and is our most economical tuner.

It's compatible with *any* mobile antenna, any HF transceiver and fits in the smallest car. It can also be used at home with any coax fed antennas -- dipoles, vees, verticals, beams or quads.

Backlit Cross-Needle meter simultaneously monitors Forward/Reflected power and SWR. Covers 1.8 to 30 MHz.

Handles 300 Watts SSB PEP, 200 Watts continuous, (150 Watts on 1.8 MHz). 7.25x8.75x3.6 inches. 3.4 pounds.

SWR/Power Meters

PM-30
$79.95
PM-30UV
$89.95

PM-30, $79.95, for 1.8 to 60 MHz.
Displays forward/reflected power, SWR simultaneously on Cross-Needle meter. True shielded directional coupler assures accuracy. Backlit meter displays peak or average power in 300/3000 Watt ranges. First-rate construction, scratch-proof case, durable paint, Lexan front panel. Lamp switch. SO-239 connectors. 5.3x5.75x3.5 in.
144/220/440 MHz, 30/300 SWR/Wattmeters
PM-30UV, $89.95, SO-239 connectors.
PM-30UVN, $89.95, N connectors.
PM-30UVB, $89.95, BNC connectors.

1.5 kW *dry* Dummy Load

DL-650M, $79.95
100 Watts continuous 1500 W/10 seconds to 650 MHz. *Ceramic* resistor. SWR less than 1.3. SO-239s. **DL-650MN, $84.95** has N connectors.

Low Pass TVI Filter

LP-30, $79.95
Eliminates TVI by attenuating harmonics at the source. Plugs between transmitter and antenna or tuner. 1.5 kW.

High Pass TVI Filter

HPF-2, $29.95
Installs between VCR/TV and cable TV/antenna cable. Eliminates or reduces interference caused by nearby HF transmitters.

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VECTRONICS . . . the finest amateur radio products made!

MIRAGE. . .160 Watts on 2 Meters!

The MIRAGE B-5018-G gives you 160 Watts output for 50 Watts input on all modes -- FM, SSB, or CW!

Ideal for 25-50 Watt 2 Meter mobile or base. Weak signals pop out with its low noise *GaAsFET* preamp and its excellent 0.6 dB noise figure. Selectable 5, 8 or 14 dB preamp gain.

Exclusive MIRAGE *ActiveBias*™ circuit gives *crystal clear SSB* without splatter or distortion.

B-5018-G is legendary for its ruggedness and is fully protected -- high SWR or excessive input power automatically bypasses the B-5018-G to prevent damage.

Heavy-duty heatsink spans entire length of cabinet. Power transistors protected by MIRAGE's *Therm-O-Guard*™. Has adjustable delay *RF sense* Transmit/Receive switch *and* remote external keying. 16-20 Amps at 13.8 VDC.12x3x5½ in.

B-5018-G
$329

B-1018-G, $409. MIRAGE's most popular *dual purpose* HT/mobile/base amp. 160 Watts out/10W in. For 0.25-10W rigs.

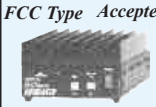
B-2518-G, $329. Like B-5018-G but for 10-25 Watt mobile/base. 160W out/25W in.

RC-2, $49. Remote Control. On/Off, preamp On/Off, selects SSB/FM. 25 ft. cable.

Power Curve -- typical output power in Watts

B-1018-G	25	50	140	150	160	160	--	--	--	--
B-2518-G	5	7	40	60	80	100	125	160	160	160
B-5018-G	--	2	15	25	40	50	70	100	130	160
Watts In	.25	.5	3	5	8	10	15	25	35	50

FCC Type Accepted



6 Meter Amplifier

A-1015-G, $389, *world's most popular* all mode FM/SSB/CW 6 Meter amplifier. 150 Watts out/10W in. For 1-15 W transceivers. 20 dB GaAsFET preamp.

300 Watts on 2-Meters, $739

3 models: 300 Watts out for 10, 25, or 50 Watts in. FM/SSB/CW. 15/20 dB gain, *GaAsFET* preamp.

Repeater Amps

11 models: *continuous* duty FM/SSB/CW *Repeater* Amps for 6, 2, 1¼ Meters, 70 cm, 450 MHz, ATV.

70 cm Amplifiers (420-450 MHz)

D-3010-N, $389 -- 100 W out/30W in. For 5-45 Watt *mobile/base*. **D-1010-N, $419**, 100W out/10W in. *Dual purpose* -- for handhelds or mobile/ base. **D-26-N, $299**, 60W out/2W in, for *handhelds*.

Low Noise GaAsFET preamps

High gain ultra low noise *GaAsFET* preamps for receiving weak signals. Selectable 15-22 dB gain prevents intermod. < 0.8 dB noise figure, auto RF switching to 160W.

In-shack or Mast-Mount models.

Frequency, MHz	*In Shack, $149.95*	*MastMount, $199.95*
28-30	KP-1/10M	KP-2/10M
50-54	KP-1/6M	KP-2/6M
144-148	KP-1/2M	KP-2/2M
220-225	KP-1/220	KP-2/220
430-450	KP-1/440	KP-2/440

Commercial Amps, $159 to $429

Commercial Amps for 150-174, 450-470 MHz, VHF marine bands, 70-130 Watts out.

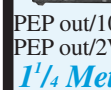
Amateur TV Amps

Industry standard ATV amps: **D-1010-ATVN, $439**, 82 W PEP out/10W in. **D-100-ATVN, $449**, 82W PEP out/2W in. (without sync compression).

Accurate SWR/Wattmeters

Read SWR directly and Forward/ Reflected, Peak/Average power. Remote coupler. 1.8-30, 50-200, 420-450, 1260-1300 MHz band models.

1¼ Meter Amps (223-225 MHz)



10 models -- 20-220 Watts out for 2-50W in, $169-$739.

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Membership Application

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Sign up my family members, residing at the same address, as ARRL members too! They'll each pay only $8 for a year's membership, have access to ARRL benefits and services (except QST) and also receive a membership card.

Family Member Name _____ Call Sign (if any) _____

☐ Sign up _____ family members @ $8 each = $ _____ .

☐ Total amount enclosed, payable to ARRL $ _____ .

☐ Enclosed is $ _____ ($1.00 minimum) as a donation to the Legal Research and Resource Fund.

☐ Charge to: ☐ VISA ☐ MasterCard ☐ Amex ☐ Discover

Card Number _____ Expiration Date _____

Cardholder's Signature _____

☐ If you do not want your name and address made available for non-ARRL related mailings, please check here.

Please check the appropriate one-year[1] rate:

☐ **$39 in US.**

☐ **Age 65 or older rate, $36 in US*.**

☐ **Age 21 or younger rate, $20 in US** (see note**).

☐ **Canada $49.**

☐ **Elsewhere $62.**

***Please indicate date of birth _____ .**

(US funds drawn on a bank in the US).

[1] 1-year membership dues include $15 for a 1-year subscription to QST. International 1-year rates include a $10 surcharge for surface delivery to Canada and a $23 surcharge for air delivery to other countries.

Other US membership options available: Blind, Life, and QST by First Class postage. Contact ARRL for details.

**Age 21 or younger rate applies only if you are the oldest licensed amateur in your household.

International membership is available with an annual CD-ROM option (no monthly receipt of QST). Contact ARRL for details.

Dues subject to change without notice.

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QST 10/2007

1.8-170 MHz *plus* 415-470 MHz
MFJ HF/VHF/UHF Antenna Analyzer

All-in-one handheld antenna test lab lets you quickly check and tune HF, VHF, UHF antennas anywhere. Covers 1.8-170 MHz and 415-470 MHz

Measures: SWR…Return Loss…Reflection Coefficient…Antenna Resistance(R), Reactance(X), Impedance(Z) and Phase Angle(degrees) . . . Coax cable loss(dB) . . . Coax cable length . . . Distance to short or open in coax… Inductance . . . Capacitance . . . Resonant Frequency . . . Bandwidth . . . Q . . . Velocity Factor . . . Attenuation . . . Has: LCD readout . . . frequency counter . . . side-by-side meters . . . Ni-MH/Ni-Cad charger circuit . . . battery saver . . . low battery warning . . . smooth reduction drive tuning . . . One year No Matter What™ warranty . . .

MFJ-269

$379.95

You can instantly get a complete picture, check and tune any antenna from 1.8 to 170 MHz and 415 to 470 MHz -- an MFJ-269 exclusive -- with this rugged easy-to-use hand-held antenna test lab! You can measure virtually every antenna parameter.

You won't believe its capability and versatility. This rugged handheld unit literally replaces a workbench full of expensive delicate test equipment.

SWR Analyzer

You can read SWR, return loss, reflection coefficient and match efficiency at any frequency simultaneously at a single glance.

Complex Impedance Analyzer

Read Complex Impedance (1.8 to 170 MHz)as series equivalent resistance and reactance (Rs+jXs) or as magnitude (Z) and phase (degrees). Also reads parallel equivalent resistance and reactance (Rp+jXp) **--** *an MFJ-269 exclusive!*

Coax Analyzer

You can determine velocity factor, coax loss in dB, length of coax and *distance to short or open in feet (it's like a built-in TDR).*

CoaxCalculator™ lets you calculate coax line length in feet given electrical degrees and vice versa for any frequency and any velocity factor -- *an MFJ-269 exclusive!*

Use any Characteristic Impedance

You can measure SWR and loss of coax with *any* characteristic impedance (1.8 to 170 MHz) from 10 to over 600 Ohms, including 50, 51, 52, 53, 73, 75, 93, 95, 300, 450 Ohms **--** *an MFJ-269 exclusive!*

Inductance/Capacitance Meter

Measures inductance in uH and capacitance in pF at RF frequencies, 1.8-170 MHz.

Frequency Counter/Signal Source

You can also use it as a handy frequency counter up to 170 MHz and as a signal source for testing and alignment.

Digital and Analog displays

A high contrast LCD gives precision readings and two side-by-side analog meters make antenna adjustments smooth and easy.

415 to 470 MHz Range features

Just plug in your UHF antenna coax, set frequency and read SWR, return loss and reflection coefficient simultaneously. You can read coax cable loss in dB and match efficiency.

You can adjust UHF dipoles, verticals, yagis, quads and others and determine their SWR, resonant frequency and bandwidth.

You can test and tune stubs and coax lines. You can manually determine velocity factor and impedances of transmission lines.

You can adjust/test RF matching networks and RF amplifiers without applying power.

Has easy-to-read LCD *logarithmic* SWR bargraph and SWR meter for quick tuning.

Much Better Accuracy

New 12-bit A/D converter gives much better accuracy and resolution than common 8-bit A/D converters -- *an MFJ-269 exclusive!*

Super Easy-to-Use

Select a band and mode. Set frequency. Your measurements are instantly displayed! Smooth reduction drive tuning makes setting frequency easy.

Take it anywhere

Take it anywhere - to remote sites, up towers, in cramp places. Fully portable -- battery operated, compact 4Wx2Dx6¾ in., weighs 2 lbs. *Free* "N" to SO-239 adapter.

Has battery saver, low battery warning and built-in charging circuit for rechargeables.

Use 10 AA Ni-MH or Ni-Cad or alkaline batteries (not incl.) or 110VAC with MFJ-1312D, $15.95.

MFJ SWR Analyzer Accessories

MFJ-39C, $24.95.
Tote your MFJ-269 anywhere with this *genuine* MFJ custom carrying case. Has back pocket with security cover for carrying dip coils, adaptors and accessories. Made of special foam-filled fabric, the MFJ-39C 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.

MFJ-66, $24.95.
Plug these MFJ dip meter coupling coils into your MFJ *SWR Analyzer™* and turn it into a sensitive and accurate *band switched* dip meter. Set of two coils cover 1.8-170 MHz depending on your MFJ-269 *SWR Analyzer™*.

MFJ-99C, $40.90.
SWR** Analyzer Power Pack.* 10 Pack MFJ *SuperCell™* Ni-MH batteries, and power supply for SWR analyzers. ***Save $5!

MFJ-98, $60.85.
MFJ-269** Accessory Pack.* MFJ-39C *custom* Carrying Pouch, MFJ-66 dip coils, power supply for MFJ-269. ***Save $5!

MFJ-98B, $88.90.
MFJ-269** Deluxe Accessory Pack.* Complete accessory pack! MFJ-39C Pouch, 10 Ni-MH batteries, dip coils, power supply. ***Save $7!

MFJ-269*PRO™* Analyzer

Like MFJ-269, but has extended coverage in UHF range ***(430 to 520 MHz)*** and ruggedized cabinet that protects LCD display, knobs, meters and connectors from damage.

MFJ-269*PRO* $409.95 ***NEW!***

Free MFJ Catalog

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• 1 Year *No Matter What™* warranty • 30 day money back guarantee (less s/h) on orders direct from MFJ

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http://www.mfjenterprises.com *for instruction manuals, catalog, info*

MFJ TUNERS

MFJ *IntelliTuner*™ Automatic Tuners

The MFJ-993B *IntelliTuner*™ lets you tune any antenna *automatically -- ultra fast.*

It's a comprehensive automatic *antenna tuning center* complete with SWR/Wattmeter, antenna switch for two antennas and 4:1 current balun for balanced lines.

MFJ's exclusive *IntelliTuner*™, *Adaptive Search*™ and *Instant Recall*™ algorithms give you *ultra fast* automatic tuning with over 20,000 *VirtualAntenna*™ Memories.

You get a highly efficient L-network, 6-1600 ohm matching at 300 Watts SSB/CW or *extra-wide* 6-3200 Ohm matching at 150 Watts SSB/CW, 1.8-30 MHz coverage, Cross-Needle *and* digital meters, audio SWR meter, *backlit* LCD, remote control port, radio interface, heavy-duty 16 amp/1000V relays.

MFJ-993B $259.95

The MFJ-993B automatically tunes for minimum SWR and remembers your frequency and tuner settings. The next time you operate on that frequency and antenna, these tuner settings are instantly restored and *you're ready to operate in milliseconds!* 10W x2¾ Hx9D". Use 12-15 VDC/1 amp or 110 VAC with **MFJ-1316, $21.95**. Radio interface cables, remote control available. See ***www.mfjenterprises.com***

600 Watt MFJ Automatic Tuner

MFJ-994B $359.95

Like MFJ-993B but handles 600 Watts SSB /CW, matches 12-800 Ohms. 10,000 memories. Does not have LCD display, antenna switch, 4:1 current balun, audio SWR meter/feedback. 10Wx2¾Hx9D in.

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-9982 *2500 Watt* Tuner

MFJ-9982 $699.95

The MFJ-9982 *ContinuousCarrier*™ antenna tuner handles 2500 Watts *continuous carrier* output on all modes and all HF bands into most unbalanced antennas -- even 160 Meters. 6-position antenna switch, 4-core balun, 1.5kW dummy load, true *peak/* average SWR/Wattmeter, 13¾Wx7Hx6¼D".

MFJ-989D *Legal Limit* Tuner

MFJ-989D $369.95

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. 12⅞Wx6Hx11⅝D".

MFJ-962D *compact* kW Tuner

MFJ-962D $279.95

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. 10¾Wx4½Hx10⅞D in.

MFJ-969 300W *Roller Inductor* Tuner

MFJ-969 $199.95

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. 10½Wx3½Hx9½D inches.

MFJ-949E *deluxe* 300 Watt Tuner

MFJ-949E $169.95

More *hams use MFJ-949s than any other antenna tuner in the world!* Handles 300 Watts. Full 1.8 to 30 MHz coverage, custom inductor switch, 1000 Volt tuning capacitors, *full size* peak/average lighted Cross-Needle SWR/ Wattmeter, 8 position antenna switch, dummy load, *QRM-Free PreTune*™, scratch proof Lexan front panel. 10⅝Wx3½Hx7D inches.

MFJ-948, $139.95. Economy version of MFJ-949E, less dummy load, Lexan front panel.

MFJ-941E *super value* Tuner

MFJ-941E $129.95

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 10½Wx2½Hx7D".

MFJ-945E HF/6M *mobile* Tuner

MFJ-945E $119.95

Extends your mobile antenna bandwidth so you don't have to stop, go outside and adjust your antenna. Tiny 8Wx2Hx6D 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-974HB *Balanced Line* Tuner

MFJ-974HB $199.95

The MFJ-974HB *true* fully balanced antenna tuner tunes any balanced lines. Matches 12-2000 Ohms. Covers 1.8-54 MHz *continuously* including all WARC bands. 300 Watts SSB/150 Watts CW. Lighted Cross-Needle SWR/Wattmeter. 7½Wx6Hx8D in.

MFJ-976, $499.95. 1500 Watt *fully balanced* antenna tuner. 1-30 MHz.

MFJ-971 *portable/QRP* Tuner

MFJ-971 $109.95

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. 6Wx6½Hx2½D in.

MFJ-902 *Tiny Travel* Tuner

MFJ-902 $89.95

Tiny 4½Wx2¼Hx3D", full 150 Watts, 80-10 Meters, has tuner bypass switch, for coax/random wire.

MFJ-904H, $139.95. Same but adds Cross-needle SWR/Wattmeter and 4:1 balun for balanced lines. 7¼Wx2¼Hx2¾D in.

MFJ-16010 *random wire* Tuner

MFJ-16010 $59.95

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 2Wx3Hx4D inches.

Dealer/Catalog/Manuals

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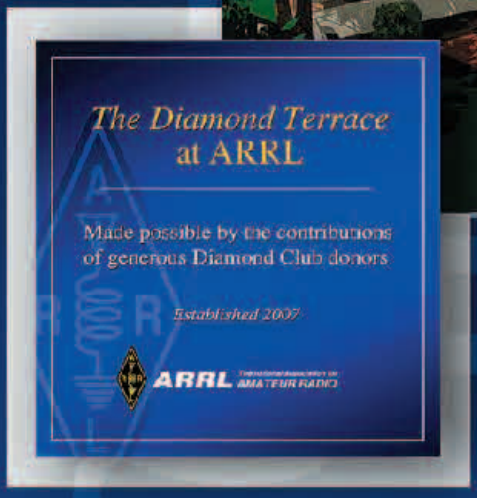


For more information, contact:

Mary M. Hobart, K1MMH
Chief Development Officer
ARRL
225 Main Street
Newington CT 06111-1494
Telephone: **860-594-0397**
Email: **mhobart@arrl.org**

The Diamond Terrace at ARRL is finally here and ready to receive visitors!

Nearly 200 personalized 4" x 8" bricks have been laid and five engraved granite benches placed in the Diamond Terrace!

There is still room for you!

The Diamond Terrace is a unique way to support ARRL as part of the Diamond Club—to honor your call sign—or that of an Elmer, Silent Key or family member.

Clubs or organizations may honor their club name or call sign, or celebrate a Ham of the Year, founding member or special achievement.

Each Diamond Club contribution of $250 or more includes all ARRL member and Diamond Club benefits, including *QST*, plus a Lucite replica of your brick depicting an inset of the Diamond Terrace graphic and your engraved information.

For more information, or to enroll in the Diamond Terrace program, call the Development Office at **860-594-0397** Or enroll on the web at **www.arrl.org/diamondclub**.

If you are traveling near ARRL Headquarters stop in and see for yourself!

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
$89.95

Tiny Travel Tuner with 4:1 Balun

MFJ-902H
$109.95

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.

Tiny Travel Tuner with Cross-Needle SWR/Wattmeter

MFJ-904
$119.95

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.

ALL-in-one *Tiny Travel Tuner* with 4:1 Balun *and* SWR/Wattmeter

MFJ-904H
$139.95

ALL-in-one! MFJ-904H, same as MFJ-902 *Tiny Travel Tuner* but has *4:1 balun for balanced lines* and Cross-Needle SWR Wattmeter. Read SWR, forward and reflected power all at a glance in 300/60 and 30/6 Watt ranges. Has 5-way binding posts for balanced lines and random wire. 7¼Hx2¼Hx2¾D inches.

Long 10/12 foot Telescoping Whips

MFJ-1954
$22.95
10 Feet

MFJ-1956
$29.95
12 Feet

10 foot extended, 19 inches collapsed, MFJ-1954, $22.95. 12 foot extended, 22.5 inches collapsed. MFJ-1956, $29.95. Standard 3/8 inch by 24 threaded stud for use with all standard mounts. Durable 1/2 inch diameter plated brass. Telescopes for full 1/4 wave operation 2 to 12/15 Meters. Cover 17, 20, 30, 40, 60, 80, 160 Meters with loading coil. Use two for multi-band dipoles. Replace screwdriver antenna whip for highly efficient *fixed* mobile operation.

MFJ RF Isolator

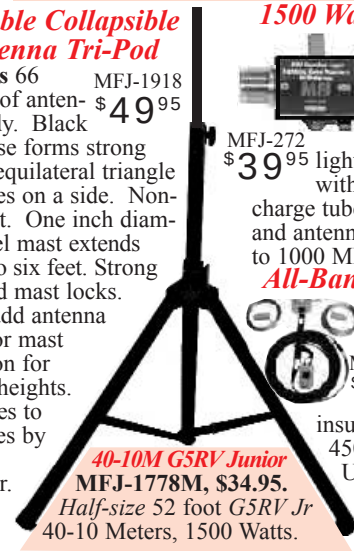
MFJ-915
$29.95

MFJ-915 *RF Isolator* prevents unwanted RF from traveling on the outside of your coax shield into your transceiver. This unwanted stray RF can cause painful RF "bites" when you touch your microphone or volume control, cause your display or settings to go crazy, lock up your transceiver or turn off your power supply. In mobile installations, stray RF could cause your car to do funny things even blow your car computer. Clear up these problems, plug an MFJ-915 between your antenna and transceiver. *Don't operate without one!* 5x1½ inches. For 1.8 to 30 MHz.

Portable Collapsible Antenna Tri-Pod

MFJ-1918
$49.95

Holds 66 pounds of antenna steady. Black *steel* base forms strong braced equilateral triangle 40 inches on a side. Non-skid feet. One inch diameter steel mast extends height to six feet. Strong base and mast locks. Easily add antenna mount or mast extension for greater heights. Collapses to 38 inches by 4 inch diameter. 6¾ pounds.



40-10M G5RV Junior
MFJ-1778M, $34.95.
Half-size 52 foot *G5RV Jr* 40-10 Meters, 1500 Watts.

1500 Watt Lightning Surge Protector

MFJ-272
$39.95

Protect your expensive transceiver from static electricity and lightning induced surges with an ultra-fast gas discharge tube. Plug between rig and antenna, attach ground. DC to 1000 MHz. SO-239s.

All-Band G5RV Antenna

MFJ-1778
$39.95

Cover all bands, 160-10M with tuner. 102 ft. long, 1.5kW. Custom fiberglass insulator stress relieves 450 Ohm ladder line. Use horizontally, as inverted vee or sloper. Marconi on 160M.

Glazed Ceramic Antenna Insulator

MFJ-16C06
6-Pack
$4.56
(79 cents each)

Authentic *glazed ceramic* antenna insulator. Extra-strong -- will not break with long antennas and will not arc over or melt even under full legal power. Molded ridges give extra-long high voltage path to prevent high-voltage breakdown. Smooth wire holes prevent wire damage. Use as center or end insulator for dipoles, doublets, G5RVs, guy wires and others.

Current Balun/Center Insulator

MFJ-918
$24.95

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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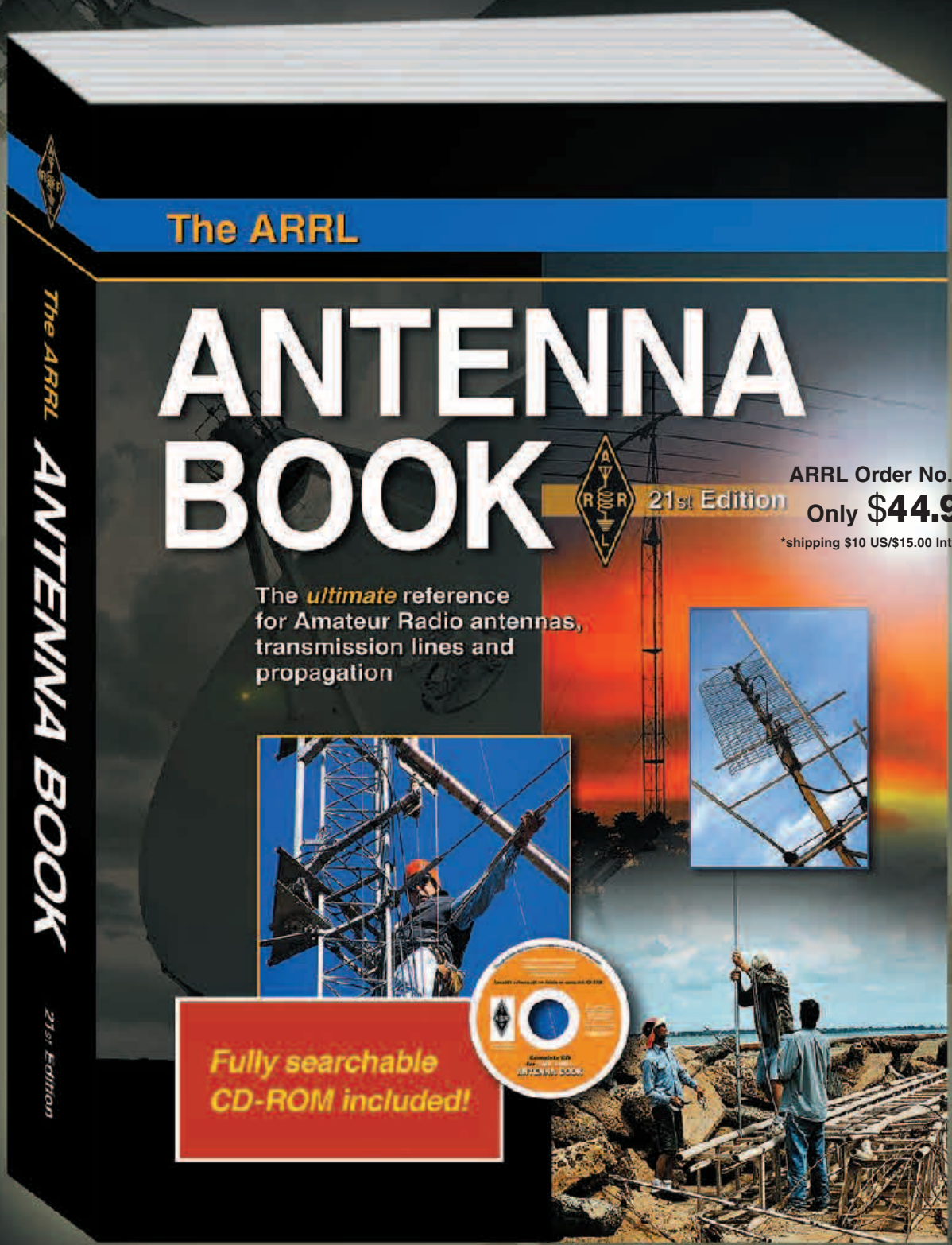

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QST 7/2007

MFJ *Balanced Line* Antenna Tuner

Superb balance . . . Very wide matching range . . . Covers 1.8-54 MHz . . . Cross-Needle SWR Wattmeter . . . Handles 300 Watts . . . Compact size . . .

The MFJ-974HB is a* fully balanced true *balanced line antenna tuner. It gives you superb current balance.

Johnson Matchbox

For decades, the Johnson Matchbox has been the standard of comparison for balanced line antenna tuners. But, it had a severely limited matching range and covered only 80, 40, 20, 15 and 10 Meters.

***The** MFJ-974HB is its successor*. It meets today's needs and even surpasses the Johnson Matchbox outstanding performance.

Everything You Need

The MFJ-974HB gives you excellent current balance, very wide matching range(12-2000 Ohms) and covers 1.8 through 54 MHz *continuously* including all WARC bands, 160 Meters, 6 Meters and the new 60 Meter band. Handles 300 Watts SSB PEP and 150 Watts CW.

Tuning is fast and easy - - just three tuning controls. You can adjust for highly efficient broadband low-Q operation or use higher Q when you encounter extreme loads.

A large three-inch lighted Cross-Needle SWR/Wattmeter lets you read SWR, peak or average forward and reflected power *all at a glance* on 300/60 or 30/6 Watt ranges.

A ground post is provided to ground one output terminal so you can also tune random wires and coax fed antennas.

Compact 7½Wx6Hx8D in. fits anywhere.

Tunes any Balanced Line

The MFJ-974HB tunes any balanced lines including 600 Ohm open wire line, 450/300 Ohm ladder lines, 300/72 Ohm twin lead - - shielded or unshielded.

Superb current balance minimizes feedline radiation that can cause troublesome TVI /RFI, painful RF bites, mysterious RF feedback problems and radiation pattern distortion.

Excellent Balance, Excellent Design

The MFJ-974HB is a *fully balanced* wide range T-Network. *Four* 1000 Volt air variable capacitors are gear driven. A high-Q air wound tapped inductor is used for 80-10 Meters with separate inductors for 6 and 160 Meters. The tuning components are mounted symmetrically to insure electrical balance.

MFJ-974HB
$199.95

A 1:1 *current* balun is placed on the low impedance 50 Ohm input side to convert the balanced T-Net-work to un-balanced operation. An efficient balun is made of 50 ferrite beads on RG-303 *Teflon*™ coax to give very high isolation. It stays cool even at max power.

Balanced Line = Extremely Low Loss

Balanced lines give extremely low loss.

Doublet, horizontal loop, vertical loop, quad, double extended Zepp, Lazy H, W8JK antennas all give efficient multi-band operation when fed with balanced lines.

6-80 Meter Balanced Line Tuner

MFJ-974B
$179.95

MFJ-974B, $179.95. Same as MFJ-974H but for 6-80 Meter operation (no 160 Meters).

160-6 Meters All Band Doublet Antenna

MFJ-1777, $49.95. 102 feet doublet antenna covers 160-6 Meters with balanced line tuner. Super strong custom fiberglass center insulator provides stress relief for 450 Ohm ladder line (100 feet included). Authentic *glazed ceramic* end insulators. Handles 1500 Watts.

MFJ *High Current* DC Multi-Outlet Strips

Choose super versatile 5-way binding posts AND/OR Anderson PowerPole(R) connectors

Anderson PowerPole® is a registered trademark of *Anderson Power Products.*

Provide multiple high current DC outlets for transceivers and accessories from your main 12 VDC power supply – keeps you neat, organized and safe. Prevents fire hazard. Keeps wires from tangling up and shorting. Outlets are fused and RF bypassed.

All MFJ DC power strips have *built-in* six foot, eight gauge, flexible color-coded cable with ring tongue terminals -- *no extra cost*. *RF-tight* aluminum cabinet has mounting ears and ground post with wing nut.

Choose MFJ's *super versatile* super heavy duty 5-way binding posts (spaced for standard dual banana plugs) and/or *Anderson PowerPole®* outlets.

Each *Anderson PowerPole®* is individually fused as needed. Standard color coded automobile fuses plug in externally. Extra *PowerPole®* connectors, contacts, fuses are included at *no extra cost*.

Versatile 5-Way Binding Posts

MFJ-1118
$79.95

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 with master fuse, ON/OFF switch, and "ON" LED provide 15 Amps for accessories. 12½x2¾x2½ in.

All PowerPoles®

MFJ-1128
$99.95

12 outlets, each fused, 40 Amps total. Three high-current outlets for transceivers. Nine *switched* outlets for accessories. Mix and match in-cluded fuses as needed (one-40A, one-25A, four-10A, four-5A, three-1A fuses installed). *Built-in 0-25 VDC Voltmeter*. Includes *extra* 12 pairs of *PowerPole®* contacts and *extra* 10 fuses (2 each: 1, 5, 10, 25, 40A) -- *no extra cost*. 12Wx1¼Hx2¾D in.

MFJ-1126
$79.95

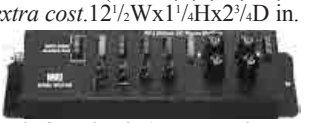
8 outlets. each fused, 40 Amps total. Factory installed fuses: two 1A, three 5A, two 10A, one 25A, one 40A. *Built-in 0-25 VDC Voltmeter*. Includes *extra* 6 pairs of *Anderson PowerPole®* contacts and *extra* 5 fuses (1, 5, 10, 25, 40A) -- *no extra cost*. 9Wx1¼Hx2¾ inches.

PowerPoles® AND 5-Way Binding Posts

MFJ-1129
$109.95

The best of both worlds! ***10 outlets, each fused, 40 Amps total.*** Three high-current outlets for rigs -- 2 *PowerPoles®* and 1 versatile high-current 5-way binding post. Seven *switched* outlets for accessories (20A max) -- 5 *PowerPoles®* and 2 versatile binding posts. Mix and match included fuses as needed (1- 40A, 2-25A, 3-10A, 3-5A, 2-1A installed). *Built-in 0-25 VDC Voltmeter*. Includes *extra* 7 pairs of *PowerPole®* contacts, and 10 fuses (2 each,1,5,10, 25, 40A) -- *no extra cost*.12½Wx1¼Hx2¾D in.

MFJ-1124
$59.95



6 outlets, each fused, 40 Amps total. Four *PowerPoles®* and two high-current 5-way binding posts, Installed fuses: 1-40A, 2-25A, 2-10A, 1-5A, 1-1A. Includes 4 pair *PowerPole®* contacts, and 5 fuses -- *no extra cost*.

•1 Year *No Matter What*™ warranty •30 day money back guarantee (less s/h) on orders direct from MFJ.

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MARCO The Medical Amateur Radio Council Ltd. is a charitable non-profit group of health care professionals who meet weekly at 10:00am Eastern on Sunday for "Grand Rounds" of the air on 14.307 MHz. All are welcome. For membership inquiries and/or free complimentary newsletter email: Danny@w4dan.us, toll free Ph 866-479-6160, or write to: MARCO, 2712 Bryant Dr., Cleveland TN, 37311. http://www.marco-ltd.org

N4USA Building Global Friendship. **WWW.FAIRS.ORG**

MFJ *Speech Intelligibility* Enhancer

. . . makes barely understandable speech highly understandable!

MFJ-616
$179.95

"What did you say?" ***Can you hear but . . . just can't always understand everything people are saying?***

As we get older, high frequency hearing loss reduces our ability to understand speech. Here's why . . .

Research shows that nearly *half* the speech intelligibility is contained in 1000 to 4000 Hz range, but contains a miniscule 4% of total speech energy.

On the other hand, the low frequencies, 125 to 500 Hz have most of the speech energy (55%) but contribute very little to intelligibility -- only 4%.

To dramatically improve your ability to understand speech, you must:

First, drastically increase the speech energy above 500 Hz, where 83% of the speech intelligibility is concentrated.

Second, drastically reduce speech energy below 500 Hz where only 4% of speech intelligibility lies.

The MFJ-616 splits the audio speech band into four overlapping octave ranges centered at 300, 600, 1200 and 2400 Hz. You can boost or cut each range by nearly 20 dB.

A balance control and separate 2½ Watt amplifiers let you equalize perceived loudness to each ear so both ears help.

By boosting high and cutting low frequencies and adjusting the balanced control, speech that you can barely understand become highly understandable!

Even if you *don't* have high frequency hearing loss, you'll dramatically improve your ability to understand speech. You'll get an edge in contesting and DXing and enjoy ragchewing more.

Here's what *QST* for April, 2001 said . . . *"I expected a subtle effect at best, but I was astonished . . . The result was remarkably clean, understandable speech without hissing, ringing or other strange effects . . . made a dramatic improvement . . ."*

Immuned to RFI. Has phone jack, on/off speaker switch, 2 inputs, bypass switch. 10Wx2½Hx6D". Needs 12 VDC.

MFJ-1316, $21.95. For 110 VAC operation. Provides 12 VDC/1.5 Amps.

MFJ-72, $69.80. *All-in-one MFJ-616 Accessory Pack*. Includes MFJ-392 headphones, two MFJ-281 speakers and MFJ-1316 power supply. ***Save $7!***

Try it for 30 Days

Order from MFJ and try it -- No obligation. If not delighted, return it within 30 days for refund less shipping.

MFJ Contest Voice Keyer

Transformer-coupled -- No RFI, hum or feedback . . . 75 seconds total, 5-messages . . . Records received audio . . .

MFJ-434B
$189.95

Let this *new* microprocessor controlled MFJ *Contest Voice Keyer*™ call CQ, send your call and do contest exchanges for you in your own natural voice!

Store frequently used phrases like "CQ Contest this is AA5MT", "You're 59" . . . "Qth is Mississippi" . . . Contest by pressing a few buttons and save your voice.

Record and playback 5 natural sounding messages in a total of 75 seconds. Uses *eeprom* -- no battery backup needed. Use your mic or its built-in mic for recording.

You can repeat messages continuously and vary the repeat delay from 3 to 500 seconds. Makes a great voice beacon and calling CQ is *so* easy.

You can also record and play back off-the-air signals -- great help if you didn't get it right the first time! No more "*Please repeat*".

A playing message can be halted by the *Stop Button*, your microphone's PTT/VOX, remote control or computer.

Has jack for remote or computer control (using CT, NA or other program). Lets you select, play and cancel messages.

Your mic's audio characteristics do not change when your MFJ-434B is installed.

All audio lines are RF filtered to eliminate RFI, audio feedback and distortion. An audio isolation transformer totally eliminates hum and distortion caused by ground loops.

New! **It's** easy to use -- just plug in your 8 pin round or modular mic plug, set the internal jumpers for your transceiver and plug in the appropriate (included) cable for your rig.

Built-in speaker-amplifier. Speaker/phone jack. Use 9 Volt battery, 9-15 VDC or 110 VAC with optional MFJ-1312D, $15.95. 6½Wx2½Hx6½D in.

MFJ-73, $34.95. MFJ-434B Remote Control with cable.

60 dB Null ***wipes out*** noise and interference

MFJ-1026
$189.95

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, $169.95. Like MFJ-1026 less built-in active antenna, use external noise antenna.

MFJ ***tunable*** Super DSP filter

MFJ-784B
$269.95

Only MFJ gives you *tunable* and *programmable* "brick wall" DSP filters.

You can continuously *tune* low pass, high pass, notch and bandpass filters and continuously *vary* bandwidth to pinpoint and eliminate interference.

Only MFJ gives you 5 factory pre-set and 10 programmable pre-set filters you can customize. **Automatic** notch filter searches for and eliminates multiple heterodynes. Advanced adaptive noise reduction silences background noise and QRM.

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BROADCAST MICROPHONES and accessories (call letter plates, stands) wanted: early carbon, condenser, ribbon, dynamic models. Cash or trade. James Steele, Box 610, Kingsland, GA 31548. 912-729-6106. jsteele@k-bay106.com; http://www.k-bay106.com/mics.htm

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CODE PRACTICE OSCILLATOR MUSEUM: http://www.n4mw.com

MFJ *Pocket size* Morse Code Reader™

Hold near your receiver -- it instantly displays CW in English!

Automatic Speed Tracking . . . Instant Replay . . . 32 Character LCD . . . High-Performance Modem . . . Computer Interface . . . Battery Saver . . .

MFJ-461
$89.95

Is your CW rusty?

Relax and place this tiny pocket size MFJ Morse Code Reader near your receiver's speaker . . .

Then watch CW turn into solid text messages as they scroll across an easy-to-read LCD display.

No cables to hook-up, no computer, no interface, nothing else needed!

Use it as a backup in case you miscopy a few characters - - it makes working high speed CW a breeze - - even if you're rusty.

Practice by copying along with the MFJ-461. It'll help you learn the code and increase your speed as you instantly see if you're right or wrong.

Eavesdrop on interesting Morse code QSOs from hams all over the world. It's a universal language that's understood the world over.

Automatic Speed Tracking

MFJ *AutoTrak*™ automatically locks on, tracks and displays CW speed up to 99 Words-Per-Minute.

Simply place your MFJ-461 close to your receiver speaker until the lock LED flashes in time with the CW.

Four Display Modes

1. Bottom line scrolls and fills with text, then that entire line is displayed on top line until bottom line refills -- makes reading text extra easy! Automatically displays speed in WPM.

2. Same as **1**, without speed display -- gives you maximum text display.

3. Top line scrolls, bottom line displays speed in Words-Per-Minute.

4. Both top and bottom lines scroll.

Two-line LCD display has 32 large 1/4 inch high-contrast characters.

MFJ Instant Replay

The last 140 characters can be instantly replayed. This lets you re-read or check your copy if you're copying along side the MFJ-461.

High Performance Modem

Consistently get solid copy from MFJ's high performance *PLL* (*phase-lock loop*) modem. Digs out weak signals. Even tracks slightly drifting signals.

Of course, nothing can clean up and copy a sloppy fist, especially weak signals with lots of QRM/QRN.

Computer Interface

The MFJ-461's serial port lets you display CW text full screen on a bright computer monitor -- just use your computer serial port and terminal program.

More Features

When it's too noisy for its microphone pickup, you can connect the MFJ-461 to your receiver with a cable.

Battery saving feature puts MFJ-461 to sleep during periods of inactivity. It wakes up and decodes when it hears CW.

Uses 9 Volt battery (not included).

True Pocket Size

Fits in your shirt pocket with room to spare - smaller than a pack of cigarettes. Tiny 2¼x3¼x1 in. 5½ ounces.

No Instruction Manual needed!

Super easy-to-use! Just turn it on -- it starts copying instantly!

Accessories

MFJ-26B, $9.95. Soft leather protective pouch. Clear plastic overlay for display, push button opening, strong, pocket/belt clip secures MFJ-461.

MFJ-5161, $14.95. MFJ-461 to computer serial port cable (DB-9).

MFJ-5162, $7.95. Receiver cable connects MFJ-461 to your radio's external speaker 3.5 mm jack.

MFJ-5163, $10.95. Cable lets you use external speaker when MFJ-461 is plugged into radio speaker jack. 3.5 mm.

MFJ *Pocket* Morse Tutor

MFJ-418
$89.95

Learn Morse code anywhere with this tiny *MFJ Pocket-sized Morse Code Tutor*™! Practice copying letters, numbers, prosigns, punctuations or any combination or words or QSOs. Follows ARRL/VEC format. Start at zero code speed and end up as a high speed *CW Pro!* LCD, built-in speaker.

MFJ Code Oscillator

MFJ-557
$39.95

MFJ-557 Deluxe Code Practice Oscillator has a Morse key and oscillator unit mounted together on a heavy steel base -- stays put on your table! Portable. 9-Volt battery or 110 VAC with MFJ-1312D, $15.95. Earphone jack, tone and volume controls, speaker. Adjustable key. Sturdy. 8½x2¼x3¾ inches.

MFJ *Pocket* CW Keyer

MFJ-403P
$79.95

Built-in Iambic Paddle. Thumbwheel speed control. Adjustable weight. Adjustable sidetone with speaker. Iambic modes A or B. Fully automatic or semi-auto "bug" mode. Reversable paddle. Tune mode. RF-proof. Battery Saver. Tiny 2¼Wx3¼H x1D inches.

MFJ *miniature* Travel Iambic Paddle

MFJ-561, $24.95. 1¾Wx1¾Dx¾H in. *Formed* phosphorous bronze spring paddle, stainless steel base. 4 ft. cord, 3.5 mm plug.

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MFJ *giant* SWR/Wattmeter

World's *largest HF SWR/Wattmeter has* ***giant*** ***6½ inch meter!***

This one you can SEE! Extra-long scales gives you highly accurate SWR and power measurements. Huge numbers makes reading easy across your shack.

Like your analog watch, one glance at the meter needle gives you fast and accurate readings without actually examining the scale. New!

MFJ's exclusive *TrueActive*™ peak reading circuit captures *true* peak or average forward and reflected power readings.

MFJ-868 $139.95

Has 20/200/2000 Watt ranges for accurate QRP or QRO operation.

Exclusive MFJ Wattmeter *Power Saver*™ circuit turns on meter only when RF power is being measured.

Covers 1.8-30 MHz. Use 9 volt battery or 12 VDC or 110 VAC with MFJ-1312D, $15.95. 7Wx5½Hx5D in. SO-239 connectors.

New!

Giant 144/220/440 MHz SWR/Wattmeter

MFJ-867, $149.95. Similar to MFJ-868 giant SWR/Wattmeter, but for 144/220/440 MHz.

MFJ *Weather-Proof* Antenna *Feedthrough* Panel

New! ***Bring three coax-fed HF/VHF/UHF antennas, balanced line, random wire and ground into your hamshack without drilling through walls . . .*** MFJ-4602 $59.95

MFJ's Weather-proof *Antenna Feedthrough Panel* mounts in your window sill. Lets you feed three coax-fed antennas, balanced line, random wire and ground without drilling through walls.

Simply place in window sill and close window. One cut customizes it for any window up to 48 inches. Use horizontally or vertically. High-quality pressure-treated wood with excellent 3/4 inch thick insulating properties is painted with heavy coat of white outdoor enamel paint. Edges sealed by weather-stripping. Seals and insulates against all weather conditions. Gives years of trouble-free service. ¾Dx3½Hx48W in.

Inside/outside stainless steel plates bond all coax shields to ground. Stainless steel ground post brings outside ground connection inside. Three *Teflon*® SO-239 coax connectors, *ceramic* balanced line/randomwire feedthru insulators.

Stainless Steel Bonding Plate

Indoor View

Outdoor View

6-Band ***Rotatable*** mini-Dipole for 40,20,15,10,6,2 M

Low profile 14 ft . . . 7 ft. turning radius . . . 1.5 kW . . . Directivity focuses signal, reduces QRM/noise . . .

You can hardly see this mini 14 foot rotatable dipole from across the street!

Tiny 7-foot turning radius fits the smallest roof -- perfect for houses, apartments/condos.

The low-profile MFJ-1775 is not much bigger than a TV antenna and nicely blends into the sky. It's easily turned by a lightweight TV rotator.

It's no Wimp! Its *directivity* reduces QRM/noise and lets you *focus* your signal in the direction that you want -- so you can work some *real* DX.

Operate 6 bands -- 40, 20, 15, 10, 6 and 2 meters. Run *full 1500 Watts* SSB/CW on all HF bands!

Its entire length radiates. Each HF band uses a separate, highly-efficient end-loading coil wound on fiberglass forms with *Teflon*™ wire with 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, $239.95. WARC band version for 12, 17, 30, 60 Meters only.

80/40/20 Meter Rotatable Dipole

MFJ-1785, $359.95. DX the *low bands* on 80, 40, and 20 Meters with an efficient full 33 foot *rotatable* dipole! Handles a full 1500 Watts. Balun included. 6063 T-6 aircraft strength aluminum tubing with a solid center fiberglass insulator. Requires a medium-duty rotator such as Hy-gain's AR-40.

Compact SWR/Wattmeter

MFJ-822 MFJ-842 $59.95 New!

Compact SWR/Wattmeter has huge 3 inch *lighted* Cross-Needle Meter, easily viewable from across shack. Read forward/reflected power, SWR *simultaneously*. 3¼Wx3¼Hx3¼D in. **MFJ-822** for 1.8-200 MHz, 30/300 Watts. **MFJ-842** for 140-525 MHz, 15/150 Watts.

2-Position *Remote* Ant. Switch

MFJ-4712 $79.95

Switch any two antennas remotely! *Single* coax feeds two antennas, DC power, control signals -- *no extra cable needed*. Use 1.8-150 MHz antennas. 1500 Watts. 50-75 Ohms. 4W x2⅝Hx1½D in. fully enclosed, *weather protected* outside switch box has stainless steel bracket for 1½ in. mast. 3 *Teflon*® SO-239s.

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MFJ-1800 $29.95

16-element WiFi Yagi antenna greatly extends range of 2.4 GHz, 802.11b/g WiFi signals. Turns slow/no connection into fast, solid connection. Highly directional -- minimizes interference. N-female connector. Tripod screw-mount. Wall/desk/shelf mounts. Use vertically or horizontally. 18Wx2¾Hx 1¼D in. 2.9 oz.

MFJ-5606SR, $24.95. Cable connects MFJ-1800/WiFi antennas to computer. Reverse-SMA male to N-male, 6 ft. RG-174.

MFJ-5606TR, $24.95. Same as MFJ-5606SR but Reverse-TNC male to N-male.

Glazed *Ceramic* Insulators

MFJ-16C06, $4.56, package of 6 authentic glazed *ceramic* antenna insulators. Extra-strong -- long antennas will not break, will not arc over or melt under full legal power. Extra-long ridges prevent high-voltage breakdown. Smooth wire holes prevent wire damage.

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Jobs

MFJ Dummy Load/Wattmeter

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.

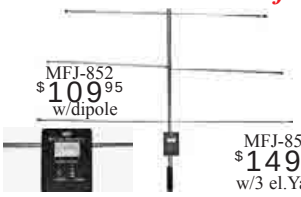
Extra-large three-inch lighted Cross-Needle meter reads SWR (1:1 to 8:1), forward and reflected power *simultaneously*.

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. $4^1/_2$Wx$3^1/_2$Hx$10^1/_2$D inches. Uses 12 VDC or 120 VAC with MFJ-1312D, $15.95.

Find Power Line Noise fast!



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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.

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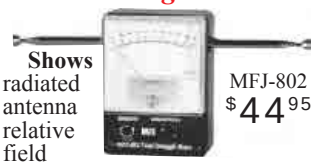

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Shows radiated antenna relative field strength. Determine radiation pattern. **MFJ-802** has huge 3 inch meter. Telescoping dipole reduces influence of surrounding objects and is more reliable, repeatable than monopole. Sensitivity control. Jack for remote sensor, MFJ-802R, $24.95. **MFJ-801** has $1^3/_4$ inch meter, sensitivity control, 20 inch extended telescoping monopole antenna.

MFJ-801
$24.95

81 dB Step Attenuator

MFJ-762
$79.95

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.

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MFJ-886
$119.95

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. $2^3/_4$x$2^1/_4$x$1^1/_4$ in. **MFJ-888**, like MFJ-886, but covers *10 Hz*-3 GHz. Measures frequency/period, has 50/1M Ohm input, auto hold, LED backlight, beeper. $2^3/_4$x$4^1/_4$x$1^1/_4$ in.

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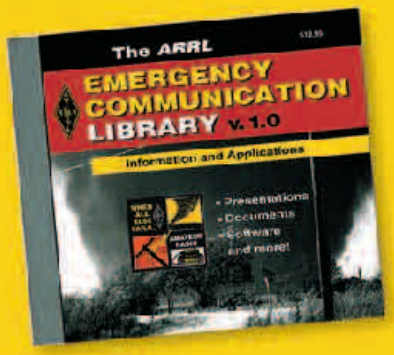

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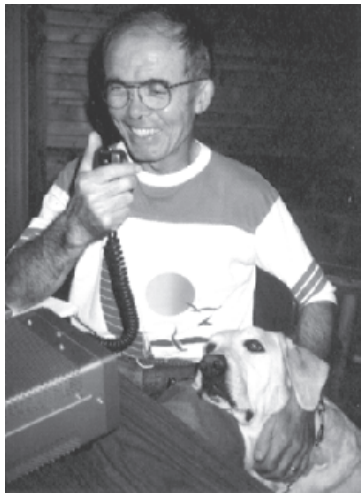

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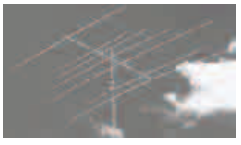

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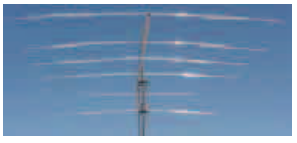

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